The first book Toyota Production System

Ministry of Education January 1973

論 より 実 践

専務取締役

大野耐一

Over the years I tried to do a variety, or to be done mainly be organized by many officials here this time, reading this now, I think a great effort.

Quotes of the late former president Kiichiro Toyoda, such general industrial, automotive assembly parts, but - "Just In Time" - the best side of the line together.

Quite obvious that this can not be hit hard and will do a variety of issues.
Ideally you would and so it is to say that once the unrealistic ideals.
However, the rational "reason" is an ideal "truth" If so, what tackle for rationalization are realized no matter what, I will try to be somewhere close to a doctorate.

Shasutointaimu and productivity, or costs, including outsourcing the burden to the manufacturers or just seems to go from the surface to contradict common sense.
Break out of this common sense, today or in the words of "common sense" post extraordinary point I must balance the conflicting.

"Just.In.Time" and the scene is translated into "what you want, when you need, just need to go to get (the divisions need)" is.
Before going to get the process back-end process, so the form of outsourcing supply goods manufacturers to indicate the quantity of goods on delivery.

The basic idea is that this is the Toyota Production System, which was developed in many ways embodies this idea.

As a front-end must be the most economically productive Okonawanakere corresponding.
Are apt front-end (factory floor), the quality, quantity, cost and easy to think individually.
For quality, in order to secure the amount or, if the cost of said loudly and tend to be particularly focused on the amount in it yet.
Quality, quantity, cost three matching techniques, it is Watakushi old technology "scene" like.

Some people call it a "manufacturing technology" also known.

In one recent occasion, "the Toyota IE" in the name MIE (Make IE) also went.

The name anyway, this method is the traditional conventional wisdom (common sense) and so far some place, halfway out so easily backfire, and must do it thoroughly.

The head switch is also required.

Way of thinking, I must change their own perspective.

About magic magic seeds (seed), so there is also a species of technology in this field.

If his tricks, "eliminating waste - out - is" "To cultivate eliminate waste at the waste to find, we got to find ways of eliminating waste," is this repetition.

Indefinitely, even where the first U persevere.

Managing the production of materials QPON

This document is written around 1970, Toyota Production System has been established, to know its origin to reprint the article was published on the Toyota Production System Want to help the old.

1, near the start of the story behind Toyota's kanban system

2, kanban system at work (Toyota Production System) case study summarized in the confidential document on the Toyota Production System, the first house

3, Toyota Production System Glossary

Receipt back-end processes, replacement later (producer), Andon, sink one (production), set-up in, AB controls, improve the rate movement, utilization, Kanban, Kanban work, kanban in the process, kanban signals, KANBAN pickup, KANBAN delivery (Kanban take thinning process), a supplier Kanban (kanban delivery component outsourcing), kanban extraordinary cycle kanban, QC timetable, of process flow, table capacity by step, why five times, cycle time carrying mixed order, work work standard work, takt time running働化self (with automatic Ninben) Just order table (order entry table), by pulling (pickup order), of little people, of people saving, labor-saving production Management Board (Production) directed villa, production lead time production technology, transportation arrangements outside many times, cycle time, with Multi-step, with many units, of rotation system, setup change (time), (re-stage (time)) line quota of fixed-position stop system, scheduled time conveyance, scheduled quantity conveyance, Toyota production system, efficiency, efficiency of true efficiency of the apparent efficiency of individual and overall efficiency, handling the transit system hire, remote island , goods cross the border, standard operating votes combined standard work, standard operation sheet, leveled, pacemakers,水Sumashi error proofing, waste, waste too much building, waste of waiting hand, waste handling,

waste processing, waste inventory, the operation waste, defects, rework waste of an irregular, unreasonable, looking at management systems Yoi don, 4S (5S), organized, tidy, clean, clean

4, the first time issued by the Toyota Engineering Society "kanban system (Toyota Production System)," a practical guide

5, the first compiled by the Ministry of Education of Toyota , "the Toyota Production System" textbook

Equation (1) Toyota (Toyota Production System) Reduction Effort, (2) efficiency, (3) standard work, (4) KANBAN (5) 06 Changes in the way of working, OA 7 Toyota Production System is also thought of , ISO14000

Kanban system (Toyota Production System), the story behind

I KANBAN

1964, I "Toyota Parts Management Division, Production Management Department" has been moved to the creator of kanban **"Ohno耐一"'s** headquarters plant was still "Kanban System" is mentioned about the birth.

Of course, **no** textbook **proposal,** under Ohno's idea, a lot of people out wisdom, and production system created in the local spot.

In-house "Toyota kanban case study" in the title, the book was first organized is 1970.

I also **"external parts procurement,"** I was happy that we participated in the field.

Now spread worldwide, so many books out too, and here **are mainly the back story.**

Sign, Kanban, Kanban

"Kanban" is writing is correct and write hiragana,

This is not written in katakana loan words, so jump in the wrong, the meaning of the kanji Aimasen thing I see is not just

Created by Toyota, **so** I write **in hiragana generic production system.**

Supermarket System

"Kanban System" is the beginning, "the supermarket system" was called, it is a visit to see supermarkets in the U.S. since it went devise a hint.

"When necessary, what is needed, as needed, before going to get the process back-end process," "pre-process the material drawn **bare minimum,** keep the **supplement produced"** principles that I can understand this better nickname.

SD system

Established in-house "Kanban System" When we deployed to the procurement of parts from suppliers,

"In the unrefined kanban "Insisted the young guys out of college and" Synchronised Delivery "put the initials" SD "process, and named it, held a briefing session,

Registration forms are in the Toyota kanban "SD Card" had become. I think that it is an international language, such as the real story lies

Uniform number

"Kanban" is part and part number, type and capacity of the box, in addition to front-end and back-end process such information, organize large numbers are written, but are written in the table, "Jersey" and called are.

"Without the serial number I have to work a lot Kanban sorting!"

"Kanban is the face of the goods, began to take on a life independent of the numbers and forget the essence!"

After such discussion is allowed to write you back for good,

Now it was different suppliers use the back, are written in the table.

Kanban divided Logo 3

The kanban is printed on a chapter of its suppliers,

This is sure to be determined at a glance the character better than the image sorting device to prevent human error.

When something is not processed because the computer image, but not homemade kanban,

The company such as handwritten letters section is not easy to pre-process and after the combination process is not difficult to prepare in advance and large print.

So chapter's suppliers and divided into three forms, most complete component information, color-acceptance, every print and separately, each solves and then plugging in combination to form a sack in three cases Kanban was.

The origin of post-processing arguments

Previous story in the main factory Toyota kanban system,

The division was responsible for the two executives and front-end post-processes,

One day after the executive process "and not produced as planned, there **is no best part, can** you keep it **before I leave** the **wrong processes,** from here, go get追Itsuitara" production plan The request came before the board was supplied process.

"That he might become a kanban system beginning to devise" Yes, people had been director of nostalgia and front-end.

Only one in five directions Intaraita

Instructions for assembly line production of vehicles and engines are assembled with a pencil on a sandwich of carbon paper was used telecommunications equipment Intaraita say "what next to make" the needle will scan and post the current flow The receiver then sends signals to reproduce the text in its current burn burn the paper, the image transmission system is a revolutionary time.

To direct the next five to five and use the equipment **to be completed,** never show no additional information was thorough information just in time.

From I use the part of many types, and well planned all not the information had been out and try to correct "game telegram" in the same, once you not take out the wrong someone correct I do not want! !

Planning for the delays go up to + -5

Plan to change the daily production of the final vehicle assembly line (uneven) and cause, the amplification process before it is transmitted to cause waste or unreasonable. We produce the final assembly line for the day, be sure to plan + -5 units are to achieve control.

That way, be late, work overtime to accommodate the left, I do, quickly made, and regular cleaning to stop the line is a simple way. . At that time, the total assembly line overtime loss to worry about the time I was allowed 10 minutes did not occur.

Nevertheless, big trouble if that many can not force overtime. If you like this, and give away even on the end of the number of days delayed plans to make up every day and topper. Never catch up in a hurry. Continue to the last stable production line is capable of production activities by the first kanban system.

* + - System

Even with kanban system, the number of individual parts need not be kept operational and equipment and materials to prepare people to calculate the unofficial announcement.

Components on the car has a huge variety has also increased rapidly expanding export markets in the type of car.

EDP was calculated by the master system was used to mark car parts unit, must be added for each vehicle maintenance, modifications Tsuiteikezu master, and each person was calculated computerized list The distribution was then distributed by the vendor and the classification was correct.

Register in person and see the "Using the Crown, except for left-hand" was written on to say.

Do not have to be more correct if it a large car engine.

Since the device can be calculated by the **master** in **computer-readable human** person

without going through the list, will now be distributed directly to the vendor.

Calculate Kanban board

Kanban system is a Kanban lives.

This Kanban calculations were done manually using a calculator or abacus was Tiger.

Recovery time and kanban required number of variables and calculations daily through supplier delivery time lag.

Now take a lot of time in the expansion of the kanban calculation.

This **two discs were transferred onto a slide rule memory,** simply adjust the number and required delivery time or per diem is to devise a tool to be solved to be answered.

Kanban defeat inflation

"The parts are not on time, very much, and may have lost Kanban?, Let me first of all one more!" Or increase kanban is prepared to decrease the time it comes off, I speak, to do it Zu, tend to leak like this is to overlap, but there are many kanban inventory increase become more number of directions, can not count the running Kanban. So long as the bar code sequence number on signboards, when I read that the vendor take the Route of empty, making **the inflation solved跳Ne出Su computer system.**

Research the origin of self-

Director independence is derived from the **Committee on the** kanban system.

Section chiefs gathered at the plant voluntarily Kamigo main plant and is improving the process of meeting a team theme.

I was impressed the first time participated as a representative office was still single.

Many units have been casting a burr, and process improvement have been on the tramp, "Bring it back to the previous machine deburring deburring machine for this work."

"I wonder why I have moved so far away just get in a better position?" And I said, "After

the previous machine, you walk with me next machine for work, while walking hand like doubling easy to install, you can set it to the next machine. "

"We waste time and keep doubling and stopped it just before" I said.

This alone is up 30 percent in productivity.

Lineside to improve their department head, went to enrich those gathered kanban system.

Speed-up

The kanban system has been named many things directed to different characters of the word homonymity.

Automated / Self 働化, Ministry of person / people of a bit rate of operation / mobility ratio, and is well known.

At a certain negotiations from the union, "right is strengthening regulations on the labor movement to the left," said a statement by Mr. Ono, "says the union is **running a piece** saying that the **animal** characters I have been improving like characters **who** say **that a piece of work** "

I work consumes energy, but certainly they could increase that speed-up, even when work is that it buys **less movement, earn a lot,** but this is better!

Like to increase energy and will not, like the character "work-earn" How do you get if you continue to strengthen. The union feels that this discussion is over 抓Ma fox.

100% Delivery System

One by one in a box attached "kanban" is removed from the box to start using, you collect it when it came to delivery suppliers, ordering and delivery of the next pass as minutes.

The order clerk is not involved at all.

The problem involved here is only to ensure order, and how to manage what was delivered.

So, when you order "invoice" and "acceptance form" was also made to pass.

And even if you have enough parts suppliers, correction of the number of documents is

Su permitted 100% documents until full payment is on hold, wait and exhibit area receiving, and processing the first time when the full payment, to a solved.

Delivery can be **managed not** by **looking at** this, I could simplify document processing.

Acceptance unchecked

The kanban system is no extra stock.

Too late to find the defective goods were delivered to inspect, you stop the line.

We guarantee the quality of the buyer, that the number of guaranteed delivery, no good theory test stand, we decided to accept the part.

Applying Kanban delivery, vendors have started from a system vendor that has been established.

As a result, this **"tough line ceased Toyota's"** Through consciousness, so it was now the driving force to strengthen the supplier's quality assurance system acceptance test is not Toyota.

Plant room walls removed

Recently, top-quality information that has not arrived, I have encountered many cases in danger of corporate survival.

Mr. Ohno was a factory headquarters at the time, moved to the conference room next to the control room of the factory to your room, we removed the wall between the control room And all the time conversation intercom fresh and field man control try to listen, if you want it is a problem in the field, had been the understanding of the facts in local products.

"Local spot" is still the base of the Toyota Production System.

Which is great manager and plant manager!

One time, when talking about large electronics manufacturers went out of the factory tour

I said, "welcome here, and the plant ○ ○, it is reasonable that the School's dean Normally, they overlap with important meetings I'll go to the head office and, a strange but fallen short of removing my plant ... "

Toyota We could not understand the greeting.

Because Toyota is a factory manager from the boss.

The stance was reaffirmed Toyota's emphasis on the field.

The control unit president - executive function - Director - Director, President and Plant - Plant Manager (Officer) - Head - were ranking manager.

Draw a circle standing Iro!

Ohno's foreman who "draw a circle Iro standing here!" And was often scolded.

At school, "If you stay standing in the hallway!" Is like being scolded by the teacher and the purpose is quite different.

The teacher's purpose is to exclude from the classroom, if not move the field supervisor, are intended to come see the improvements to continue to observe the problem at that location.

"Why why why why why" five times and 掘Ri下Gero！, Is said to be, is a technique for observing it.

Standing Desk

The site is not a writing desk and chair.

Attendance records and records of quality and production records, documents and forms must be written by the foreman, but quite often, these documents are written in the writing desk which stood standing. Soon the line to accommodate the call.

Proposal complied with

Companies that provide suggestions for improving the system from the field work is

often characterized by Toyota's proposal complied with a principle. Only then is it worth the effort to implement ideas move.

"There are suggestions on where the installation of fans every month, if only had one year back the original position," but said that there are changes in monthly production according to the layout, getting a perfect environment temperature and wind direction I think it's always seen as the position had been placed.

Of course many great improvement effects, some of those who work more than the total prize money of 1,000,000 yen per year.

Toyota Calendar

Toyota's calendar is different calendar and general arrangement of the week.

General Calendar	Day	Month	Fire	Water	Tree	Kim	Soil

Toyota Calendar	Month	Fire	Water	Tree	Kim	Soil	Day

Moreover, if a holiday is a week long holiday in the transfer.

"Operate five days, two days off," repeated cyclically, and has achieved a weekly look at leveling too.

This type of calendar 1960, [the format made five day work activities Getting the union](#) is.

Issuance of temporary Kanban

Kanban system is not a process that lead to cyclic operation. Suppliers and in particular, is ideal odd number of days per week, does not rotate properly kanban. Extraordinary amount of work and use, by issuing a temporary Kanban disposable and pre-split, store and issue every day little by little, I used the kanban has been discarded.

When you enter the high growth period, the models and processes, but many places will have holiday work fast enough to produce produce, making a very special kanban.

But it survived, and print graphics on a PC character in the character of the time, you can print bar codes in bit image, I learned that dealing with a hobby, not a trick BASIC program was used.

Weekdays inventory, the inventory of boxes, identification tag list

Kanban system, the inventory issue a power second to none.

The world is "bon appétit inventory for a break." Many are just that, in Toyota's Hazama Tadashi working days (working day is over, time to start working at night) intuition inventories in real (quantity counting, inventory identification tags to fill the table) to complete.

Identification tag list is prepared in the shelf unit shelf in numerical order, counting the number of boxes in the fraction, as it can fill, people do not count as equivalent. The inventory, the most common mistake is not a mistake in counting count leak, "the capacity × number + fraction" because of miscalculation, and that the work is computer work.

Can you make it, so that free flow of parts is kept constant as kanban, or just because they organize the inventory again, and there is no need to investigate.

Additional yield

To achieve improvement, team improvement in an organization called to improve the tools necessary to be ready to explain the concept if you ask here, using the name of facility where a dojo improvement tools can also make your own .

One by management and budget, and continue to improve the metrics are not so active.

However, out of order shall, subject to better manage a large budget.

1 application for the purpose, we proposed three measures, estimate the amount and effectiveness of their investment, adding much later, you can add effects much money, so let filed.

I put the budget in any case, all the way to arrange the order of the additional yield due to the effect that the amount of additional investment and additional measures are recognized to the extent that the budgetary system.

Morning market

The site also make mistakes and defective processing or reproof, and will not add to the cost of losses.

Defective processing daily work on display in the exhibition, called Farmer's Market is the wisdom of preventive materials and begin to figure out the problem together.

Blame or defective work or when used to evaluate losses and added to the cost or hidden defects, 限Rumasen've also used under the cover or not.

Taught at an early expansion of the problem！, Which is covered in attitude.

Refresh Activity

The scene around the 60th anniversary of the factory headquarters, the mechanical oil-covered floor under the oil pan is covered with scattered coolant, the walls were stained with soot. "Work of a man!" Was spent, and this condition is actually changed the recognition that there are curse kills better mask the problem, "one company-wide over three years to plant pretty much a surprise." campaigned under the slogan of refreshing. Oil pan and remove the floor, laying down cardboard boxes of equipment, attach a card or pass and go inspect drop of oil from falling, to wash and paint containers or empty cup flying high Moshita. Most years, starting with big issues left office, general manager level, which improved with responsibility assigned to those departments in order from top class manager.

Became the first Document "Kanban System"

50-Year History of Toyota "Kanban System" is described as follows originated.

Spring of 1954, adopted a pair of jets in a supermarket with Lockheed American newspaper industry, reports that topped 25 million dollars in savings per year.

The article was small and very nondescript, with people who had seen it.

Just a Kiichiro Toyoda, in-plant practice the idea of time machine, in part, but it was possible and had Ohno 耐一 planned production flow. (Below omitted)

Since the Toyota Production System, the system is thoroughly supermarket management tools such as "kanban" was used by the "Kanban System" Nirimashita be called.

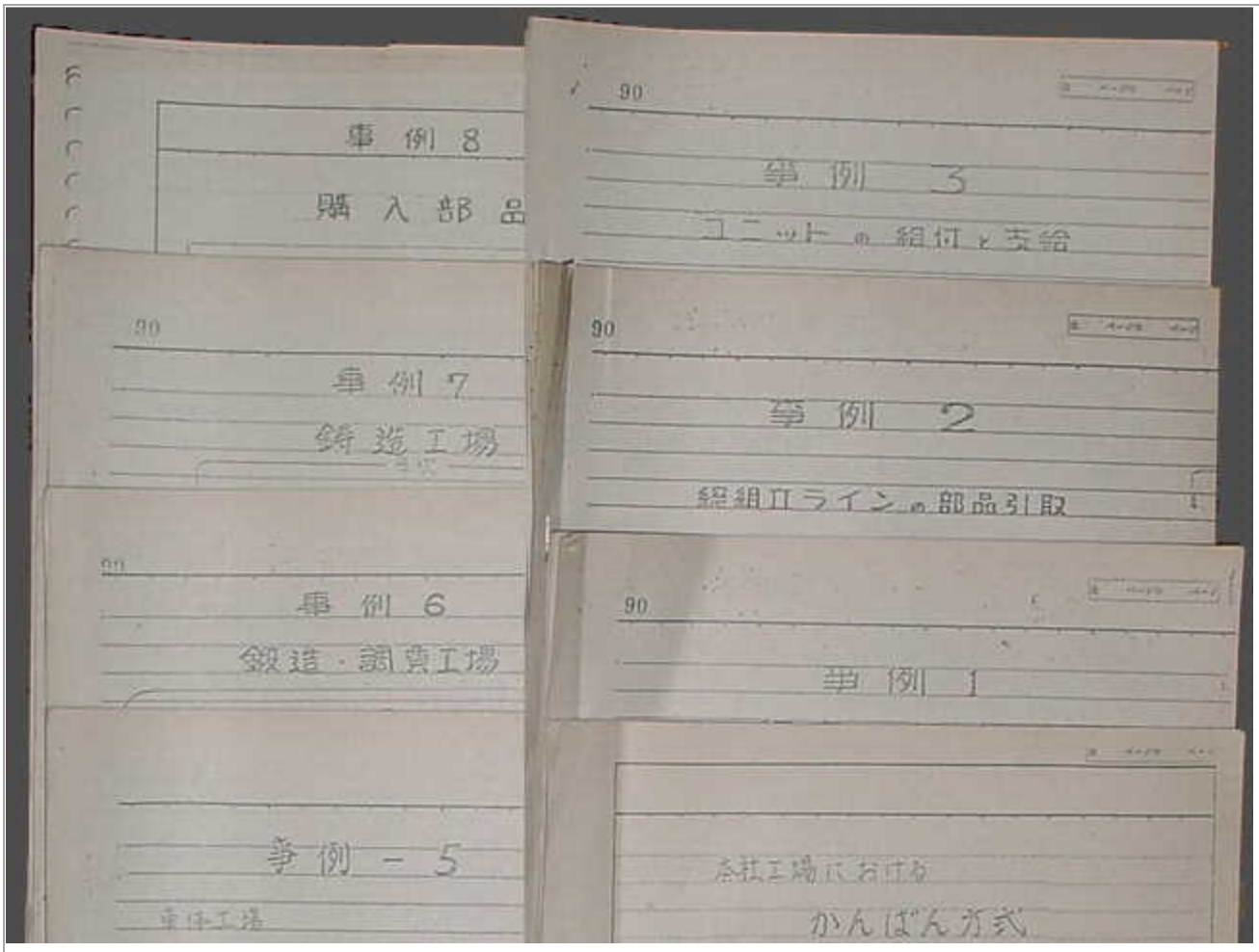
However, after more than 10 years, well into the 1960s, "Kanban System" document was not written about.

The first documented, the Public Works Department responsible for each step, a case put together a mechanism responsible for their production site, it was.

I participated as a member of the "Case 1" - 3 "Case" 記述Mashita charge.

Now, the publication of the number of publications has been established as a

science, "Kanban System", but was published in March 1970, "case studies kanban" self-reflect on the current situation in comparison with also meaningful to wonder whether the introduction here.



From those involved in leadership positions in editing, such as: addition, history has contributed more just.

"Kanban case studies" of the background and then

1954, Toyota Industries (Corporation) was introduced as a method for factory production control headquarters machine system "supermarket", in 1963, "Kanban System" evolved into, and then continued to evolve.

November 1965, TQC (total quality management), the opportunity of winning the Deming Application Prize by the promotion of "kanban system" also in the need to combine our method, there was a tendency that .

Next, Hino Motors, Ltd. in October 1966 (Corporation) signed the partnership, and training for people working to a machine shop managers soon headquarters (400 total) came on. When completed practice work, factory headquarters 耐一 Ohno at the time (the creator of the Toyota Production System), heavy on meetings and have been cultivated in the main factory for many years from the plant "manufacturing" approach, and tools such as the spoken.

This opportunity, that the basic contents of a meeting was held a few dozen

times, the kanban system in the main plant, "General" organized as a specific example has been implemented in manufacturing plants each "case study" The acquisition, as is putting together in March 1970 "kanban case study" is.
Until then, "Kanban System" was no documented information, a summary was here first.

November 1970, the instructions at the main factory situation first Japanese Quality Control Award, the production control system "features" as "Kanban System" was written.

After that, "Kanban System" has been contributed for magazines and newsletters Toyotamaneijimento Toyota technology, in June 1971, the production control department, "Business and kanban" have written a.

"Kanban case studies" is utilized as a special education courses in-house education ministry leader is from about 1972, also in January 1973, "the Toyota Production System ---- Basics", 2 1930 In September, "the Toyota Production System ---- Application Guide" as it has evolved further, "Kanban System" together, subjected to the use of their organization.

Then, in the progress of the use of external style "Toyota", "The Toyota Production System" was changed to.

(Ikeo Masakazu censure)

Factory headquarters

Motor Industry Overview <br> kanban system on March 1, 1970

(Ltd.)
Public Works Department Headquarters Plant

Introduction

Since the invention of our own aircraft Sakichi働織have been handed down for the traditional spirit of **self働化.**
働化 spirit of this **self,** which is defective to the next process on that never shed, self働織Sakichi machine is also loom out of the yarn itself even if the collaborative work Stop and leave out the threads are stuck.
They work with automatic stop device to say if the loom, thread run out, then, is a defective can only be produced on the spot treatment.
Was made at the amount of waste material defects, and that work should never worked.
That means work is to construct as defective, and that **self働化** with automatic shutdown system work.

In contrast, only automated productivity by switching to just-minute performance will increase automatically, the machine can continue even if non-standard goods movement.
The **supermarket** is called the **method** was applied to the surface of the production activities of this concept of **self働化.**
This is a supermarket (the previous step), the customer (step back) for, the goods they need, market availability and quantities required only when needed, and customers like to buy a stock without having to force (with and without stock) well aligned Do not worry about

what customers want and supermarkets, is based on the idea.

And without any clog the series of work leading to the total assembly process from material taken by each process is repeated one after another this idea, but they can form a circular assembly line as a whole.
Those aimed at improving process control **system** further with the idea of this **supermarket,** "Kanban System" is.

In terms of conventional inventory management of stock levels at Kame Tetsu did not order.
For example, production is determined is the middle of the month following month, at the end of that inventory is disgraceful, as we know the inventory and the inventory at the end, even if ordered after that time already can not be adjusted or later.
If you experience also defective, inventory control production activities had not been replenished quickly and only when it was planned that all of the work which is actually executed as planned planned Ru it is almost impossible.
While the shortage could also lead to include the excess inventory resulting basil for that.
A **kanban system** that was devised for the improved these defects.

Kanban system if ordering system ascribed under the plan inventory conventional to change the plan is understanding the amount of stock at the time of ordering, treatment proper can respond quickly even if the event of defects, such as adjustment performance-based ordering system that can be said that each time we have.
In this method, instead there is no shortage 起Ranai well too many things.
Originally, this scheme is intended to fine-tune the inventory will **not cause** very **large changes are most Mubeki precepts.**

System Route I or adopted since 1963 has been put into practice each case sequentially in the main plant, now and adopt comprehensive, average workload, 働化 own the equipment and machinery as well as reduced inventory levels, streamlined production method has greater effect and give the proper staffing.

Kanban system is not something fixed, improved further with the times With the development of future production systems are extensive, and probably will develop a good production management system.
However, people who operate it are not the same forever.
Could proceed in a different direction or the wrong interpretation by those who operate a kanban system that is now.
Also, people who work on kanban system, the new from the other point as a reference when implementing the kanban system and the future need to know quickly what a **kanban system,** cases that are relevant to the main plant was carried out to date systematically acquire, I once arranged to implement the basics of **kanban system** together.

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1. Kanban System Principles

What you need to have front-end back-end process, when necessary, go for it as needed, according to pre-process it should become the minimum stock.
Kanban system is a method of tuning control of cash management focusing on production activities, is based on the idea of reversing the normal process of transportation.
Customer that is (step back) money (kanban) with a supermarket called (front-end processes) to want (an essential component) when you want to (when necessary) just want to (the number required) to buy (to take) can think of to go.

What is actually what time, I just want the goddamn customers (post-processing) are probably most familiar with, and post-processing is required other than the extra post-processing is that it will 弓|Ki取Ranai Stock Stock will not.

Front-end, so come back for it in the interval that the process after only quantity given the minimum required by it (as minute instructions produced by the Kanban) to produce, so Do not worry about securing the place shelter given There are more than necessary to prevent production must.

2. Required to implement a kanban system

Kanban system is one with a cycle.

This cycle time and go get the goods produced by the previous step to the process after production, before the process is to be contacted before the collaborative process and quality information for their own goods to prepare this information include: The process flows that later.

The means of this repetition.

Each step of connecting the cycle, we are tuning the regulation of the various production chains to fit together.

For better management of this scheme is necessary to note that the following matters.

2-1 continuity of production

Which is produced by a kanban system shall continue to be produced to some extent.

If the individual made to order only once cycle is one example does not hold because there is no continuity.

The average production of 2-2

Each process in the production plant, according to the characteristics of the process around, averaging should be possible by the ability of the process. The average production of the final process is particularly important.

The average production of this final process, as well as the average per day, it is necessary and making the average time per one day.

Waves have the required quantity of the final process for the process before the process goes back before that as We is increased or decreased load current, each suffered greatly confused the process of wave formation cause or over the amount of stock , we may be unable to achieve target production plan.

2-3 streamline work process stabilization

Improved production efficiency is to eliminate waste in the irregularity Muri, in implementing the kanban system, the first work process is streamlined, which should be stabilized.

To do this, we devise self 働化 equipment and machinery, it is desirable that the system can malfunction and emergency preventive maintenance on mechanical failure of the conveyor line.

Stable quality 2-4

"Into making a quality process" for the department is always working bunch 握Shi process capability of the process itself does not produce the products shall be guaranteed for the next process.

If you have a stable production process itself, and which goods can be shipped first, even if completed processing much, given it Kere has not been guaranteed even to secure the quantity prescribed and stock and is premature.

If you wish to send the defective back-end process, that information is fed back to the front steps, front-end management, supervisors and other measures Bakayoke think should be the head of preventive.

3. General management methods kanban system (the promise)

Various regulations are needed in order to enhance the smooth operation of kanban system, kanban system who are engaged in the operation have to defend the rules of operation determined.

Kanban system and Kanban means in the instructions that can be used many times.

That is, the instructions produced, instruction material, transportation (Collection) instruction, order, by displaying the signboards of a single content and instruction delivery, without the need for documents and forms, simplify the business, organic medium that works for various communication and coordination for those that affirm their own without requiring the collaborative workforce.

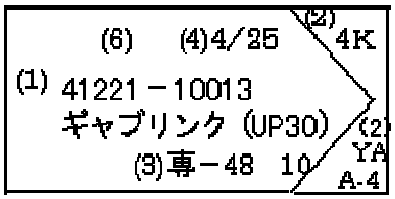
As a matter of a general commitment to operate the kanban system is what follows.

3-1, the basic information provided and the type of Kanban

A) If the assembly line

This form is heat-treated parts, machined parts, purchased parts are available and new applications such as assembly.

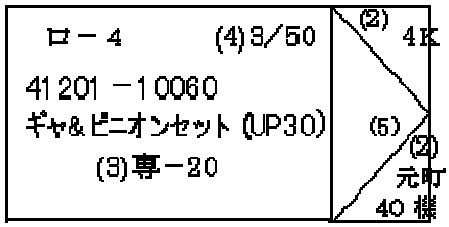
機械加工部品



<第４機械工場と熱処理工場の間の例>

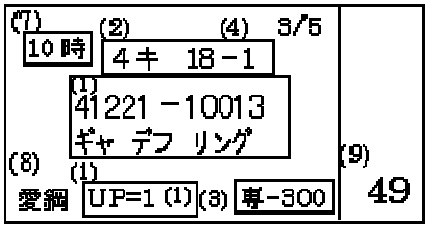
(1) 品番、品名、使用車種
(2) 工程（前工程、後工程）置場所
(3) 箱種（荷姿）収容数
(4) 整理番号
(5) 工程などの色別指示
(6) 運搬単位の荷姿　　など

組付部品



<第４機械工場と元町工場間の例>

購入部品



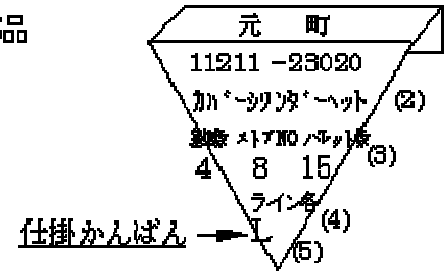
<仕入先と第４機械工場間の例>

(7) 仕入れ先納入時間
(8) 仕入れ先名
(9) 自工への納入先（受入）
(10) 品番コード（背番号）＝裏

（注）運用の仕方については事例集４.８参照のこと

B）ロット作業の場合　この様式はプレス部品、鍛造部品などロット生産する部品に利用し、信号かんばんと呼んでいる。

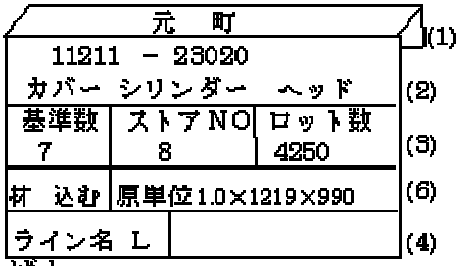
プレス部品



<プレス工場とプレス品ストア間の例>

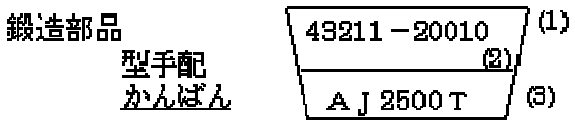
(1)（１）材料出庫区分
（２）品番・品名
（３）基準数（下限在庫）ストアNOパレット数
（４）ライン名、ライン色
（５）在庫ストア色別表示
（６）材質、原単位

など

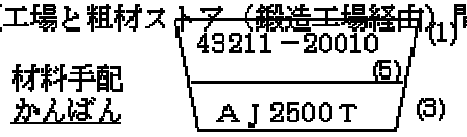


材料手配かんばん

＜鉄板倉庫とプレス品ストア（プレス工場経由）間の例＞



＜型工場と粗材ストア（鍛造工場経由）間の例＞



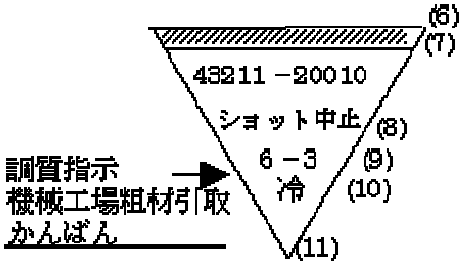
＜鋼材倉庫と粗材ストア間の例＞

（1）品番

（2）型手配かんばんと材料手配かんばんとの色別標示

（4）材種設備名、仕掛担当組色別

（5）材質区分



＜粗材ストアと機械工場（調質工場経由）間の例＞

(6) バリすり標示

(7) 後工程色別標示

(8) ショット要・不要

(9) 後工程の置場所

(10) 冷間コイニング要・不要

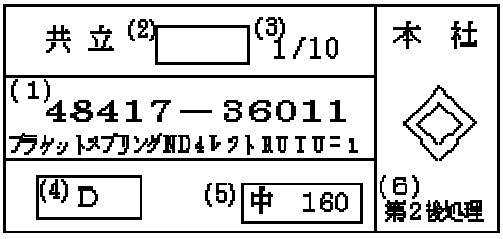
(11) 調質温度色別標示

など

（注）運用の仕方については事例集6参照のこと

C）鋳造部品　この様式は可鍛鋳鉄、ダクタイル鋳鉄など鋳造部品に利用している。

の場合



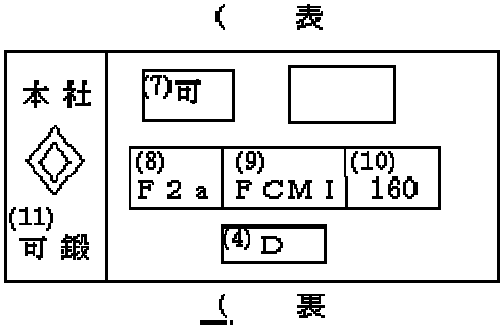
(1) 品番・品名、使用車種

(2) バリスリ区分

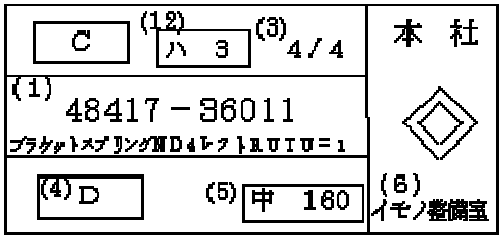
(3) 整理番号

(4) 仕掛区分

(5) 箱種、収容数

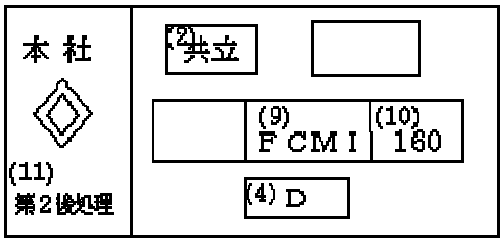


＜鋳込み工程とバリスリ工程（後処理工程経由）間の例＞



(12) 整備室置場所

(表 面)



(裏 面)

＜バリスリ工程とイモノ整理室間の例＞

(Note) See how the operational case study 7

D) In the case of low-volume production for small parts are produced every day or every month but continue to decide the form of kanban to consider the following.

Stream processing components: (1) necessary, in accordance with the principle of producing the required amount, according to the quantity needed to reduce the capacity of a box, using the mass production of parts kanban style.

Batch processing parts (2) using the concept of a kanban signal to a fixed quantity of production as the following: inventory becomes necessary to lead - only minute arrangements.

The style of the components used to produce large amounts of Kanban style in this case it is necessary to determine the minimum inventory level.

Kanban determination of 3-2 (volume control Widget)

3-3 Specifying a yard where parts and Kanban

(1) yard where parts (office address) to clear.

※ The relevant part is not the only place it absolutely.

When determining the location given shelter with the front-end back-end process ※ The transportation is convenient, considering that the retention or quality.

Specify the address where the post-processing front-end components to the appropriate Kanban ※.

(2) set in place a kanban post.

※ After the installation process is in place and within reach of workers to put a

kanban kanban post when using disconnected parts.

※ Before install process to put a post Kanban Kanban is empty to pick up the goods after processing. Front-end ※ is coming to pick the parts are back-end process, when no component corresponding post kanban for product rapidly gained in Me 知Ruta that come to the sudden get the parts that (post-red) also established.

How Kanban 3-4 Handling

(1) parts after machining processes flows ※ The first one is retrieved when using common components, given to post without a Kanban Kanban. (Figure 1)

A) Normally

Machined parts lot ※ (forging press products) division using kanban signals, such as having to by post-kanban bound for front-end Kanban that arrive hand in the box because they are kanban take back sequentially from the store stock go. (Figure 2)

(2) the transport process

Back-end processes ※, go get goods into front-end with empty boxes and kanban, to post Kanban process before I have Nokan front-end that is attached to the finished product at shelter finished producing process, Kanban identification tags attached to the process brought from their own.

When you pick up from the previous post-processing step must be set and ※ The actual item and kanban, the place you specified in the shelter pick Kanban Kanban designated delivery unit.

(3) pre-process step before the current line products ※ The number of minutes Route I just put in the post or kanban, or do not produce it. 1 box min were completed, one by one attached to each box of the post must be from Kanban Kanban retrieval.

B) in case of failure

(1) express treatment products (The role of the post in red)

If there is no stock on hand when we went to pick up the goods before the next process step ※ The kanban post for items that express a given front-end (post-red) Kanban put to the most appropriate components for the front-end仕掛Ru tells priority.

(2) ※ Kanban loss treatment "kanban" is also the most important of the adhesive system will operate Hakan.

Kanban is the possible loss that will be impossible to achieve production targets and not only to stop production activities.

If that was discovered missing kanban, to clarify the division of responsibility, and on measures taken to prevent the recurrence of the loss caused to the department, to reissue lost Kanban minutes.

3-5 The Role of Kanban

Kanban is not from the attempt to control an autonomic work even more relevant to the production process changes in the amount of production that, as a whole than to adopt a kanban system between each process and making the tuning can yield.

With the fundamental role of kanban is what follows.

(1) The number of times to request information about the Widget Widget ※ (eg quenching temperature and cycle)

Widget Type Order ※ (eg flow or processing or batch processing)

(2) the availability of appropriate staffing process ※ ※ own self-understanding of the process capability of a standard work in process compliance ※ ※ ※ downstream progress of the work provides information on working conditions

(3) instructions for carrying

Process of transportation and transport equipment yard where containers ※ ※ ※ time delivery quantity

(4) ※ urgent priority in process step that is required by post information about unusual situation ※

3-6 kanban system by looking at management

Kanban system is a clear reality of productivity without using written materials and paper reports from subordinate managers and supervisors, which was able to manage eyes "kanban," which comes from here the origin of the word .

Management point of looking at is as follows.

(1) work to be done through the standard check that you have constantly been working as a standard that other standards for the establishment of a working kanban work standards.

(2) stop work on the line when it is not against the standard work, line managers and supervisors to take action to stop that line can not stop

(3) Improvement of production managers and supervisors must constantly improve 心掛Kene waste found by looking at the realities of production.

Said line stop, especially since 100 is to improve the problems that surfaced in the production process must use%.

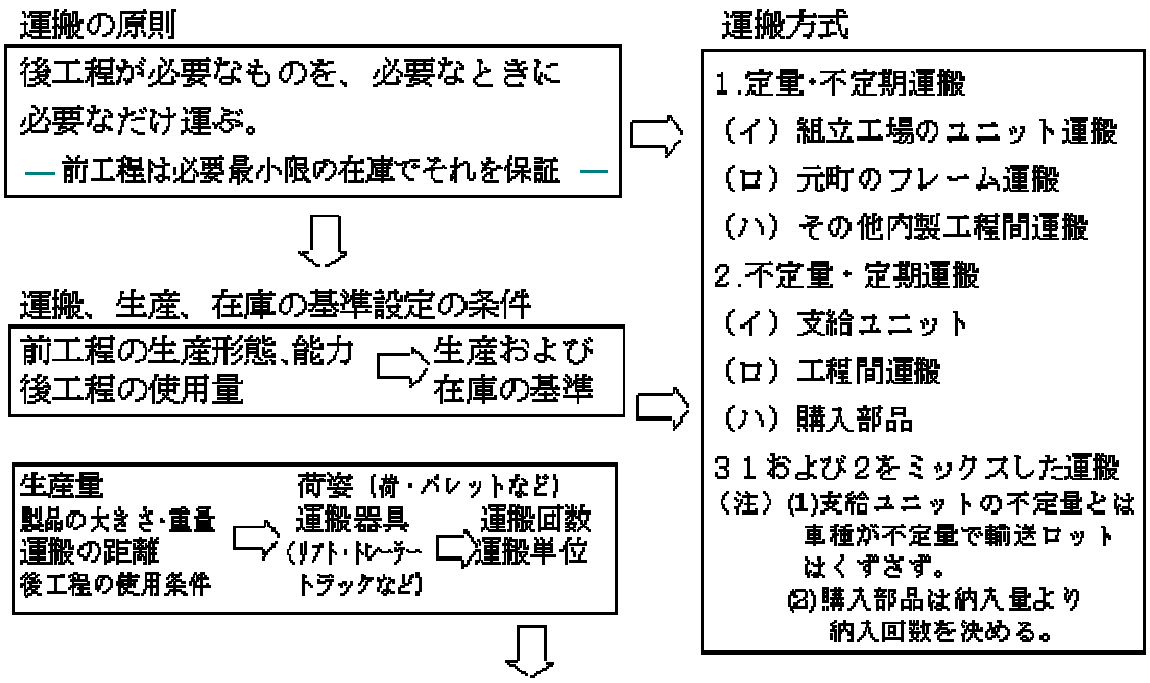
(Note) 1 stop line workers. In the event of process failure.

2. When you protect the standard work.

3. When you have completed only 04 production Kanban. When you see poor quality of front-end.

5. When shortage.

4. Kanban system and transport



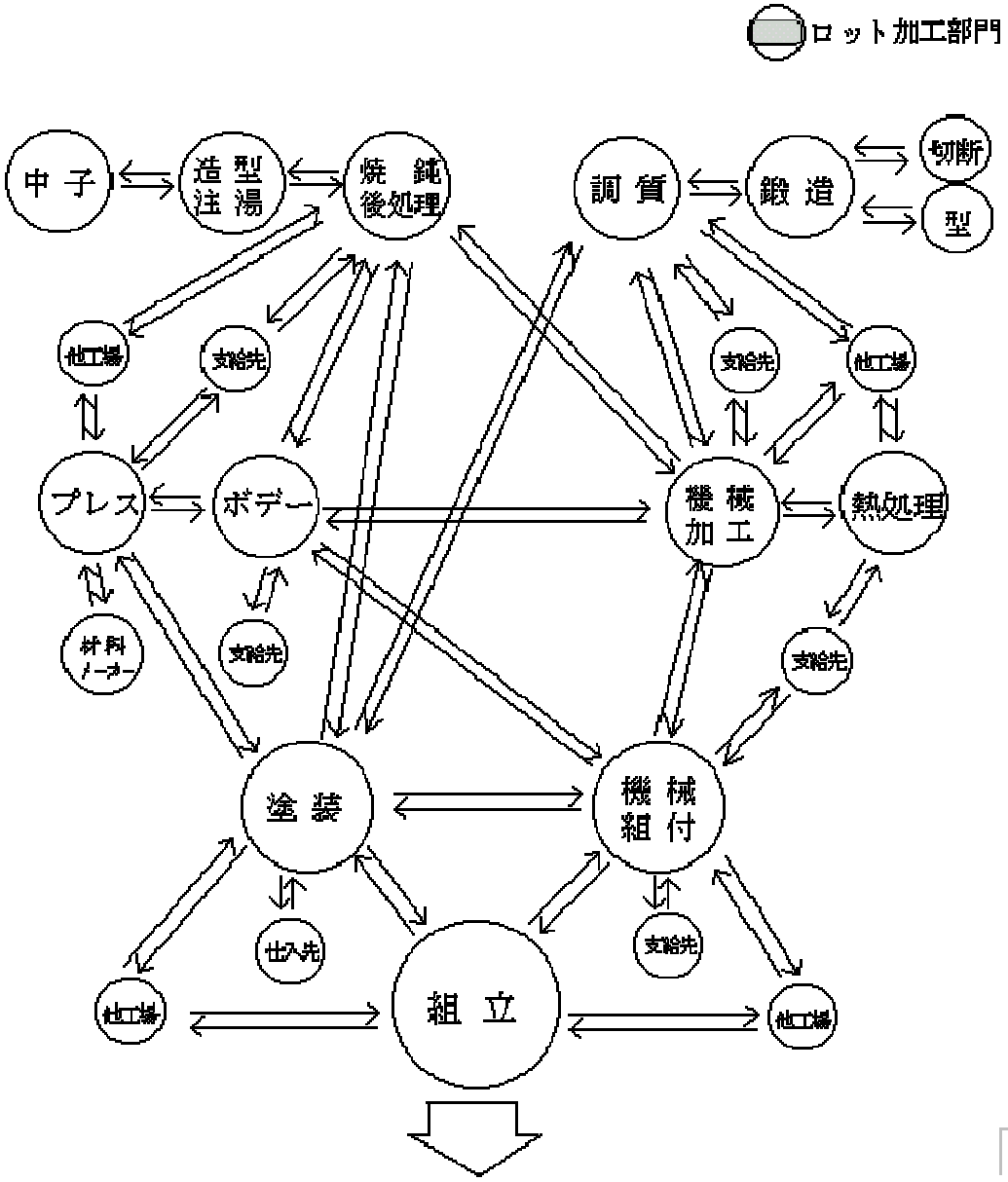
運搬・生産・在庫の基準設定の事例

小トラ　カウンターシャフト　使用量　317 個／日　製品重量　2.3 kg／個

工　程	４　機	焼　入	５機（研度）	５機（組付）
生産形態・能力	１ラインで2 点加工 １日１回段取替え	CD サイクル切替え 炉中 約 10H	組付の使っただけ研度	インターライターの指示動の組付（混合ライン）
後工程使用条件	焼入れ用トレーで熱処理後木箱に入れ替え →	手でもてる位の木箱が適当 ← →		一本のラインで多車種類を混合して組付
運搬距離	１４６m	６３m		１５ｍ
荷　姿	トレー １８個	木箱 ６個		金箱 他部品と１台セット
運搬器具	トレーラー	リフト		コンベア
運搬回数	１時間に１回空かんばんがあれば運ぶ	１時間に１回かんばん枚数が運搬単位になったら運ぶ		空箱が来たらセットして送る
運搬単位	４トレー／５機焼入の運搬箱数のトレー	12 箱／約３時間分を基準パレットに載せる		１台セット
生産在庫基準	11 トレー ／ 8.8H分	120箱 ／ 1.5H分	22箱 ／ 5H分	

5. Kanban system of tuning by

If we use kanban system between each process, each step is a final step.
Endoresuchein connected by a general assembly of factory tuning.



Case studies

This case study has been conducted on a case-by-case basis in the main plant.
I have seen everywhere in need of improvement because of a kanban system summarizes the truth. These areas will improve sequentially, and intend to go to work or do more substantial adhesive system.
If, when it adopted the kanban to refer to case studies, these case studies is not the one described about KANBAN wearing was completed, you have fully understood that, according to the department to conduct We hope that this scheme be investigated.

<Case 1>

Assembly and assembly-line

1. Average production plan

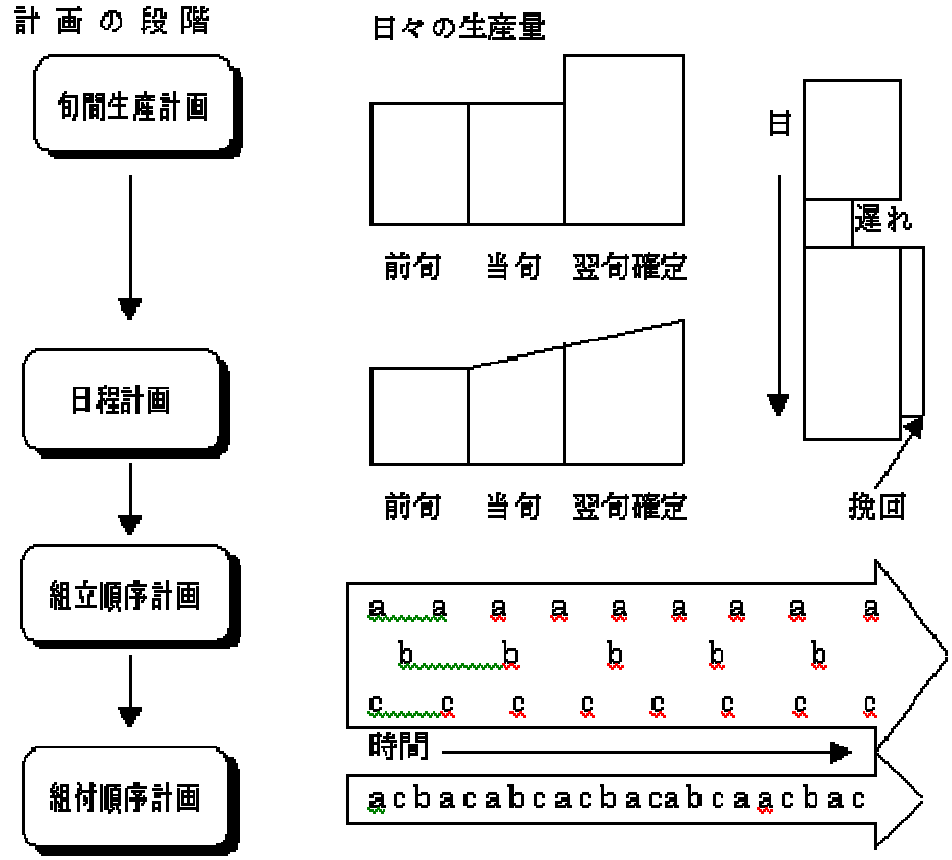
Production planning, and be based on your order early, must be satisfied that both the average and production.

To meet both of these are incorporated into planning titrated customer requests quickly, so that we will create a production plan on the decrease.

Your order is not intended to focus on one point, there is a tendency of gradual decrease from incremental or not, not inconsistent with the idea of the average production is anything but.

Averaging in this context, even for different types of cars, even hourly, or even for each type of unit also for other type vehicles have been the ideal that you seem to be averaging at per month in per day.

Moreover, if production delays, the dispatch plan permits it has to catch up to average.



a schedule

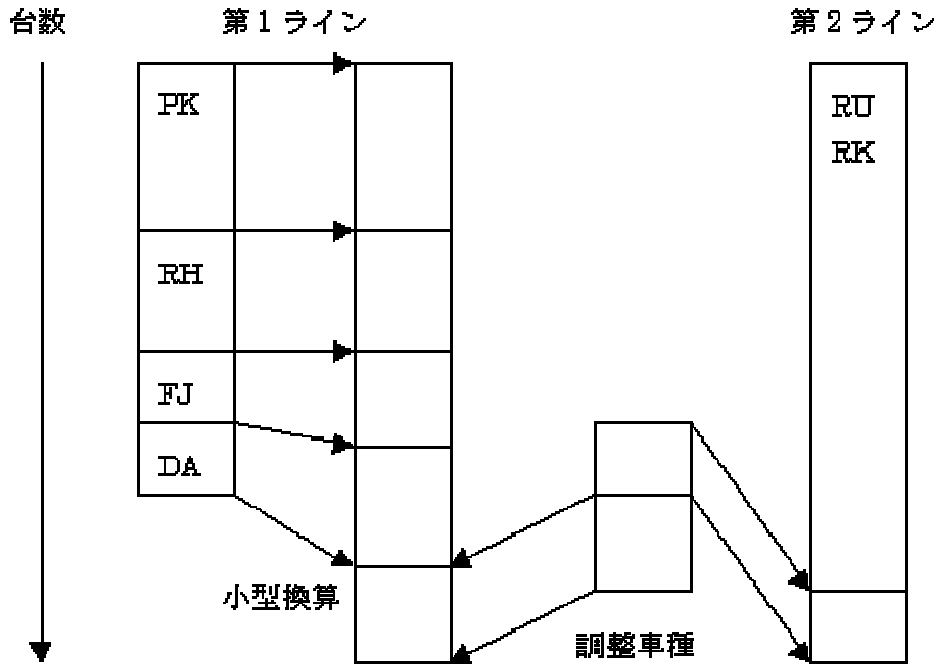
The total production according to types of vehicles given in units of 10 days with plans 旬間, even by car, in every type of vehicle in each type of unit, even by special specifications, which even as much as possible to the production volume of daily to create.

(However, three large-scale production unit, five so small, in multiples of conduct) and, car by car type or specification not only the number of daily production, to produce regular intervals that this condition is often overlooked well for average conditions is important.

Average order

The average number of lines of assembly plant by Lee

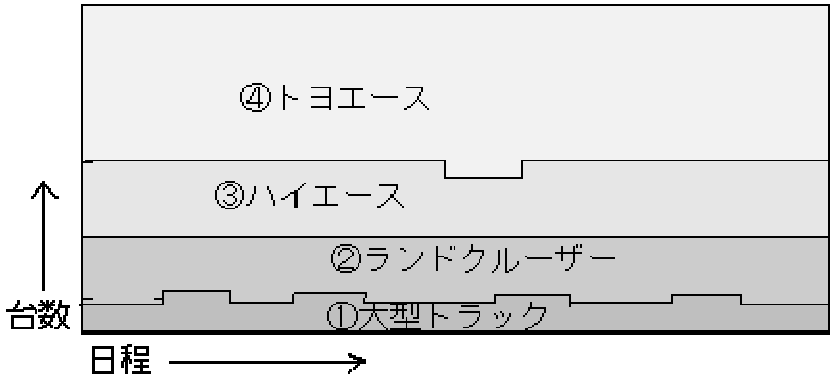
There are two assembly lines to produce the same number of lines of two per day on average take



from a front-end discount

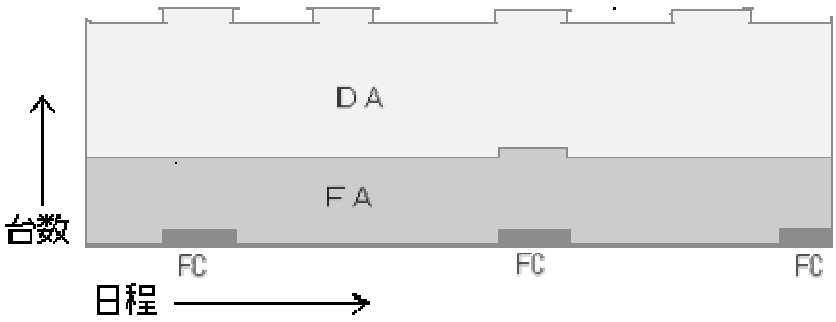
Car name separate averaging B

When averaged for each line in the frame, the average car by name, this time averaging is performed in order starting with the least number of



Ha averaged by vehicle

When the average car by name, by the average car in the frame. The unit performed well, starting



from the least at that time.

By averaging the car type and function of different average d

When averaged for each vehicle, we mean with the type assigned to each vehicle in the frame. This assignment is done sequentially from small car-type vehicle type unit been high priorities in function of each car type belongs.

Major features

エンジン	F型・D型・３P型・２R型・５R型・２J型・H型　等
ミッション	小型ミッション・小型強化ミッション 等
アクスル	大型２スピード・ダイナ・ダブルタイヤ　等
フレーム	ダイナ・ロングシャシー・ＦＪ55用 シャシー 等
ステアリング	右ハンドル・左ハンドル　等
ボディー	キャブ付・デッキ付　　等
塗　装	ＦＪロングシャシー・ダイナ・ロングシャシー 等
組　立	ＳＫＤ・ＣＫＤ等

Note: The average results by name or type of vehicle, vehicle type as well have been another average function is performed without considering the functional allocation.

Using the above average in computer system "creating scheduling" is done.

Moreover, the average condition of the slogan of the current ones, and so also not say enough, we mean works for the improvement of conditions in the future.

assembly sequence plan b

Given scheduling, vehicle units for each type the number of slots per day and the second line of the first line (three big, five small) and subdivided, each lot equally by every type of car assembly allocation to be. Moreover, because mixing line, made to order Kuzusanai a combination of equal intervals every possible type of each vehicle, assembled to give NO.

By the average car name Lee

Half the total number of lots to make a frame a day for each paired line is that they get equal intervals so that the border by car name.

B KD (knocked down vehicles export system) to average

When the frame taken by the company and in the name of the car at regular intervals to take minutes KD

Name another car that averaged Ha

Once the frame assembly minutes worth of KD and KD assembly minute intervals will be assigned to the vehicle frame with each minute

By averaging the function d

Determined by the vehicle frame, which features regular intervals so that the allocation of the frame

By vehicle type to average ho

On average we割Riate each vehicle type frame made of the above will be performed in order from low-volume vehicle types at this time.

※ averaging more than is done by using the electronic computer system COSMIC.

Moreover, average condition, but gave those present, and not say it enough yet, ※ strive to improve the average condition and future COSMIC Converyer scheduling & Mamagement Information Control System stands for assembly sequence Toyota is a term named when to dispatch from computerized.

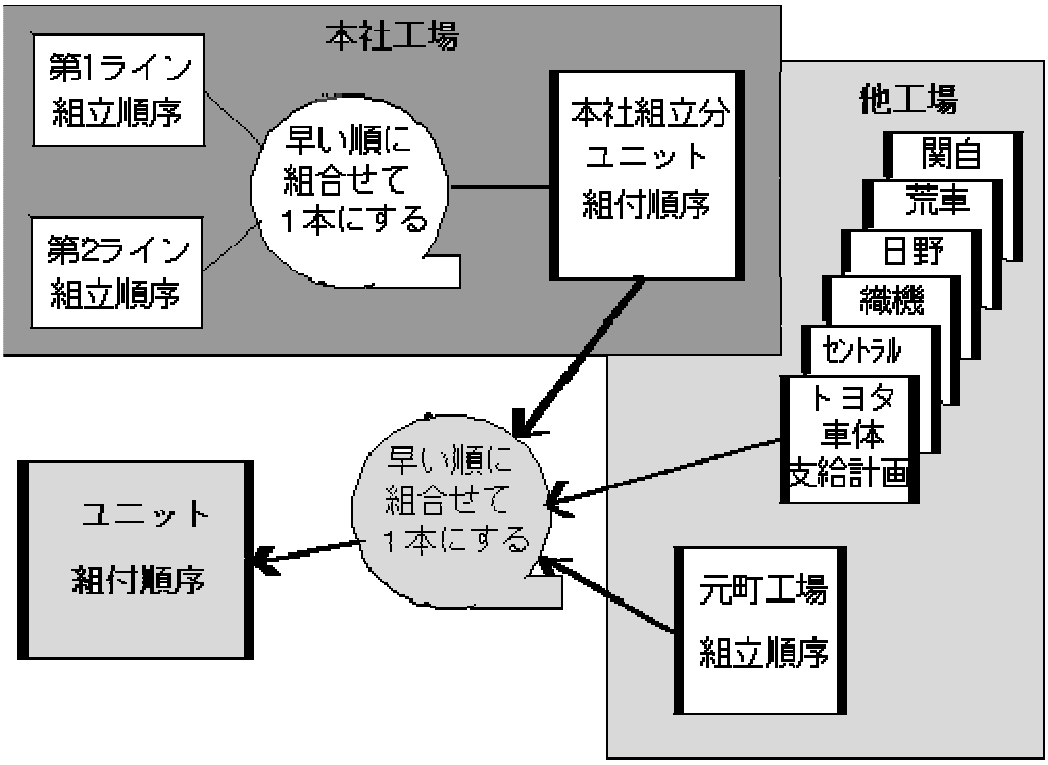
The system is created as shown below in more

3月6日　　第一ライン組立順序表

組立NO	車両形式	台数	配車先	仕向け地	仕様 エンジン 言語	サーモ	ファン	クリーナ	アクスル ギヤ比	等速	フルフロ	タイヤ サイズ	塗装色
39	DA115-1	3	SKD	9706-07750	E	X	O	P				825-20-14	
40	PK32	5											
41	FJ40L-A2(R)	5	AR	9104-04901	E	O	S	P	4			760-15-04	
42	PH10	5											3148
43	PK41-B3	5	TY										
44	DA115-1	3	SKD	9706-07750	E	X	O	P				825-20-14	
45	PH10-B3	5	TY										
46	PK32	5											
47	FJ45P-B2	5	AR	9808-09570	E	X	O	P	4	*		700-16-06	
48	PH10	5											
49	FJ55V-2(R)	5	AR						3	*		700-15-06	
50	PK32-3	5	KS										
51	PH10	5											452
52	DA115-1	3	SKD	9706-07750	E	X	O	P	4	*		825-20-14	
53	PK32-2(P)	5	AR										
54	FJ40L-A2(R)	5	TY	9104-04920	E	O	S	P	4	*		760-15-04	

C assembled sequence planning

This plan is the engine, transmission, Afusuru, Furopera handles are used to assemble each unit frame order. These units are also taken from the assembly line and the second argument first main factory assembly line, factory and manufacturers also supply CKD 袈装 Motomachi plant and body, which also produces parts. This order is the order taking custody of each process, which was organized in order discounts are taken from an early time.



(B) How the combination

- Insert the following units combined payment minute intervals from early 2nd line consumption rate of the first assembly line and headquarters

(B) when a combination of different methods and post-processing capacity

Afusuru Example 1, the propeller, factory handles, assembly plant (post-processing) for production

capacity in relation to the first shift, and thus have a direct production, currently producing 2 minutes worth of assembly production unit provided have to do later.

- Provision to the minute after minute assembly unit into the car at regular intervals by type

Example 2-F engine plant, which has now produced two shifts day and night, minute and assembly are combined in the order of minutes through the regular payment intervals combined unit.
In this case, the difference between the assembly plant with capacity of 1 / has been solved by having two days worth of inventory.

(C) how the combination of the main production plant is a unit worth of payments

Example 1 R engine plant supplies 25% of the total production to assembly of the head office, the remaining 75% of the Motomachi Plant, Kanto Auto Works, has been supplied to the Body, in turn produces two forms of work and also day and night so, other plants and different methods are combined.

- Calculate the total number of days required, 1 / assembled engines just give lots and lots of time to determine the 5 NO way an engine company to write assembly (RU engine)
Headquarters at the opening of the assembly 1.5H 1.5H before the closing time to line-up before we put the car assembly line in the order a second order from the table to take a distance within that range.
RT and RS morning - Motomachi plant calculated from the day the order for collection of body construction, Motomachi factory way for the main plant after production of the day to determine the number Enjinsutoa check the current inventory for RS Machimukai for Kanto between the original sequence into intervals according to body construction over RS engine into the engine at regular intervals and engine parts 5R After allocation of the engine for the RT43 and then from Machimukai the order to start construction on a spare body, Body to complete the assignment for a place to assign the remaining intervals.

d production, leading change, make up, and plan production cuts

Changes in the plan, was expediting the request from the sale, and were conducted from as early as possible to allow average productivity, so that there is a large difference to the daily burden.
In these cases a significant increase from the month following the month prior to the to the break-in production.
The plans make up for any delay in production, the dispatch plan permits, or to catch up to average as possible.

Lee, planning ahead

1) Based on the informal notice issued on 10 study units in the previous month unofficial announcement of the next month, next month to calculate the number of day and day of month number, the requirement of the preceding necessary to determine the need.

2) The final plan will be issued based on one 15 month study determined the number of the next month) as well as study

3) The study plan will be presented each time based on model switching plan, the number of minutes required to produce minutes of the period preceding line modifications, form a long-term plan to reduce the load increases daily as possible.

Russia plans make up

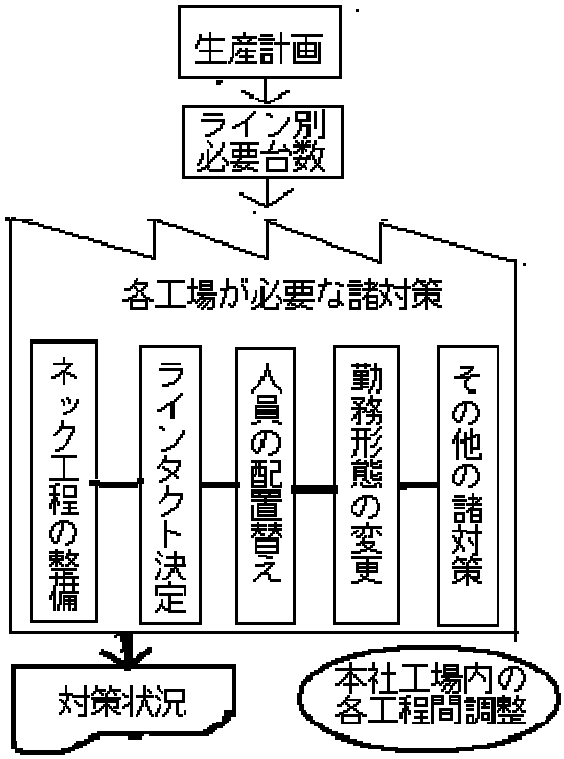
Make up the credit until the end of the day can now catch up, in principle, conduct on an average.

Ha, production planning, production cuts

As if to make up the production.

2 production lines planned for production planning

And production planning next month, according to the schedule next season, each assembly line, with each group for each line, indicate the number of factories required to produce a different type of vehicle.
Each plant, in order to produce this volume, the various measures required to enter the run time, the system has been prepared.



昭和44年3月度生産計画台数に対する能力検討

	ライン名	生産計画台数					問題点		対策	勤務			
		最高	2月	3月	4月	5月	設備能力	工数		普通	連2	昼夜	3直
小	PH,RH		167	178	167	168							
型	RN		57	69	79	78							
ア	PK32		65	58	58	57							
ク	PK32-H,41		99	88	85	79	問題なし	問題なし	現状通り		○		
ス	RK101-K		38	41	42	40							
ル	RK101-K		6	7	6	5							
組付	計	434	432	441	437	427							
大	FA,DA		15	24	25	25							
型	FA-H,DA-H		6	6	6	4			1)ドラム搬送自動化				
ア	BUS		7	7	8	8			1名分は吸収する				
ク	FJ		66	70	71	67	問題なし	2名不足	2)1名補充要		○		
ス	RU,JU		185	188	181	178			3、ラインタクトアップ				
ル	FC		1	1	1	1							
組付	計	281	280	296	292	283							

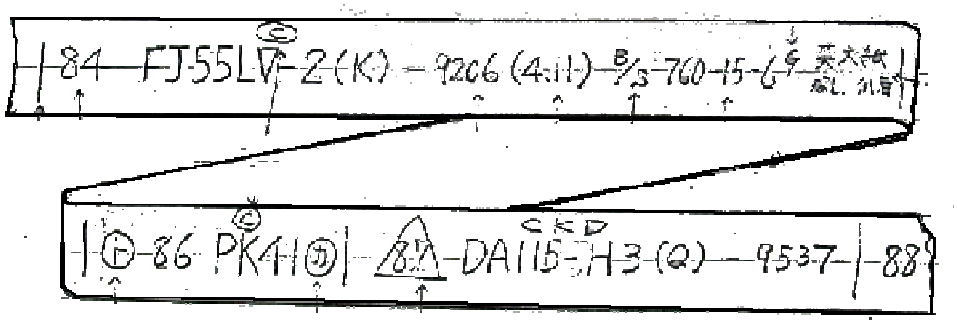
3, vehicle assembly, with instructions to set the production unit

Instructions for each line of production to the operations room (control room) that conduct.
The directive instructs the room, as **long instruction plant** in each line is treated.
Thus, contrary to the instructions are not allowed any production.
The directive from the room, to the vehicle assembly line last line, assembly line unit to the front-end production and production order production order is directed only.
Out little by the previous instructions of one lot is that there be no changes made and instructions to avoid the fat.
Method of communication is being done by the writer interface indicated a need to produce all the items.
a, vehicle assembly instructions to

Assembly sequence according to Table 1 Lot (three large cars, small cars 5) indicating little by using the writer interface.

(And the writer interface, communication devices like facsimile transmission, sent letters to the electric pencil on paper completed, the discharge device is reproduced on letter paper multiple receiver)

(B) has completed all the required fields ranging from production design, including a special type of vehicle car exports the contents of the instructions.



(B) which directed

Mission Line →	△ ○
Engine line R →	△ ○
F-line engine →	△ ○
Propeller Line →	△ ○
Steering Line →	△ ○
Large Akusururain →	△ ○
Small Akusururain →	△ ○
Frame paint line →	△ ○
Mission-line engine-× Icon →	△ ○
Tororikonbea parts	△

Command and control center
△ = ○ for 1 = 2 line for line

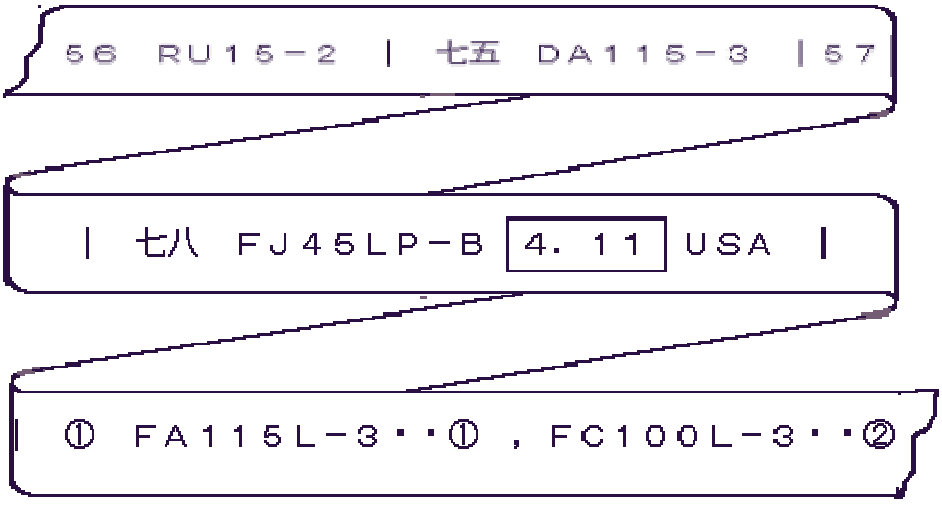
Frame custody	
Tires pick up	
General Assembly Line 2	
Tororikonbea parts	
Frame custody	
Tires pick up the radiator assembly	○
The first general assembly line	

(C) up to the front lot line is 15 vehicle assembly instruction timing (about 2.5 hours ago)
This place has been set based on the longest lead time.
Tororikonbea parts pickup (pre-10 lots) + preparation + α = 15 slots for this instruction is directed assembly line production process is used as directed before loading into transport truck unit.

(D) termination assembly instruction daily, lighter end of the day inter NO inform each line.
This instruction is determined by the decision ± to plan operations room and the situation within five.
Transmission method is enclosed in square inform instruction writer interface.

with instructions to set b
Assembled according to an order of one lot (three large, five small) indicating little by using a lighter interface.

As with the contents of assembly instructions, Lee still needed to fill in assembling all the items, separate interfaces are NO different characters post-processing



(B) which directed

□	Mission Line
○	Engine line R
○	F-line engine
△	Propeller Line
△	Steering Line
△	Large Akusururain
△	Small Akusururain
□	Large Frame Line
□	Small Frame Line
□	FJ Frame Line
□	Dainafuremurain

.

Command and control center
Mission □, △ = ○ frame for axle-engine propeller

Ha instruction timing

About 6 hours ago 40 slots for line-up before the assembly plant
This, in large truck axle factory brake Collection are determined based on location of the longest lead time (Lot 10) + Line Painting (Lot 3) + Line assembled (Lot 2) + Brake Collection (Lot 20) + alpha-Lot 40

C delivery of parts from supplier to supplier's instructions, the kanban system has 行Ko in parts of the assembly 1 is being delivered according to the order of the same line of industrial self-assembled The reason is because many types of great things, only used to supplement the shelter provided by each type. Kanban system that it is a very large area for shelter. Suppliers have an office that paid in accordance with the following order

Manufacturer	Parts
* Body	Cab deck all models
* Toyota	3P · 2J · H · D engine
Aisin Seiki	Dyna FJ · large (full sync) mission
With brake Yutaka	Brakes all models
中央精機	All models tires
Topy Industries, Limited	Large truck tires Stout

Table of how to interface assembly sequence of instructions or writer Lee

Writer of the timing of the interface where instructions from table b where the same assembly line sequence of industrial self assembled ago (little by five days.)
Because delivery of the table assembly sequence would fix flaws in the delivery order unit 5 days ago,
What kanban system, is being considered for the scheme will change from writer interface. (※ the only sign above)

4, pick up a vehicle assembly and parts production line

Assembly line from the front steps of the above instructions from the operations room, pick up units and parts, and Tororikonbea Also, parts and supplies from the side line, and trolley lines and components for collection and mobile units to the line supply of parts from the site in more detail in Case 2. Case 3 also described how the units assembled line and mobile

Determination of line tact Lee

From total production per day, the line tact tact line is determined, the 5 - to decide if there is no stop line to achieve the planned 10 minutes early one day (this is called an adjustment time.)

Collection and replacement of the unit B

Assembly line (step back) assembly line process from pre-process argument before coming little by taking a lot of room in the order directed replenishment directives keep producing units in the order directed the operations room only discounts taken Collection and supplementation is not a direct passage of Ku, a certain amount of truck (stock) is carried out with

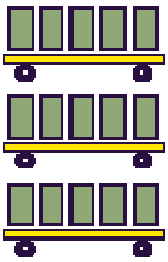
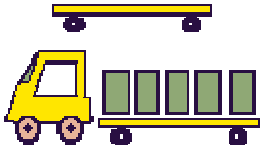
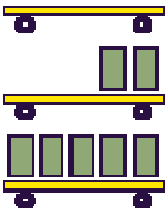
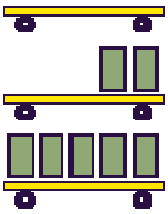
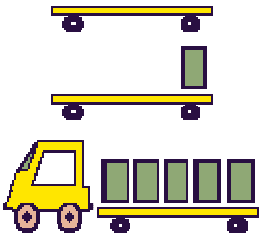
Ha parts supply

Using a trolley conveyor components, in principle, be provided in the order indicated from the operations room. However, large or heavy things that provide a direct line from the side.

Completion of the plan D

Although final assembly will be NO day of instruction each day from the operations room, to stop the line, even within hours of this plan is complete. When work is not completed and will continue until

Replacement unit and pick up

Assembly line	Custody	Unit assembly line	
↓ ↓ ↓ ↓ **Gross** **Group** **Vertical** **La** **Y** **Icon** ↓ ↓ ↓ ↓			**← ← frame** Truck stop there is no free line, Wait until a carriage free.
			**Axle ← ←**
			**← ← Engine**
			**Propeller ← ←** Many administrators are taking measures to make up for the free trolley

This is the same relationship between the front-end and front-end.

---

05 control line

Office Judiciary fingers other directions of production, constantly monitors the status of movable line assembled and the assembly, in case the stop line at the same time to understand the factors in immediate contact to the department concerned to measure.

Always stop the line if you experience any problems, will resume production in a vicious instruction command and control center.

Because according to the principle that each line has a manufacturing defect can understand the situation if it stops monitoring the line.

determine the extent of a moving line

Will be connected to the power of each line identify the line stop Lee, assembly plant is the final step in particular has to inform the chime light is red board graphics operations room and stopped the line,

step 09 As can be seen that the department was divided into stopping.

B number of stops, time stops, and stop switch will be connected to the understanding of the time clock operation, the number of graphics board suspended operations room, downtime has to understand the cumulative operating hours

Ha line up line up line when NO understanding of the general assembly, line up on the plate by the electric sign graphics that are as NO lights

Graphics board

---------- ○
---------- ○
---------- ○
---------- ○
---------- ○
---------- ○
---------- ○
---------- ○
---------- ○
---------- ○

74
90
The second line ① = ② = ③ = ④ = ⑤ = ⑥ = ⑦ = ⑧ = ⑨

62
78
The first line ① = ② = ③ = ④ = ⑤ = ⑥ = ⑦ = ⑧ = ⑨

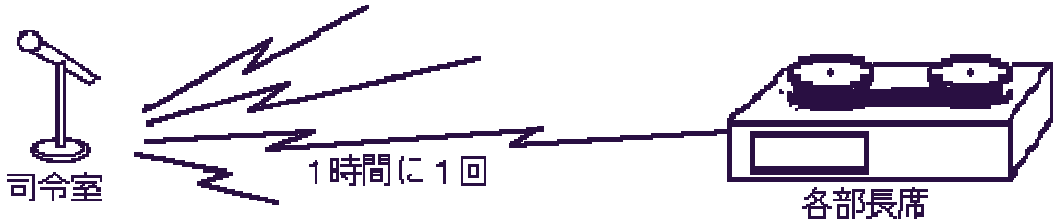
Line	Stopping times	Down time	Operating hours
Mission	06	12	258
Engine R	00	00	370
F engine	01	01	369
Propeller	02	05	365
Large Axle	05	Fifteen	355
Small Axle	03	11	359
Large Frame	06	13	357
Small Frame	04	08	362
RU frame	00	00	370
RS Frame	01	02	368
Frame FJ	00	00	370
Cab ceremonial equipment	01	04	366
First Assembly	04	10	360
Second Assembly	01	07	363

Contact understanding of abnormal b

There is a stop line, there are command and control center immediately contact the operations room intercom abnormal situation is related to the contents of the front-end factor (to the department and administration), the contact is divided into the following three-stage replacement

Occurs each time using the intercom immediately contacted Lee to go over to the department responsible for first aid related to contact line

The relevant contact the administrator of one hour once b (production manager) to preventive measures against, once an hour broadcast, the receiver know the status of trouble even when absent・tape to try to have a recorder to record



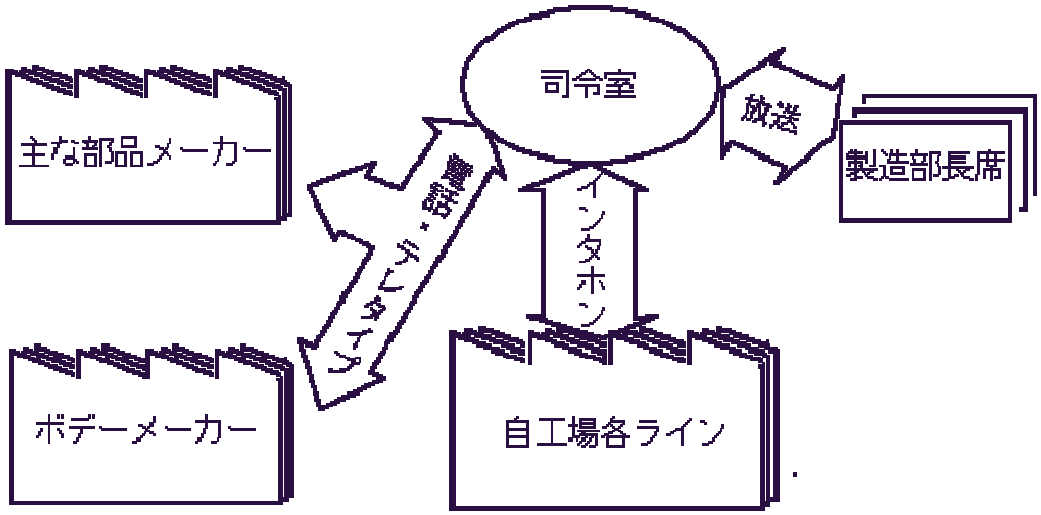
Distributed to related departments together the next morning one day abnormal contact line status

table summarizes the Ha one day, to measure

Line Status Table (March 8)

Line Stop	Car model	Part number	Responsibility	Delay	Quality	Wrong part	Shortage	Steps taken	Content
8:41	FJ40	Axle	Machine						Without split pin holes Abusobaburaketto
11:00 to 11:06	DA110	Shackle	Assembly	Six					Shackle mounting error
5:00	DA115	Engine	Outsourcing						No mounting screws accelerator wire

Information System Chart



C. Vehicle treatment failure

Vehicle defects, vehicle shelter arranged outside the assembly plant responsible for the failure of each department place profits before adjusting the final assembly plant 出Sanai however, shelter is full to stop the vehicle becomes defective line

Lee rework rework defective vehicles from the operations room contact, we immediately went into a department responsible for assembly plant

The failure to prevent the recurrence of the vehicle facelift Russia, and promotes preventive measures immediately know the cause of the problem since.

Other abnormal processing d

If unable to supply parts to equipment failure due to Lee, from the failure of equipment and machinery, if you encounter a situation impossible to supply parts to cease production of vehicles involved.

In this case, command and control center to stop the whole line problem occurs not only lines (see entries make up plans how to change page page -12)

If you like to outsource parts shortage temporarily Russia

i) If prior to the instructions found on Internet writers, assembled to hold the assembly line with production

ii) if found after the writer indicated interface, as well as vehicle handling problems, shortages will be line-in, arrange shelter for vehicle defects.
However, the shelter is full to stop the vehicle becomes defective line

Since under construction

<Example 2> take back part of the total assembly
1a, the frame
1b, propeller axles
1c, engine mission
1d, cab deck
1e, tire
2, parts supply purchase

<Example 3> with a pair of unit
1, with unit group
2, provision for vehicle manufacturers
3, provision for Motomachi plant
4, non-replacement of the unit materials provided

<04 cases> Machine Shop
Loss

<05 cases> body shop
1 product kanban Press
Two, Signal Kanban
3, Kanban material
4 kanban mechanism
5, temporary Kanban

<06 cases> Forging Plant
1, the movement of parts
2, the movement of kanban
3, forging factory
4-refining plant
5, determination of the capacity
6, determination of the number of lots
07, prior manufacturing
08, new discontinued

<07 cases> foundry
1 Product line
Two types of kanban
3, which moves
4, the movement of kanban
5, adjustment Kanban

6 ・ new obsolete

<08 cases> Buy Parts
1 kanban system purchased parts
2 Procedure Kanban delivery
3, operational procedures
4,100% payment methods

Toyota Production System (TPS) Glossary

Oh	Or	The	Or
• After the withdrawal process • After replenishment (production) • Andong • One piece flow (produced) • The setup • Control AB	• Improvement • Mobile rate • Utilization • Kanban • Kanban mechanism • In-process Kanban • Signal Kanban • Withdrawal kanban • Transport Kanban • Supplier Kanban • Temporary Kanban • Kanban Cycle • QC process chart • Of process flow • Another table process capability • Five "whys" • Mixed transport	• Cycle time • Sequence of operation • Working standard • Work • Execution cycle time • Self 働化 • Just • Sequence chart • By pulling • Of little people • Ministry of People • Laborsaving • Production Control Board • (Production) directed Villa • Production lead time • Manufacturing technology • External setup	• Frequent conveyance • Takt time • Process has many • Many units have • Of rotation system • Setup change (time) • Fixed-position stop system • Line capacity system • Scheduled time conveyance • Scheduled quantity conveyance • Toyota Production System
A	**The**	**Or**	**And**
• Efficiency • True efficiency • Apparent efficiency • Overall efficiency and Individual efficiency • Transit transport	• Hire Scheme • Isolated Island • Goods cross the border • Standard operation • Standard work combination ticket • Standard operation sheet • Leveling • Pacemaker • Error proofing	• 水Sumashi • Waste • Making too much waste • Waiting to get wasted • Waste transport • Waste processing • Waste inventory • Operation waste • Waste of defective Unfavorable alterations • Mura • Muri	• Don Yoi System • 4S (5S) • Arrangement • Order • Cleanliness • Cleaning

		• Look at management	

Toyota Production System (TPS) Glossary

After the withdrawal process Pull System (of Production)
It is one of three basic principles for the just-production, post-processing is required at the time, just before the front-end process required to take back what you need is just minutes to produce the means to take back scheme .

After replenishment (production) Fill-Up System (of Production)
Finished goods inventory process before the process is minimal (store), rice, and means to replenish the building process take care of every kind just minutes later.

Andon Andon
Windows of information to stakeholders to encourage action, and electronic display board that can do so at a glance where the solder point anomalies. In addition to the unusual display of work instructions (quality checks, exchanging cutting tools, parts and transportation), to show some progress.

One piece flow (produced) One-Piece-At-a-Time Production
Processed one by one by one process or means to flow the way one by one to the next assembly process.

Arrangements in the On-Line Set-Up
Of the setup change, type of cutting tools can not be stopped and the driver's line of machinery, means the kind of work such as replacing and fixtures.

Two-Point Control Control AB
Is held constant as the amount on hand in the process or process standards, criteria and process conditions to transport the product from the aircraft carrier may be moved in each place 2 (A point point B) whether the product mechanism controlled by means.

Kaizen Improvement
People (labor), materials (inventories of the product material usage and material), or a waste of equipment and production systems (present everywhere), find out as much as possible without the expense of wisdom, rapid means a series of activities will eliminate wasted one by one.
The improvement in labor work, the Carrier as a priority work better than the facilities do not improve.
The improvement is not a business person, and what can be done in each position of all employees, is done.

Operational Availability mobile rate
If you want to drive the equipment (when you get a kanban), the probability of the state will be working fine.
Reliability equivalent to that posed by facilities and maintenance. It is always 100% of ideal.

Rate of Operation utilization
Post-processing required (leading to sell) to the production process, at which the facility operated at

full capacity, meaning the proportion of demand for part-time capacity.
The sales rate is determined by the operation.

Kanban Kanban
A tool to achieve just-in-time production management. Kanban role is as follows.
1. Production, transportation direction information
2. Looking at management tools
(I) reduction of over-building
(Ii) delays Proceed detection process
3. Classification by Function kanban process improvement tool process is as follows.

Kanban	Kanban mechanism	In-process Kanban
		Signal Kanban
	Withdrawal kanban	Thinning process takes Kanban (transport Kanban)
		Kanban external component suppliers (supplier Kanban)

Production Instruction Kanban Kanban mechanism
Production started in the production process (mechanism) is used for instruction Route I speak, and have in-process Kanban Kanban signal.

Intra-Process Kanban In-process Kanban
Kanban is a process used in the entry instructions.
Taken to process only after the amount is used to set up kanban replenishment after the order to produce collected.

Signal Kanban Kanban Signal
The variety of goods processed in a single line, the kanban mechanism used in the production process takes lots of time to change some plans. I called you speak so-called triangle of a triangle.
Press, die casting, mainly used in processes such as molding.

Parts Withdrawal Kanban withdrawal kanban
The next process is the withdrawal kanban to indicate the amount of time and go to pick a front-end parts, thinning process takes kanban, kanban is outsourcing parts delivery.

Thinning process takes Kanban (transport Kanban) Inter-Process (Parts Withdrawal) Kanban
In-house, what you need back-end process from the previous step is used to pick up the kanban.

Kanban external component suppliers (supplier Kanban) Supplier Kanban
Kanban is used for parts to be delivered from the vendor. Delivery is made by the vendor, to be delivered in just minutes supplier Kanban process unstuck, basically, you can pick up the same post-process Kanban thinning process takes.

Temporary Temporary Kanban Kanban
Type maintenance, repair of machinery and equipment, and work days due to the difference in means to indicate the transport Kanban production and production parts that require more than the usual minute.
After collecting and using one-time use indicate the expiration date. Identify and put another red diagonal line.

Cycle Kanban Kanban Cycle (Delivery Cycle)
Frequency of parts delivery (many times a day) is arranged to be delivered late or many times I have brought back from the flight Tokan.
Kanban cycle or the delivery cycle, sometimes called Kanban factor.
The display as shown below.
(Example)
1-4-2
1-day (sometimes 2 days)
4 = 4 = 2 were delivered late delivery of two flight

QC process chart QC Process Chart
Build quality into the process to target, and the characteristics of each process control items in accordance with established specifications and standards, which in a way that anyone testing, checking, and whether management will is decided.

Continuous Flow Processing of process flow
It is one of the basic principles to achieve just-in-time production, the process eliminates the step of stagnation among other things, that you do one piece flow production.

Standardized Production Capacity Sheet capacity table by the process
Parts at each step in the process, which represents the capacity of each process, the time manually, enter the cutting tool change time and time and automatic feeding machine, table for calculating the process capability.

Whys 5 Five "Whys"
So-called 5W1H (WHY, WHAT, WHERE, WHEN, WHO, HOW) has been used as a process analysis of current research point of view, even more, WHY 1.2 degrees without stopping, why, why ... ... root cause means to pursue it and ask why five times.

Mixed transport MIXED-Load Conveyance
One vehicle, and carrying means to carry a wide variety of parts.
This consolidated the transportation, without compromising the efficiency of transport (without increasing the total number of runs as a delivery vehicle) can reduce the inventory process can carry around multiple times. Changes in the number makes it easier to change production and operation.

Cycle Time Cycle Time
One worker, means the time required to pass through the working process in order to charge a fixed task.

Working order Working Sequence
Standard work in one of three elements, which means the production of defective work order to the most efficient workers.

Standard Operation Standards Working
Will run correctly on a standard work on site, process chart, checking the quality standard, QC and safety standards based on timetable and conditions for each task and how to be safe and secure and cost mass Although known to be standardized. As typical, there are manual procedures and work instructions of cutting tool replacement operation instruction, instruction quality check process.

Work VALUE Adding Work (Shigoto)
Which boost the value of materials and components, and that process continues, our field is doing work.

Actual Tact-Time execution cycle time
The calculated cycle time for the regular production, operational, it may set a non-scheduled time forced tact. This setting means the tact.

働化own (with automatic Ninben) Jidoka
One of the two pillars of the Toyota Production System.
Abnormalities and machinery and equipment, unusual quality, if you encounter any abnormalities and delayed work to detect anomalies themselves machinery or to stop automatically, and so stopped the line by pressing the stop switch itself worker be.
With this, there is no leakage of poor to be able to prevent the recurrence of abnormal abnormalities clearly understand, "built into the quality process" can be. Furthermore, the automatic stop and abnormality, watch equipment (epidemic), eliminating the need to, "Ministry of People (Reduction Effort)" will be possible.

Just-Just-In-Time
Is one of the two pillars of the Toyota Production System, in response to changes, to increase operational efficiency, and what you need when you need it, and how ideas or to produce and transport the necessary amount means.
Assume leveling "process after receipt" "process flow of" need to determine the number of tact "We are three basic principles.

Sequence chart (table entry order) Production Sequence Table
In order to do was to produce a table, the table is the order of entry was based on the equalization rate of car production plan type. (Formerly called the order entry table.)

By pulling (pickup order) Sequential Parts Withdrawal
When the order is decided which products and components work, get to pick something from the front-end order entry, order pick is officially called.

Flexible Manpower Line of small people
Production according to the number required, without sacrificing productivity, and then building a line of people that can produce small but many people.
Despite the decrease in production, not increase or decrease in proportion to the number of workers it always requires a line of fixed quota of line workers.

Ministry of Manpower Saving People
Process improvements and improved facilities, and energy conservation can save a unit of one person.

Lobor Saving laborsaving
I can simply replace the mechanical part of the work performed by human operators, who say the state can not be saved.

Production Management Board Performance Analysis Board
Each process and line, and the contents of display boards to record and produce the required amount of experience and abnormal hour.
Supervisors can check every hour to confirm the effectiveness of the implementation of preventive measures and improvement of the abnormality.

(Production) directed Villa Specifications Manifest
Car, or what parts to install, and then type a sign of components rather stick to the directions paper products vehicle.
The advantage of this poster is to have one of the objects and information.

Production lead time Production Lead Time

Orders from factories, means the hours leading up to delivery of the product.

A: time spent in production instruction information corresponding B: Time-process materials through to finished product from the corresponding (time + processing time stagnation)

C: The first one's finished products concerned (units) are made from, time to go up the finished product is made after a number of pick processes (production of transport appropriate tact ×)

And you, production lead time = A + B + C is represented by.

Operations Management Engineering Manufacturing Technology

In the process of producing, as a total person present material equipment, techniques and Toyota have a good idea that the most efficient manufacturing technology.

Arrangements outside the Off-Line Set-Up

Of the setup process, you can not stop the operation of machinery and equipment line and ready kind of tool type cutting tool, which means clean up and work.

Frequent Conveyance frequent conveyance

I often carry a lot of ways to transport when viewed in each part used to reduce the amount of inventory before and after the process. However, many times only to transport vehicles, to transport many times not to lower the loading efficiency of the vehicle, consideration should be given such as increase the total number of delivery vehicle carrying a mixed transport. - Carrying four products.

... Requirement for each product with 1 minute car / per day

	For example, instead of carrying multiple times	Frequent conveyance right
One eye flight	A, A, A, A	A, B, C, D
First two flights	B, B, B, B	A, B, C, D
Third flight	C, C, C, C	A, B, C, D
Flights at 04	D, D, D, D	A, B, C, D
	Once for each product / delivery Sun	Product 4 / Sun delivery

Takt time Tact-Time

How much time in one minute or one component of what time means the value of production. Takt time is calculated from the following equation.

Takt-time (working time per day (scheduled)) / (number needed per day)

Constant-time employment working hours, mobility rate is calculated as 100%.

Multi-step with Multi-Process Handling

Each work order processing machinery and equipment arranged, just minutes means to takt time is commensurate with one line worker. Have also called vertical.

		Product			
		A	B	C	D
Coarse material	Step 1 (Turning)	●	×	▲	■
	2 step (milling)	●	×	▲	■

↓ ↓ Finished goods	3 process (drilling)	●	×	▲	■
	4 process (tapping)	●	×	▲	■

Alone responsible for four processes

Multiple units with Multi-Machine Handling

When machining parts, machinery alignment, machinery and equipment is arranged similar to the similarity of process equipment and machinery, it means to work more than one worker. Side have also called.

		Product			
		A	B	C	D
Coarse material	Step 1 (Turning)	●	●	●	●
↓	2 step (milling)	×	×	×	×
↓	3 process (drilling)	▲	▲	▲	▲
Finished goods	4 process (tapping)	■	■	■	■

Responsible for turning in one of four

Multi-Skill Development of cross-trained worker

In order to have a sink in one step and more work of various kinds of machinery and equipment operation and can also work outside the scope of responsibility Pu y means it keeps working constantly training. Changes for each month a production cycle time, can change the work scope according to the new tact, and to facilitate this effort.

Setup change (time) (step change (time)) Set-Up (Time)

Setup change will be divided into three tasks.

Arrangements outside: setup in the work taken steps can I have to get stop the machine: work adjustment taken steps can not and do not stop the machine: normal task of stopping the machine for handling problems and ensuring the accuracy of quality after the replacement step, time and setup change is part of the process since the end of that process at the moment, I can be the first time to the next one to replace defective parts and components to produce the type of cutting tool and then be classified as follows.

The setup change time = time + setup time adjustment

Fixed-position stop system Fixed-Position Stop System

Conveyor lines, work on the problems (slow work, quality problems) and when found, fixed-position stop switches (switches reorganization calls) and put a stop to go to where the conveyor is determined not stop now so that means a mechanism.

Fixed Manpower Line System Line Capacity

Despite the change in production, not increase or decrease the number of workers in response to changes that require line of fixed quota of line workers at all times.

Scheduled time conveyance Scheduled Time (Unscheduled Quantity) Conveyance

How to transport a specified time each. So Haul is unknown in between depending on time of consumption. Method of transportation is the convenience of taking this approach if the remote service delivery should be determined.

Scheduled quantity conveyance Scheduled Quantity (Unscheduled Time) Conveyance

Reaches a certain amount of downstream components used at that time, which means pick the way to go before the process. Efficient transport, is the principle of internal transportation.

Toyota Production System Toyota Production System

Way of doing manufacturing at Toyota, based on the idea of completely eliminating waste, making more rational pursuit of material throughout the production and cost reduction with the idea of making quality combined with narrow , it should promote the overall technique has two pillars, and the just-and self 働化.

Productivity efficiency

The yardstick to evaluate the productivity of production processes are generally represented by the following formula.

Efficiency = (Actual Production (defective) / X personnel working time (effort)) X (100 / 1 per hour in a standard volume)

The general formula, however, by way of operational experience with the issue of molecular manufacturing-production must be sold. Also give a lead to sales efficiency produces, it will lead to substantial cost reductions to improve the efficiency of the eye.

True True Efficiency Efficiency

The minimum number of production facilities and sell the quantity, improve the efficiency in a way, and which lead to substantial cost reductions.

Apparent efficiency Apparent Efficiency

Regardless of sales, increase efficiency in a way to increase the number of people present production, the apparent efficiency of the computational efficiency up only.

Individual efficiency and overall efficiency Total Productivity and Independent Productivity

Toyota Production System, is seeking to improve the overall efficiency of the production company just in time.

Machinery and equipment for each individual line or process it, regardless of the process around the concept of efficiency I'll only be taken as self-efficiency of the process that the individual efficiency.

If I was purely individual efficiencies, and build something more than the number required, and tend to perform their own production processes FANDANGO convenience.

Transit transport Truck Transfer System

Separating the role of materials handling tasks and unloading delivery trucks, transported to the destination when the driver, we have already loaded (unloading) is taking up the tracks to waiting is over.

This method can be performed in parallel unloading and transport operations, it is possible to reduce inventory and logistics lead time. By using the truck driver in the small number also can raise the productivity of the transport driver.

Hire On-Call Delivery System

Full-time person for transportation, such as castings and forgings and lift Pressed to abstract work by the transport pallet. The central panel displays requested information from the transport process

that requires each component, providing only what is needed to process one palette that appears, after the chef went back to central supply, transportation waiting for the next instruction system.
The central board, by holding the requested information transport, information and enables first-out prejudice, to understand their full-time or over a carrier for the present workload, will explain more efficient transportation.

Isolated Jobsites remote island
They are isolated away from the work process, layout, production increases or decreases depending on the means line configuration can not be effectively combined with other workers.
Production line and can not respond to changes is one of the few who inhibitors.

Goods cross the border Overflow Parts
Shelf parts, including the shop floor line, cross the border from the shelter component specified parts rather sits on the floor.

Standardized Work standard work
Focusing on the movement of people, in order not waste, the way to efficient production, the Toyota Production System is composed of three elements: a standard handheld work order cycle time and a good standard work.

Standard work combination ticket Standardized Work Combination Table
Time and walking time to reveal the hand of each process in cycle time, which you can examine the processes responsible for how much range one. The automatic feed and fill the time, so that together can explore whether a combination of people and equipment.

Standard operation sheet Standardized Work Chart
The work illustrates the extent of each worker, in addition to the three elements of standard work, quality check, and attention signs to be completed safely. Standard work sheet will be posted on the site for processing.

Leveling Levelled Production (Heijunka)
Material production (thing led to sell) refers to the type and amount of averaging.
Is a prerequisite for just-production.

Pacemaker Pacemaker
For a given time, and delays in work progress of the work per cycle, the operator is a tool for supervisors to understand or control.

Error proofing Failsafe Devices (Pokayoke)
Or prevent the occurrence of abnormal failure to prevent the occurrence of inferior quality equipment and machinery, tools and ideas for cheap and reliable line stop if you experience any unusual

1. Mechanism to prevent operator error
2. Warning mechanism for worker error found
3. Detect any issues with the item, not including processing and system

水Sumashi Fixed-Course Pick-Up (Mizu-sumashi)
Patrolled by more than one front-end given the means to transport parts to collect the order type of manufacturing process required to own a fixed number. That means a combination of a pickup carrying a set sequence determination.

Waste Muda (Non-Value Added)
The production site, and added value Umidasanai means only increase the cost of production factors.

1. Making too much waste
2. Waiting to get wasted
3. Waste transport
4. Waste processing itself
5. Waste inventory
6. Operation waste
7. Defects in material and waste in correction

Making too much waste Muda of Over-production
Just off the cardinal rule of production, when you need more or faster production time, indicated that excessive production and Kanban means the stock and therefore occur. Waste too much structure is waiting hands, to hide or wasteful behavior, and causing the waste of transportation process, truck, for generating the waste for subsequent growth in revenue and palettes, the problem the most in the waste will be useless.

Muda of Waiting waiting to get wasted
In the process of working order in accordance with standard work tasks, I wait and get ready to move on to even move on to the next step is often caused by small amounts of work.

Muda in Conveyance waste transport
Transport itself is essentially not raise the added value it is a waste product, just in time for the production, waste transfers and other transport temporarily placing small amounts transshipment Minimum means.

Muda in Processing of waste processing
And progress of the process, the accuracy of processed goods and means not contribute to any unnecessary processing.

Muda of Inventory waste inventory
Stock production caused by transport mechanisms (inter-process PVC material) means.

Muda of Motion waste operations
Production activities that waste the movement of people working to grow a value-added.

Defective rework waste Muda of Correction
Defective and must be scrapped, which means they have to build things you have to fine-tune the product.
Rework process, a step that regular adjustment process is less progress in improving the feeling that this waste is occurring.

Mura Mura (Unevenness)
Not constant production planning and production vehicles and parts, which means that the temporary increase or decrease variation. In terms of people means a criterion for the variation of the load.

Muri Muri (Overburden)
The production site in terms of people, but does not take undue stress on the mind and body, and of

machinery and equipment is capable of holding their own against the mean excessive burdening. 3 Mudarari collectively called Mlamli waste.

Look at Visual Control Management
Managers and supervisors, site management means the form can be determined immediately whether the eyes are normal state of production activities. The typical way of looking at management, and Unden and kanban.

Yoi don Simultaneous-Start Time Study Method
Methods for problems to arise, all workers at the starting signal for each cycle, the starting point for their work (the first operation sequence of standard) way to start working more in unison. Finished work at one cycle, the signal again, start working together.

4S Four S's
Which shows the initials and the four Japanese phonetic clean and tidy cleaning. This is a term that emphasizes the importance of materials management.
Training on 4S (rules and decided to defend), also known as adding 5S.

Organize Seiri (Sifting)
Need to categorize things and need in the field, which need not be disposed of immediately organizing. One of the 4S.

Order Seiton (Sorting)
Organize, to leave things as needed when needed, as needed, or eject the easy, so easy to use means to place side by side where a fixed address. Just simply put side by side are arranged in no order.

Clean Seiketsu (Spick and Span)
Organizing, clutter means cleaning to maintain good condition. One of the 4S.

Cleaning Seiso (Sweeping and Washing)
The line worker's job easier in the field, there is no security against fear, is to clean as it does not impede pedestrian movement and work. One of the 4S.

In print, KANBAN

"Kanban System" is the first documented summary of the Public Works Department headquarters, "kanban case studies" were distributed and a copy was burnt blue penciling in.

The next few years, the Toyota Engineering Society "knowledge vehicles" now first printed and published.

Here below the main content.

What is the Kanban and how we Dasa

Birth of the kanban system

We are in our production system to seek rational thought on the making of thorough elimination of waste, which were developed through the idea that the overall system productivity.

The scheme is called the Toyota Production System.

Just Toyota Production System (just need to make what you need when you need it, speak transport) 働化 self (if there is abnormal stop, stop) consists of two pillars, just in time kanban system delivers was conceived as a means.

The method is called from the supermarket kanban system was devised to be inspired by the supermarket.

Part as a means of supermarkets operating system, and other markings required information on work in progress "kanban" This production control system that was used as a tool to "kanban system" began to call.

This method is now widely implemented in all plants around 1962 improved by repeating the main plant.

Processing custody after

The production site is sold, poor, failure, absenteeism, which is sort of obvious and not planned for production shortage.

The post-processing method to deliver a front-end production plan instructs each step, the realization of just-in tend to be more than I need to get difficult.

Every customer has arranged to store various types of goods we buy what we want.

If you thought the shop Just linked to a commercial supermarket that was bought refills it, take what you need on living after the processes, the process of making the system just before the minutes were drawn.

That is, we just want to take the post-processing schemes to pick from the first transport route delivery system, making the bill Bisugiwoosaerutameni conjuncture.

Just goes to take a minute to say that is vacated bills.

Kuri Hatsu process and before order to keep the bill to make too much, just minutes off the bills drawn is that we create rather just minutes off the bill.

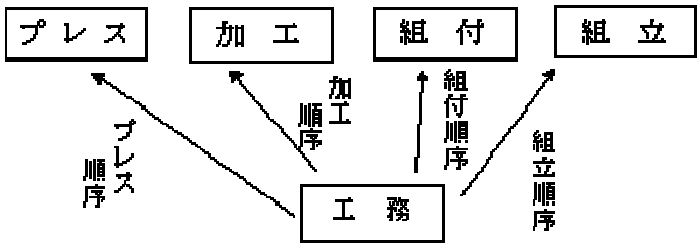
This bill "kanban" system and called after this replacement, "Kanban System" called.

Denial of the scheduling table

Take a front-end processes on living after we make the process before the process was only taken care of before the scheduling table is unnecessary.

That was disturbing was the expulsion of the agenda rather than unnecessary.

Traditionally, the out roadmap all the front-end as shown in Figure 2, the possibility that there might be only the final stage to stop the charges front-end, the front-end process will supply a unstuck for me if Book So let it be.



As previously mentioned production site is selling snow, poor, failure, absenteeism, and not quite as planned in the shortage.

If he could be the movement of the pieces just do each step in the roadmap such things, if one operation fails to Okose, where they accumulate a lot of things.

Then each process has become to deal with that extra clutching to protect people and facilities planning.

Thus, after the plan was put in just the last step that it should combined.

Each step there is no agenda and are not bound by the plan, the change in production levels to cope with some automatic means kanban as a tool to exert fine-tune the production.

Kanban and transport, setup change

Transportation as needed in this case (out of kanban minutes) so as to carry, and transport must wiggle.

Only consider transport efficiency, and each process is carry once they have been forced to Nake-hand a lot.

If we take the form of a mixed gathering around the Kanban therefore carry no loss of wiggle transportation (pick up) is achieved, it will be

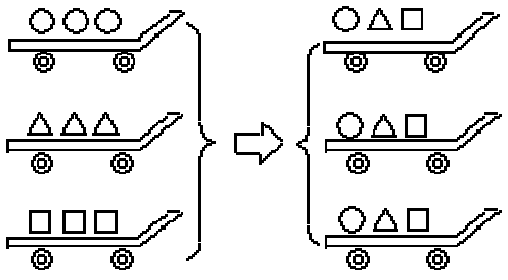


図３ 混載→小刻み引取り

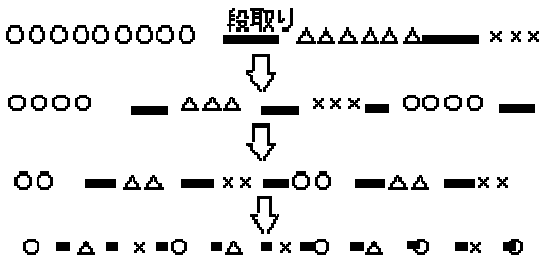


図４ 段取り時間短縮→小刻み生産

connected by a small-hand.

Machining process is also just minutes taken to make little at a time pull (Kanban well off the dribble) one lot is so small.

Shorten the time needed so setup change.

There are two first reduction of transport and setup of wiggle words, each step of rotating at low kanban becomes available on-hand for less.

Store frontage for each process are large (only required type) shallow depth, must achieve.

Production leveling and kanban

I like the convenience of their own processes, we mean that the minute process to get things together before making certain types of processes, equipment for liquid nitrogen freezing front is also a shortage pull together, the personnel extra support should not be Motanakere.

The production kanban system where leveling, it becomes necessary to pull the leveling.

Kanban is not leveling with the outsourcing company to make, so can not be applied.

Currently, we are also from this reason that we united to create a production plan from every angle equalization using the electronic computer.

The aim of the kanban (kanban as a tool for improvement.)

① In the absence of kanban kanban not carry rules, Tsukuranai.

② kanban always should be soaked in kind, 100 ③% must be defective.

Will reduce the number of kanban ④.

Will run through four points, will continue to kanban as a tool to exert improved from entry tool.

Most often in the field produced by Ross ② "making too much" can be prevented.

"Making too much" is excess staffing, excess capacity, which produce the most waste rid of excess inventory bad.

Have their own pool or a defective process or after the process stops and the poor'm ③, forced to be preventive measures to the fore the issue of process improvement to process the defective 出Sanai that we are.

働化 emerge in their own way of thinking can stop the machine and the collaborative process itself is defective 出Tara there.

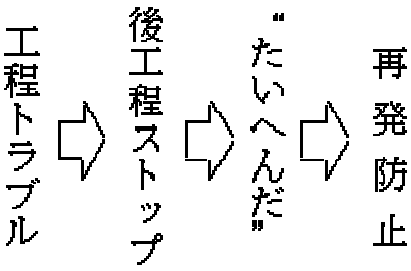
Cushion the less defective ④, the process will be stopped immediately and after a mechanical failure.

Defective extinction caused instability there needs to kill personnel, poor work standards, stability and shorter setup change process, will be efforts to streamline.

I live and get the shop floor management tools to promote cost savings by keeping the kanban that the above rules.

Adhering to these rules, "Kanban" is destructive in some cases even without the introduction.

So to overcome any difficulties, it becomes necessary that we observe the rules.



The kanban system is said to be prerequisite leveling

And leveling the

In every step, the amount to be averaged, the average amount was only the final assembly line just is not enough, should average about type, this "leveling" in Toyon .

Need for standardization

In the field, plans to produce variation, (for example: 1,000 pieces today, 100 tomorrow, the first half of the month to 10,000 units,

Zero late) is not planned production, causing a shortage kindle.

Even though, as we produce, which includes a great waste, the cost will be high.

Because the equipment, people, inventory, and other factors needed for production is to be prepared according to the first peak.

In particular, after processing through the principle of custody, if the production process has been thoroughly synchronized, the larger amount of variation to take

back the next process step prior to fly people and equipment over Kakae込Mazaru no.

Here, "leveling" of the need.

Equalization program

The department shall consider the best plan is that plan to standardize.

We are using the electronic computer, take into account all the elements are creating a production plan lost your leveling possible angle.

Planning time Mon ("knowledge of automobile" P244 reference) Speaking with regard to vehicle production for January, for example, over the design details of more type vehicles from cars in October, "informal notice" is, in the middle of December, the contents of its production is confirmed.

This is a review of capacity, line, and rotation can be set Kanban number.

In other words, kanban system, even say build what was taken argument that tomorrow is not that I do not understand, "leveling" on the premise Ito, beginning there is the required number of approximate levels of monthly approved.

The program, based on the month, will plan, schedule thoroughly leveled.

Production instructions, as planned, further leveling the order arranged this schedule will be sent only to one place of final assembly line.

Production Leveling

That out of the kanban production as the process in which 造Reru system is required as needed what you need when you need time.

Therefore, the dispersion of production, it is necessary to eliminate variations in the types of goods.

Describe the specific methods of production and then leveled.

(1) of small-lot

A larger lot confused about the process, causing a number of waste and excess inventory.

However, casting forging press heat treatment process, there is something

inherently fit for synchronization and batch production.
Small lot production, so that face the difficult question shall maintain 働率 yet accepted.
However, if such a setup change that quickly, but it is safe to produce in small quantities, can be synchronized.

If we look at the press, to the preparation setup change, eliminating the adjustment process, and to standardize the work has been shortened to three minutes setup time.
Quick set up and it's going to reduction of such a setup.

(2) One piece flow

Good things that are important to the flow of production leveling.
Because, the greater the production lead time production began to be compiled that would carry things to a crawl if you ask.
Therefore, machine shop, not to put the machine for each model are ordered process.
This way, you can hold the structure of semi-finished products too, and they can only carry the parts, the product may be in place early.
One of this flow.

Quick set up and do what is

And a single setup

Sheet metal press, press forging, machine tools, plastic molding machine and, in so-called general-purpose machine, the setup change is needed and the type of cutting tools.
Previously, because we setup change much trouble, had the idea I want to process the many products and even a little, to fabricate many products at once would require a warehouse large products, car lifts, truck transportation , who will be transporting equipment and many other tracks.
Furthermore, because of the long time to be used from the product being built,

rust and products, and get wasted snowball and cause you need to take rust.

In order to reduce the production unit, must be devised to change the setup Kakusuru this short.

Around the beginning of the 1960s, the press cut replacement time or an hour or two hours of "time" which was one digit unit (single) "minutes" as a goal and can do in promoting better results has been achieved in many departments which are currently challenging for small-lot production and reducing it further.

How to achieve a single set-up

1. Work out plans to move the setup operations

The setup process is the type of preparation, removal of the device type attached, loosen the clamping bolts, tightening bolts, replacing the type of auxiliary equipment installation work is to be seen and then get rid of the processed type, the type of preparation you like, keep working near the machine tool type, and can work without stopping the machine set-up work outside of it.

The replacement bolt to loosen the type or types, throughout the machine to stop that work in this setup.

To speed setup change is to separate the work and working out arrangements in the first setup, then make arrangements with outside work to improve the setup should reduce machine downtime.

The following specific examples.

When changing the type, the type of crane was transported from a place behind the press line 型置Ki opportunities in the machine next to the type of preparation, carrying out the type plans in the next process, the types of arrangements shorter delivery time.

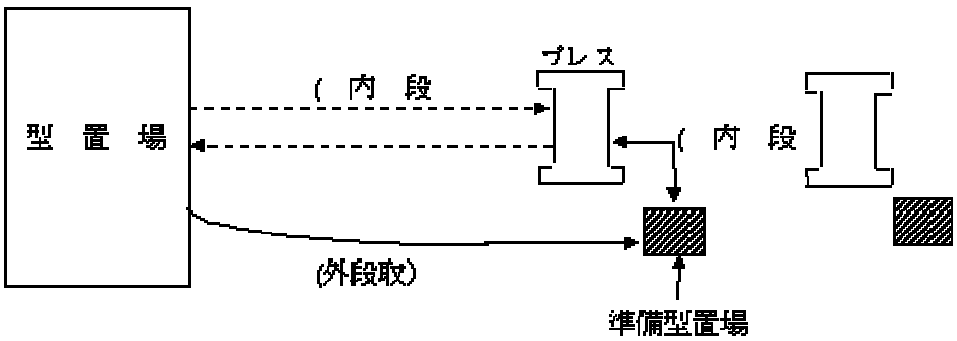


図１ 型準備の外段取り化

And required tools: change type wrench, Joe, automation components and fingers only, with arrangements to prepare a written out next to the standard machine setup operations.

2. Abolition of Work Adjustment

Some even die height adjustment or set-up work, adjust the air blow out products that have a lot of work tailored to the type position adjustment.
This adjustment process into their decision process, not only by skilled work Baratsuku large, not stable in terms of quality, making the underlying defects.
In order to shorten the setup time must be abolished and become standardized and carried on doing the current adjustment process.

Because the thickness of different types for each type, when changing the type had to adjust the height of the press slide, put a uniform thickness of steel plate thickness of a given type in the upper and lower surfaces of the type slide adjustment abolished.

Was used to blow air out the product because it stops with bolts outlet as in Figure 3, which had to adjust the angle of looking at the weather flow of the product each time setup for each type of the outlet become dedicated, mounting the air piping to allow one-touch quick to merge with air piping joints.

If you put the type of press on the bed, and put into a fixed position, entering into the groove of a bed-type bolt, located on all sides need to be adjusted.
The stopper is provided on fixed type guide and hit the bed, the discontinuation of this adjustment process.

3. Parallel implementation of the work

When replacing the type, the type 具合I that put out the next type of processed, or have to work to improve how the work of parallel bars so-called bridge will shorten the time points.

Type of exchange can be simultaneously processed and the following types, connecting rods attached to types and type.

Type replacement, leaving the front of the machine press bed, there beside the need to move between the press conveyor.
Traditionally, because I was using a crane to move the conveyor, the conveyor moving in from the crane, was a type of exchange, laying the rails of the conveyor movement, while the exchange-type , which can be moved by hand to push the conveyor workers.

Effect of a single setup

To allow small lot production and shorten the setup time in this store - Reduction of product above, significant effects emerge in addition to reducing inventory costs.
Arrangements after less trouble adjusting to the abolition of such work were obtained from the first stable productivity, and worker "Kang" Mo stable quality to rely on only a few leads to reduced defect rates .

"Lee" (Ninben) and marked with automated

働化self is just in time and said the two pillars of the Toyota Production System.

Recently, the sophisticated machinery that the goods automatically by pressing a switch can be faster yet.
If an error occurs, but some facilities to high-speed machinery, however, and broken drill example, it lacks punch, and the process remains poorly clamp, or will be building a defective product, to be faster, notice would be to a large number of defects.
Building a defective product, to use waste materials and electricity, machinery that is only just moved to a job that would increase the added value? Zu, it should not be called work.

A building that is not defective, there are abnormal mechanical equipment, machinery and equipment to stop people (Watch for machinery and equipment)

and was put to production, the productivity is getting a high cost Ps.
We like this machine equipment, automatic machine saying that Ninben irreversible.

Instead of people take to the automatic machine, drill or broken, it is insufficient clamping electrical shock if the device automatically stops the machine, machinery and equipment without having to always watch people MAY.
Work is called automatic machine Ninben with a twist of the machinery that automatically stops the machinery had such abnormalities.

With the idea of self 働化 Ninben is the source of self-invention work Sakichi Toyoda machine.
Sakichi machine is self 働織, but one is missing or warp or warp, if you disconnect, that is to stop the machine immediately.
Creativity and ingenuity that have been made with the automatic machine was purchased from Ninben machinery manufacturers such as error proofing facilities Furuwakushisutemu our machines.

However, if you decide to incorporate the anomalies of all machinery and equipment machinery happens to the material seems to be a very expensive machine.
For example, you are subject to abnormal thickness of the yarn machine 働織 own and having to determine whether the defective parts to determine that the cut yarn, or is seems to be difficult, it is too expensive machinery Ps.

Our machinery is also, normally prone to error that put Ninben, not just yet, or where, it is necessary to devise, machinery and equipment are subject to hard cases like the machine itself 働織for the abnormal, it is necessary to determine the people.
Put a lookout on the productivity, but can not hold up.
So we are determined to have a number of processing machinery, all that might have an abnormal, stop the machinery automatically (with a self-concept Ninben 働化), who lit the icon and Call, machinery, whether abnormalities in the product, people have to judge.
Quality checks, exchanging cutting tools, inspection of the oil supply, check for

abnormalities and other equipment, eliminating the cause of any abnormalities to restart the machinery, if there is no anomaly.

Important at this time, from which to judge whether the abnormal people, it is correct to judge people, you need to decide how well the criteria considered.

As mentioned above, they found that with a self 働化 Ninben do is only a defective building, the next process is to shed a defective product, is the principle of "quality control into quality making process" in particularly lead.

Self-concept 働化 above machinery, as well as people working line assembly line, it thinks fitting.

In other words, themselves assembled conveyor worker doing his work "This is not" or "poor" if the thought is to get his workers to stop the conveyor.

Defective products that fail to build that should work.

The idea is that you have worked.

Assembly or defective products, in that great line in late loss and stop working, which flows into 組付Kezu car parts and bad.

Selling your car would become a bad team after the line alterations and surveyor can not be assembled.

This is equivalent to Watch for automated machinery.

Found to have abnormalities in their workers, management, supervisors made a firm standard work, it is important to get workers to work as a standard work.

Workers can not work when the standard (when there is abnormal) should stop the lines if you ask.

Line stops, management, supervisors will remove the cause immediately, and improved, due to the same line will not stop us (can not stop to avoid the workers), we prevent a recurrence, incorporated into standard operating .

By repeating this, the stop line is less and less good products become cheaper 造Reru.

By promoting itself with a Ninben 働化 this way, and take the case of machinery, mechanical equipment during the normal work, sweety who take action when abnormal abnormal abnormal can control the way be.

And Andon whether there is abnormal and where Once you have that you can see eyes due Kanban so good if you go only to place unusual to 働機 itself many

a person in its controlled .

One benefit of self 働化 here is one of our unique management "on the second administration" concept was born, grew.

Improvement and efficiency, or what it means

Efficiency and efficiency

Consider first efficiency.

Efficiency and productivity, "about a product, the product was (or advanced process) compared with 100 minutes out of the labor force and labor to build it" is that.

50% of that production efficiency of the worker out of the labor force, building a product, but only half (or to carry out the process) and not helping, the other half is wasted power out of that.

The bigger the number, the higher efficiency of production.

If you think about things that work

Net-work work (work to increase the value) + waste

It will be.

Therefore, efficient production that is a net that has been working most of the workforce are out of work.

How much do Hakaru increased productivity compared to the past then "yardstick" is being used as streamlined.

That is an effort to improve, the higher the production efficiency can result in a number'm now less effort than ever before, even when the required number increased when the number began to increase in effort could create the same

improvement improved efficiency compared to that before.

True and apparent efficiency efficiency

In general, the efficiency of two types.

Consider the following example.

The 10 100 / 10 120 people better days / day (20% efficiency improvement)

120 this month is consistent with the increased production of this improvement was carried out just / day and production planning.

In this case I had to increase to two, because it was produced without increasing the number of people continuing improvement, and lead to profit improvement.
Production planning in a 100 / 変Waranakatsu or day, or cut production by 90 / day if no matter what the production plan.
If products made by 120 every day just because it goes up even when efficiency is 20 left over each get a day 30.
This is where the material costs, labor costs as well as eating, in order to manage this stock, pallets and yard plants and more effort, as the company becomes a drawback.
In this way, you 変Waranakatsu the required number, when you are cutting production, the Toyota production system the way and raising the efficiency to increase the amount, which is called the efficiency of appearance, Te doing most is trying to do.

In this case

The 10 100 / 08 100 people better day / 7 days or 90 people / have to-day.
Thus, the holder of the same efficiencies Toi

The 10 100 / 120 in 10 days / Sun

08, 100 people / day

Around 20% efficiency improvement is that both of two ways, either way you take, the production volume (number required) will depend on how much of that either.
In other words, forget that the production volume is not a prerequisite.

Aim to improve efficiency because there are other words to reduce costs, only the seller, whether it comes to how to make less people.

Way to improve efficiency, but can be done to increase the number of relatively easy ways to improve efficiency by reducing a person, than it hard several times.
So, ignoring the needs and means of improving efficiency and really, how come the former likely to take.

However, No matter how much difficulty, cost-reducing efficiencies led to "improve the efficiency of true" to be done, and of course, now you can do to improve my real efficiency, improve production efficiency during the is not very easy.

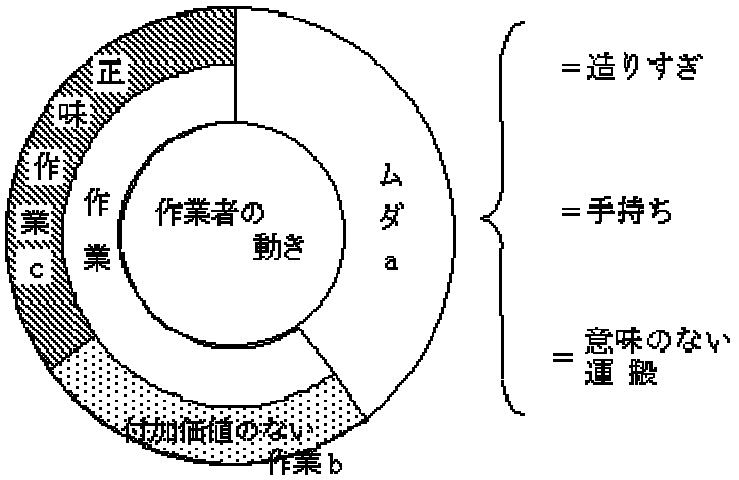
According to eliminate waste and reduce man-hours is what I

Analysis of the contents of the work

In the building promoting activities to reduce man-hours, the most important thing is, observing in detail the contents of the processes itself, but which part of the movement of workers, or help to increase the added value really try to analyze is that.

In any field, and observing what is called work, more or less, can be divided as shown in Figure 1.

(A) waste



We are not required to work in any way. Therefore, you have to do is very clear that, is save you now. Making too much sense not hand carry case (accumulation of intermediate products, carrying duplicated effort and 持Chikae)

(B) non-value added work

There is no added value in the working group of the present Article shall work to do (really good properties and also waste) to eliminate this, a partial need for a change workplace conditions.

押切Ri button action and retrieve the bits cut the parts from a large pallet wrapping external parts to take part walking example

(C) net increase value-added work

Work and increase the value added processing (such as a pair only with altered transformation) is to.

In other words, to build parts and products, as well as hand workpiece materials and crude product, giving value-added work, this ratio is higher efficiency may be said.

Such as body paint and welding gear to quenching the steel plate to press the coarse material to assemble the parts forged an example.

The site also is a non-standard work as an exceptional work In addition, equipment or fixtures small bug fixes, including alterations in the defective, the ratio of net work to increase the value, the surprisingly low know.

(Otherwise, the only element of cost increase for all)

Work improvement and is such a waste, is to change the value-added work that no value-added work.

Work "lot" to "work with" to

In general, the field of forging and casting rough forging press, the convenience of processing equipment, energy costs, constraints and processing conditions, processing and keep the stock at once settled in the amount of each component have been working lots.

However, due to various ideas like the above constraints Zama If you think Nake well, when you need one by minute, according to the final line (ie just-in) to build even the most effort Other expenses (such as the location for the pallet stock) even fewer.

More recently, breaking the traditional concepts, shapes and coarse plant ever 専問 parts manufacturing process, a lot were working part, by minute according to the tact to do with one pair of main lines, The process has been the case with the group while the main line.

Thus, while the main line of work, the task of processing the parts needed by minute by one "work with" he said.

For example, stamping parts.

The main line of body parts, not in the press shop press, simple and inexpensive equipment (for press, but has to be processed in one second, one in tact when working with tens or seconds to several minutes, slow process, so do I, in the small corner of space and facilities, yet it could be less expensive if the device failure), using the material to the main unit during each other's work Installation has now been completed and processing has been coming around to one's work and holding the start button.

Such a device, "but press" is saying.

In addition, spot welding, painting parts, caulking, cutting and driving, in many areas, from working lot, "work with" we turn to the line through work improvement by eliminating waste from the process before the final assembly We

are.

What is the little man and of what it means

Automation and labor saving

Say that the original purpose of automation equipment to the "placed in the machine who is doing the job, reducing the worth of people," is that.

But how to automate the work in person, tend to automate the operation of the machine placed in first place easily.

Automated installation and removal of the feeding network.

Moreover, the drawback of automated machinery and equipment is located where you judge yourself not to stop, to prevent damage to tools and equipment types, and the flood of bad, people need to really monitor be.

Therefore, even if the person is decreasing, automation and literally just put the machine replaces human work but most of "labor saving" could just be that.

In these labor-saving automation does not make sense.

Oh, to make effective automation should be to stop the machine to determine their own error.

働化 own ideas appeared here.

Ministry of person and self働化

If the 働化 own work becomes more need to monitor, "as the result of saving people" can.

Who is a labor-saving automation, 働化 of people to self-saving.

So I have to put their own work and wisdom of their automatic machines.

In addition, this thinking as well as machinery and equipment shall be there to hold your line to line fitting abnormal working people, and this way of thinking is established province who own 働化.

In our production system has produced significant results.

But the oil crisis occurred in 1973, it grew steadily until, in 1974 we have also steadily increased production has led to the production cuts Yamunaki, will reduce production time, when the production is not a new problem arose.

Little idea of who

Most of it is self 働機 is that the system is full.

Complete self-働機 drones aside, automated machines like manual work, but only 50 input materials and parts were moved by two people when full production is also 1 percent decrease in output unworkable.

Similarly, two people still need each one of the inlet and outlet of a large automatic machines, for example.
From a different aspect of such automated equipment, has a drawback that it can not be driving capacity.

Little idea of who is to break the system in this capacity.
This idea not only the machine, which is applied to line people are working.
In other words, five lines, if produced in 80%, but you can do to make four.
As another case, keep it to four 造Reru absent one, but the amount will be 80%.
To do this, training facilities and better constraints of working for the rotation system layout must have been accumulated from the usual number of improvements, like more than that of the little people, one which means any person or machine can do in line at two people, and I started thinking that denies the original concept of system capacity.
Industries significantly affected by those selling the quality of the economy such as automobiles Given the basis of every month, there is a fluctuation in significant productivity for each car line, that is not of people a bit this time, is the peak times機種Nari or failed to achieve the production process does not introduce personnel, yet fell in line, so people not be reduced accordingly, it will increase their number who would have had a lot.
In such a corporate structure that will overcome the tough times in the future must think it's impossible.

To help people a bit of support in particular, in terms of layout and facility design should consider the following.

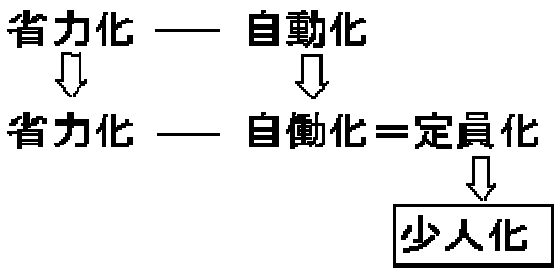
(1) Hanare Kojima (in the position to help others who may not be distributed work processes) without a layout that you can help each other.

(2) can not work without a work by intuition and years of experience and ingenuity are the tools that you work as a standard for everyone.

(3) 働化 own facilities shut down automatically if there is abnormal, we prevent a recurrence yet to generate any abnormal shutdown, close to 100 percent mobility rate.

(4) in the field, the rotation of the work done, that you can do training on a regular basis to work in any.

(5) promote the development of cross-trained worker training and standardization of treatment machine can do it as a different process



Tell whether a line of people a bit,
even going to less with two or one from the staff working here, drop in productivity can be judged by whether it can now work .

I have been on friendly terms what equipment to use

Rate of movement of equipment 100% that it is desirable, but I can say anywhere limited to Toyota, the Toyota production system, especially rate of 100 movable equipment percent because it assumes, and the cost to promote the Toyota Production System we will work on a reduced rate of 100% effort to keep the equipment moving it is one of the indispensable activities.

Rate of 100% and this activity is to keep moving, "conservation" is. This term preservation, however, has been seen as different by each person who uses what, and was difficult to understand the texts in the original meaning of the conservation of the emergence of strange words such as preventive maintenance and corrective maintenance, Do what you must do it, because that tends to obscure the original purpose of conservation, preservation of the Toyota Way thinking, and about what

YokohamaProgram way while folding case.

And maintenance

And conservation is to maintain health in the healthy human body speaking. No word as health prevention, protection and prevention are pointing to. Term health and not even post again. This is speaking in the human body treatments, and corrective maintenance is simply speaking to repair equipment, repair anything that is a failure to preserve.

Given such facilities and shall not voluntarily break, fail to preserve, destroy and that should be considered. Device to which it is not broken and this is not something you can expect to equipment manufacturers, come together and tackle those who use the equipment, the equipment purchase and production activities are the same as the accumulation of this effort Even when, the result will be not big difference between each plant.

Lubrication and cleaning equipment

Clean fuel and equipment that are likely to be a very important integral part in conservation.

Outsourced or left to this most important, however, often find the company you work hands-and others. The Toyota system has been improved to work with all parties, especially the commandment to use this facility.

In the busy production, without removing the timing, they found that to ensure the small, more on that as easy as say the mouth is not, however, are closer to the ideal little by little overlap twist in each workplace. .

Regular exchange of ideas

In general a lesser cutting tools, have been more economical to replace become spoiled with the best possible use Shiro to expendable parts, and contrary given the evil caused by the use until the last minute, at the Toyota Way If you are taking a break before the scheduled replacement.

Has many ideas but do not forget to replace different parts of the replacement cycle and also what point. Way as in Figure 1 is an example of one that is not skillfully managed, but not all the pieces, which is currently consolidating the basis of observations of each periodic inspection and fault There.

Repair and renovation

Is very important that the same mistakes like breaking effort.

I want to explain a viewpoint the meaning of what I often see the word used incorrectly or repairs where repairs.

And repair, so that makes sense (again) and that, as a preventive treatment should crush the cause, while only the broken parts and repairs without cause and seek to Make Torikaeru manner means.

Do not understand this distinction, we often find that the group named in repair repair.

Scrambled up to repair, not only falsely, in the same place to cause trouble again, this is to prevent recurrence was not in the true sense.

Not only repair place just happened bug fix, is to prevent the same problems twice investigate the cause.

Who engage in conservation work, of course, fully aware of the differences between repair and also repair the machinery used in the repair needs to always endeavor to do no repairs.

Less equipment failure

Difficult to fault the facilities, there is obtained through preventive techniques for large companies and their workplace, meaning still is an excellent example to introduce among them, but these cases are generally of specific many stories high, it seems to be quite hard to reference, here are some you want to place focus on the file was then easily and often overlooked in versatility.

(1) Using the limit

Limit or do not work reliably, have a loose cable traffic into contact while oil is a familiar story, just not finish repairing the exchange limit the way through a solid striker and Doc Damn straight, about to change into the type of oil or oil resistance Su, hippopotamus - or devise, and that once you move the limit to avoid splashing of oil where more advanced features, the same switch without slit device is also required to fulfill.

(2) in conjunction with the consolidated

Automatic mechanism to work with classified "connection mechanism" and "interlocking mechanism" can be divided into two, to take over the electrical interlocking mechanism to limit the help of independent movement and rotate vertically and horizontally, cam - skillfully combined gears and links, the reliability of the connection mechanism to succeed than the mechanical movement of the necessary steps to be high.

(3) the speed and timing

How do I process equipment in one minute, which has a cylinder or blinding speed runs, and required more units to retreat and retreat and the limit already started quickly, moving equipment funny often find that, just in time for the idea that those facilities are important, whether it is desirable that the equipment and getting too fast, we need to recognize that fully.

(4) adjustment

The facility, named something about the adjustment mechanisms are more or less about. Rather than replace that each time I wear a Indeed, the mechanism must be easy to correct if it protrudes, it has a right to use two important points.
One is the reference plane, and another adjustment is fixed. Even without adjusting the reference plane Eta out if you need accurate, it is likely to be just a house of cards. The next adjustment is fixed, that you can easily adjust the shift is that The flip side, there are many failures can cause this.
It is important to consider that can be used without adjustment is not to say, the idea should be fixed for the necessary adjustments.
Figure 2 is an example of the improvement was secured with a lock nut color alone Su Toppaboruto fixed.

(5) movement unnecessary waste facility

Meaningless movements mechanically (unnecessary motion) or neglected to put any effort into automated equipment failure measures are trifles without merit.
If you do not have to use a facility failure is a matter of course that does not matter.

If you say more, unnecessary equipment with a little ingenuity will not say a lot. Abandon the idea that it is wrong Now that you have to use Loss of purchasing, buying things that reflect rather trivial, is a powerful tool to devise measures to get out of trouble even without.

Chapter 1 of the Toyota work improvement

The basic idea of the Toyota Production System Section 1.

Toyota production system and the balance increased productivity by eliminating waste completely, and a series of activities and thereby to reduce the cost.

The underlying idea is to improve the productivity of Toyota purposes only, it was believed to have arrived over the years, the general IE based on the theory that, although as it was borrowed by the no.

The basic idea for this section, list only have to stop by enumerating the features of the Toyota production system, you want someone lose ideas underlying cane.

1-1 company-wide IE is directly related to management.

For production control system, the traditional variety are described also apply to any product of any process "the making, but" it is not official.

Therefore, the company has one product, one built in, other companies will build two people, completely uninterested in the company builds in the making of three.

If so, maybe three companies are building in the warehouse, and transport equipment, pallet, conveyor, and even to many facilities.

And with this increased indirect personnel.

Become about twice the cost, take big difference in profit.

Number is not clear that this relationship is not, in reality, few companies, the difference is so much about and imagined.

Moreover, this difference is not just now. Also directly affected by investment year after year.

Because that is what planning and planning shall be based on absolutely current.

Moreover, fixed costs (equipment, machine building equipment) was invested last once known to be irreversibly on track no.

Given the dangers of over-investment, this is a serious issue for companies.

To prevent this, the scale efficiency in all aspects of daily production, machinery and equipment minimize the intensity of effort, no more hand to reflect the next stage of planning.

And we get this way, the conduct in corporate management, IE will have a significant impact indeed.

IE is not doing enough business is like a house of cards itself.

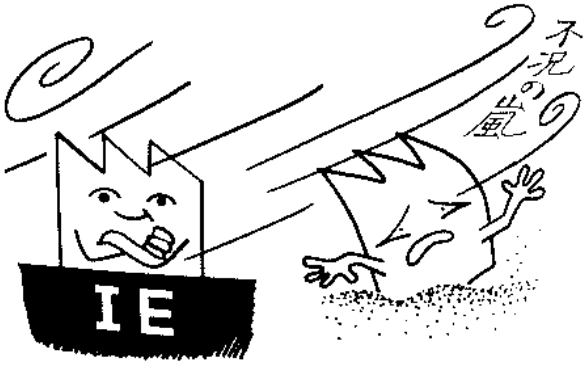
The good times might look good, as if hit by typhoons and earthquakes recession once in a short period and then would have collapsed.

The Toyota production system has been positioned in the corporate management to improve productivity in this activity.

Therefore, all departments are related to production, to be able to conduct the most efficient operations as a whole, for the production system, has taken the following approach.

(B) to standardize production planning.

Considering only the final assembly plant, the flow appears to be effective only once the same species, frequently before the process is wasted.



(B) the lot as small as possible.

Production process and in the press lot, as small as possible.

This effort increases not only the gathering of inventory carrying, causing

shortages and sometimes wrong priorities, lack of ability is determined to press it, which could lead to the expansion from the line.

Also cause decreased ability to produce small lots, the power should take steps to improve replacement.

(C) as necessary to build a strong commitment to what you need when you need it <br> holding the waste of making too much, the goal is to make clear the capacity in being actualized.

1-2 scientific attitude

In the field, starting with the actual phenomenon, dating back to the cause from there, the emphasis on the way to solve this.

That is, for the scene, the most important facts are.

For example, to show how many data, the data from the field to grab the actual figure is difficult.

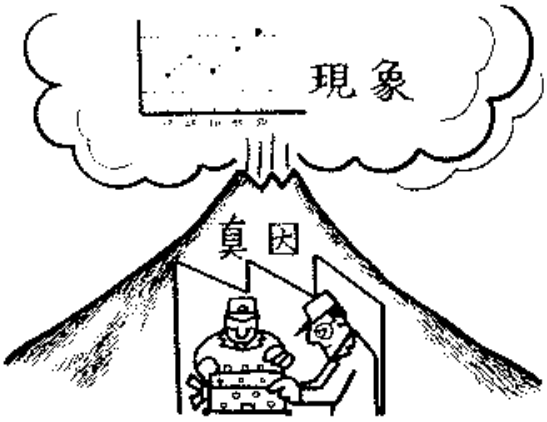
Even if poor also know from the data, the measures will be delayed.

Therefore, the root cause of poor remitted. Some things that could give the effect of preventive measures.

Rather, to grasp the true picture of the scene, the scene, a place that can hold it in place regardless of the poor, can easily grasp the real cause, to take immediate measures be.

Therefore, the Toyota Production System, the scene is that of focusing on facts rather than data.

If you have problems, identify causes people to be insufficient, measures will be something to miss.



So, why, why, why, and five times in a repetitive manner, it is necessary to reach the true cause.

To ensure this approach has taken the following approach.

(B) to keep anyone know the whereabouts of the problem.

Knowing the problem is relatively easy measures. Rather, it's hard to find what is the problem? This "kanban" is making a stop light and.

(B) to clarify the purpose of problem solving (based on the needs to improve.)

Identify the true motive is to solve this. Measures remain inadequate to the pursuit of root cause is only a temporary measure, lead to relapse prevention.

(C) the failure of any single measure.

1000 also happens even once, if root cause investigation of the facts there can be, to prevent bad hand to strike. Rather, it is not enough to stop the eye frequently than bad, it is important to note that 見過Gosanu.

1-3 is a practical

One is that its approach is gradual. The goal is to conduct high you put the implementation in stages. The other one is to rely heavily on results.

The following ideas come from here.

(B) to improve facilities to better work (detailed in Section 6)

(B) and human effort (opening) The number, of people in **labor-saving and labor saving**
 on the calculation, called, say 0.5 or 0.1 can be artificial. However, in reality, even if one job takes 0.1 man-made.

Therefore, the work of one person can reduce man-made 0.9, the resulting cost reduction should not be. The true cost reduction, the number (or number of units) can be achieved only by reducing.

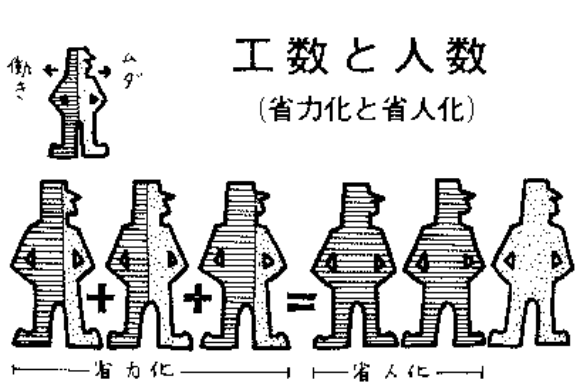
Therefore, effort should be improved to reduce the number of people focus on the last.

Especially when the introduction of automated equipment, labor can also be artificial 0.9, 0.1 remaining artificial (often the lookout) and are left as a result, the money spent, fewer people Senakatsu or it could become.

We have seen that sometimes in the name of this labor-saving in the Toyota

production system, called the ministry to reduce the number of people leading to real cost reduction, saving and distinguishes.

(C) difference between automatic and self-work
(detailed in Chapter 2)



(D) is a reflection check.
The improvement has touched over the results obtained is that as intended.
The results are not obtained, which often leave work to do.
Check the results carried out in the field, improving on the first iteration that the check also the first Improved results are good.

This means checking and not just to look through, you must reflect on their work.

Economic criteria are all 1-4

The goal is cost reduction. Therefore, the basic idea of all "economically advantageous to do this" is a ruler.

The idea of a fact, something like follows.

(B) utilization rate is determined by the required number of production facilities.
This is the concept of sunk costs, buying equipment that is well worth've let the full capacity, and to fall into the false belief has been strongly emphasized.
Also, many cars have a chance basis, mainly working people see (the machine is not the center) are held to the idea, which is the same reason.
(See Chapter 2 and discussed in Section 2)

(B) to the practice if capacity replacement stage.
Workers with no work to do in between the regular salary, his practice and even replacement step is the same even playing.
(See Section 2)

1-5 positioned in the field is clear

Organism is considered as a single scene. Limb field in the brain is not entrusted to manage the department.
Only and the site is a hero. Therefore, the Public Works Department which is not the field commanders.
What is important to emphasize Self-field effect.
This responsibility can be distributed, or lack of information, so as not to overload, the Public Works Department should play a role in missing parts of the site back up.

1-6 focus on changes in responsiveness

Many plans may change. The important thing is to have a responsive system that can change against plan is strong enough for this site.

Section 2 and the cost reduction effort

2-1 is the goal of reducing cost-reduction effort

Section 1 This section, "basic idea" in touch, especially the concept of economics, describes the relationship between work improvement and cost reduction.

Toyota's formula work improvement work is on-site corporate activity, where the aim is cost reduction.
Accordingly, various measures improved thinking, if tactical 詰Mere must all lead to cost reduction.

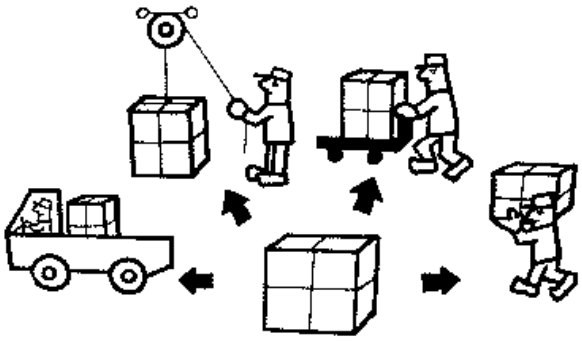
Opposite words, all the criteria depends on whether you can reduce costs.
In this case, reduce costs and going to bite, we must clearly divided in two ways: it.

(B), A and B and which I favor, a decision problem

If we take A to B which will not get in (or vice versa) is to determine if such conduct.

At this time we have for Toyota A and B, and that you can decide whether we get one.

Purpose There are many means at least one



For example, current street fashion, to give way to reduce one expert, is to think about when you get one.

(B) A, B, C · · · · among other things, the question whether the choice of which one is the most economically advantageous

"Reduce the people" for that purpose, and should have some way.
In this study the most lucrative of which must always be made.
As these two decisions, which may occur independently and that I normally conduct an improvement if, for these are two decisions in the course of study, can be said that the order must be seen.

But sometimes (b) there is more improvement is not enough. (B) not enough consideration, and generally excessive (Too much money) and become better idea.
It also (b), it is made because, say it If you look to be getting together, resulting in rather poor settlement.

For example, there was a plan to install electrical control equipment to reduce the 10 million yen in person.
If implemented, which was reduced from 10 million yen per person probably was a lot of money as it comes to Toyota.
But they turned out very well considering, by changing the operating procedures be empty money if you reduce it appears that about one person, a plan to improve over the next 10 million yen will succeed without fail that, must be seen so quickly.

That do not get anything from it in this way, you have to choose the plan is considered the most gain in the gain.

This trend, especially when introducing self 働化 is prone to be careful.

The cost increase is wasteful 2-2

The Toyota production system, to improve productivity and eliminate waste, and that the basic idea.

How does that help you reduce the cost, which I think is not too late to even mention, that will help you how much some people are a bit different interpretation.
Including them here, like say whether they thought that what affects the cost of waste.

If you borrow a phrase often heard, and waste in the manufacturing floor, "We are only increasing the cost" is an element of production.

For example, too many people, excess equipment, excess inventory is told. Materials for some products than necessary facilities and people will likely have only a high cost.
In addition, the occurrence of secondary waste is waste that causes this.

For example, it seems Shimai make something work because too many people, goods and supplies'll be consumed by power, which can be thought of as secondary waste generated.
This biggest thing is due to excess inventory. Try this as an example detailing.

Have to be here now than stock. It is necessary to build factories and warehouses just to fit it. Expand view to hire warehouse workers and delivery. Buy one lift pass by these people more. In the warehouse, and inventory management also for rust, should put out some people.
So has scratches and rust tend to occur. It becomes necessary to rework the worker for this.

Knowing how many What is the department still requires significant administrative effort.

And to think people come out to introduce computer inventory and have it be over the limit.

Should shortages occur and what is not good enough grasp of how many. Shortages that occur even if only that daily production would think that the idea from a lack of capacity.

The expansion plan be put in next year's capital spending plan.

Come more and more stock of this facility is introduced.

Listed here, or computer facilities are also building a lift pallet people can be all wasted.

Waste to have all the stock, which has been generated and second, even without all the unnecessary inventory.

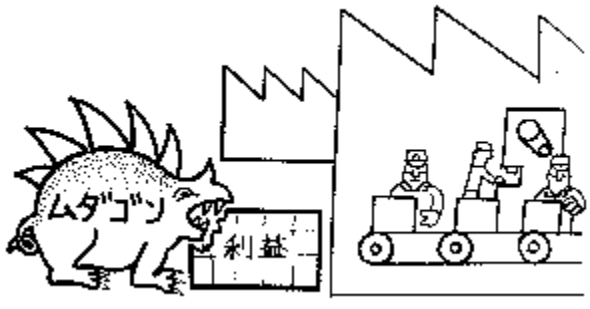
Such a case is a statement of assuming the worst, in order to assure Toyota would not still varying extent, a similar phenomenon is happening everywhere, and If it is caused by a little careless.

Extent it is necessary, it is difficult to determine whether waste from the destination where the air is often difficult with the idea the magnitude of the impact, it is important to note that ten minutes of every day.

In particular, as part of the back of this case, and the lack of ability to determine what the missing part Okoshita the wrong priorities, things like connecting to the capital investment, and irreversible mistake.

Primary said so far, the secondary waste, get into the inside to raise the cost of depreciation and general administrative expenses and any direct labor cost.

And we get this way, we can not ignore the cost will never increase the portion of waste. One mistake and in fact, only a few



percent've wasted all the benefits of eating, could cause a crisis management itself.
The idea that there are cost savings in production systems for the Toyota is aware of the above cost.

That you also may eliminate waste, reduce inventory to specific people and the capacity of the facility will be clear, can extinguish a natural secondary waste, since they would lead to cost reduction.

Concept of economic superiority 2-3

In Section 1, when the concept and implementation of all things, there are criteria that determine whether it will reduce costs, said that based on this decision.

Here, about whether it is economically advantageous to do, "economic engineering" Let's look at the concept of the Toyota production system from the point of view.

2-3-1 states that no state capacity

If there is no surplus in production capacity if the decision comes in different economic advantage.
Simply put, if there is surplus, people are playing, and use it for free from idle machine (new cost does not occur) is.

(B) If made outside

In-house or do some components for outsourcing or do, but often the cost comparison, if there are surplus to in-house if the actual cost of a new generation of cost or material cost or oil only variable costs. Therefore, it is advantageous to in-house without a cost comparison.

But say that a similar example.
Transportation workers, such as when waiting in line to fill the next pallet, or preparing to work and letting the line, which cost up to be.

Can not be examined until the loss and gain.
Just think up this effort and this effort is the wrong calculation.

(B) reduce the problem of batch

If you have a surplus in the press and general-purpose machine, setup time is shortened as a separate issue, and who obtained a small lot production possible.
Also, if still less than ordinary, but to practice replacement stage, nothing more is not always achieved.
This is because (i) is the same.
As an example, if there is room capacity is a clear break even, not to be as cost considered.

The important thing here is to always keep clear from the available capacity.
Capacity and there is not clear, after all, would increase the cost of selection errors.

The Toyota production system, one step farther, endeavor to come up with the capacity to improve.
With just capacity which would seem to be much like the example above for free.

2-3-2 sunk costs

Costs had already put the measures in the future is irrelevant.
When considering improvement, think of this constraint is wrong.
In addition, improvements to save this as a flip, and private facilities and equipment pallets are not rated as effective.
Was clear that the only waste.
It is therefore when the next investment, we can do is take advantage of lessons learned.

(B) equipment or higher and raise the operating loss

高Karou principle and equipment and cheap and that mounted over the field, and field use and independent of the price of the machine.
If high mechanical (A) and low mechanical (B) have a problem of whether to use both may be used to cheaper costs.
(A is usually lower costs should only be higher.)
Of course, it has a high performance machine, in order to utilize this technical problem is the case more work for me.

We want to say "the conduct frequent replacement and high equipment because it is the loss column," and the idea is if other conditions are considered in more alone, which hold that such a theory be.

(B) reduce the human cost reduction

Tact to deduce the required number of 100% of people in work and form a process that can work with multiple machines for one worker.
In this case, the machine will play do not think that loss is wrong.
The ability to make unnecessary, the play is a natural machine.
Who mainly work is economically advantageous to form a standard work in accordance with the work of the machine.

(C) to improve performance and planning issues

After the improvement, or lift or pallet has a lot left over, you often hear that the empty space.
However, this assessment can not improve as a result.
Amara was at much, because he does not even get the sentence.
If you like this, by way of production, the idea that it should also appear to be wasted all this time of the next plan, the planning department will require feedback to repeat the same mistake.
A plan which is usually based on the current situation will be fresh.
Therefore, there are many ways to waste now that they are incorporated into planning the next one.
And once they are invested and irreversible consequences even better later. This is important.

Fully aware of these relationships, as you try not to waste from the site daily, waste is revealed by the improvements, it failed to inform the planning department should make sure.

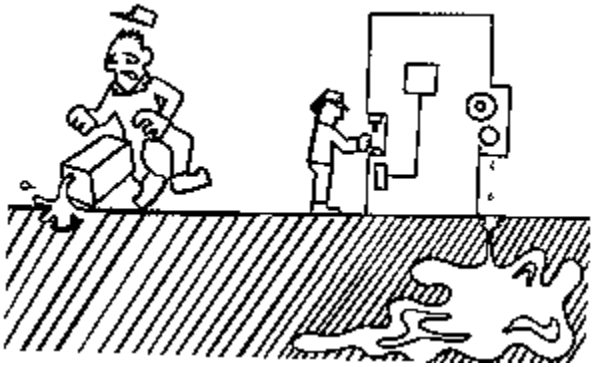
2-3-3 fees and costs incurred to temporarily continue to occur

Costs continue to occur daily, appear to show once and cheap one, might miss.

Costs incurred to temporarily hand, tend to think that once the loss is so high.

However, the cost of waste continues to occur, and once converted into a temporary cost two years for example, tend to be surprisingly expensive.

The primary cost is high and feel to improve (as a cheaper way to find a different matter), and leaving a waste elimination occur continuously, Often as a result of a loss.



Deciding what the feeling should always be calculated.

This is the icon and installation or, sort of like the cost of setting kanban, or a temporary increase if improvement overtime, and when the problem is often discussed.

Using the ratio 2-3-4

"Is improved ○ ○" or "○ ○ advantageous because of its high rate of this approach is more" approach such as may be determined by goal difference.

And scale of investment or even profit margin products, with products and investment when choosing a plan is often not favorable. (The reason is because it technically optional.)

We'd like to think in terms of utilization, especially for the cost.

Run-down rate of loss, the idea seems to be everywhere are still being

done by.
But what you need, when you need it is the best way to get wasted little as you want to build.
If trapped in utilization of 100% of all machines running deserves what happens.
Intermediate products such as Yama became even finished, and will require twice as much as three times now people.
Materials and must also purchase parts several times now.
Income and expenditure in the light of this, but they will be spending four times to three times the current revenue has not changed at all.
I would rather not be lost.

So utilization is best thought of as determined by the required number.
However, when you need it can not operate at any time, opportunity or loss caused out, and then you lose this and more overtime.
The Toyota production system into thinking that these two rates. (See section on utilization rates and moving chapter 2)

2-4 Summary

More than what it costs in what is considered the Toyota Production System has been discussed or what decisions of the economy.

Finally, we must consider that what is called economic efficiency is that many differ with external conditions.
Extreme words, that was obtained yesterday, joining a new element today may be lost.
For example, if changes to a contract from the time the contract wage contract, the pros and cons of the issue emerges in a different way though.

In addition, this section does not touch many cases and seems to be hit often a need for improvement.

In short, you always lose a flexible attitude, under many conditions, which asked whether the economic challenge is to improve the standards

will be implemented this idea, stating that this section to the end.

Section 3 and the quality of work improvement

Quality 3-1

In this section, if you consider the quality of work improvement activities, and work improvement activities and to ensure quality, and explain whether any relationship.

In this case, from the design quality is primarily for manufacturing quality.

Therefore, except in special cases where the quality and production quality that can mean.

The build quality into the process 3-2

We are involved in the automotive industry, our mission is to provide customers with trouble-free vehicles.

So, it is necessary to produce quality goods according to the design, the need for checks on the quality produced here.

Traditionally, the finished products are inspected by the inspection man, but after being swept into the process, what had made, where much of the good or bad decision, and to build good quality stuff by any means.

In addition, industrial inspection and spot checks, even if they are defective, if one were to thousands of poor, if thrown away from the perspective of the customer, one way in because thousands of No, it should never be.

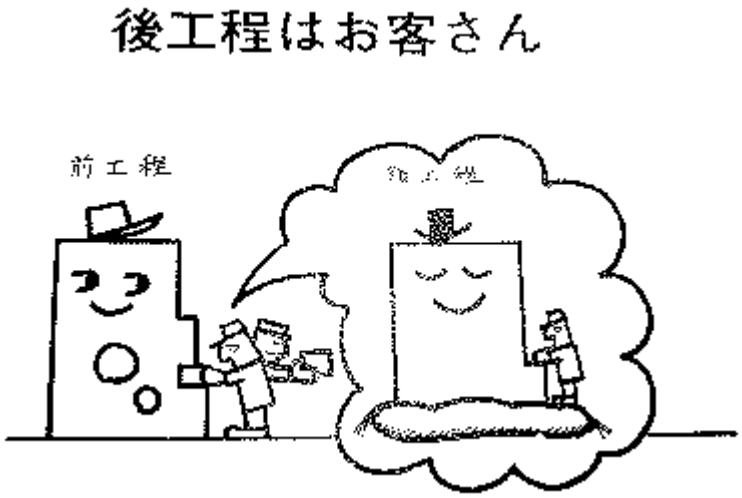
Must be checked in any way exhaustive of all products.

Here, eliminating the dedicated test engineering, "built into the process" is born of the idea.

"Into making the process" concept is responsible is the individual worker, make sure the quality completely by working one in the process, to flow into the process after the good things brought to the in-process

inspection , is to remove defects on the fly.

After the process is the idea that customers, after a process that is absolutely defective shed is built into the basic process for quality.



If you like this, still, if defects are found later in the process, contact The process is immediately preceding process step are contacted by the department to stop processing, pursuing the cause and treatment measures must take.

Out of touch and soon, it will continue to cause defects.
The defective rework is absolutely necessary to rework defective products out of the process.

Just because that little problem, after it had gone processes alterations must not remain silent.
Processes and would be rearranged after so much build based on a defective product is the responsibility of the department to have to defective products造Ridashita everywhere.

The value of quality improvements 3-3

Building good quality stuff for our manufacturing industry is the foremost prerequisite.

How much weight can build a lot, it is a bad thing, then you would buy if money can be made換Waranai much cheaper, after all, it will lose.
If the car much more, particularly from safety is important, and I'm busy, for reasons such as cheaper product that blends hand-to-market is contrary to the social, be fatal for the company could.

In other words, to ensure quality, and even has to think in the first work to be neglected by any other reason should be seen as too preposterous gross.

So, to ensure quality work and, I think that refers to any work.

Unlike the past, intuition or a worker at each step of the current low level of specialization is skilled in a predetermined working conditions in general, be made a standard work to ensure quality that may be considered.
In other words, should have been built to work and to ensure the quality standards required.
Also, just as if it Baratsuku processes is also checked by visual and gauges must be incorporated in the standard operation is a single step.

Putting you in an environment like this bad, does it not be done by working through the standard operation, or it may be considered failure type metallurgical worker and machinery equipment.
For the former case, I would like now.

Sometimes "bad Okonattara increased effort to reduce" or "too, so I stopped at a quality that reduces wrinkles, people" hear the words.
As described so far, but this is preposterous to think that the Toyota Production System, it is absolutely not happening.

Looking at the real problem is going to be divided into the following two.

(B) and I work in a unit time has increased, they omitted to do work to do, or forget.
In other words, if the elimination of waste they do not cut corners.

(B) afford the effort because there was ever re-stock and can work the middle, but not out of the surface defects, to reduce effort, if done by the surface.

(B) If the work is especially common and are using Konbearain assembling, this mistake, or working late, in order to keep lines occur when there is a problem.

Toyota's formula work improvement activities are taught to stop the profuse line.
Even for newly hired workers, is Toyota's way of teaching how to bear the first line.
By stopping the line, even if you know each person's workload imbalance, seize the prospect of eliminating waste.
Moreover, it is possible to cure the root cause of the delay task.

In unit time, that in time would save you from the stop line is not too strong idea.
Switch off the line but, to be more important to pass after a complete

process, supervisors must ensure workers.

In this case, sticking to the line speed and no tact.
Or "tact and people are irrelevant," it is important to keep clear.
Workers did everything they needed their own pace, so one cycle to complete the work.
If not completed in tact, simply line until its withdrawal.
In this tact, that how you put is an entirely different measure, the task of managing employees and technology・supervisor.
For example, a worker, it takes 5 to 70 seconds to process a first step, and over 10 seconds to 60 seconds tact.
Cut it by over 10 seconds during this time should not even be discussed.
Line workers to stop work by the usual 10 seconds, If you build good quality good.

Waste of each process or omitted, and shortens the walking distance, the better able to process 60 seconds to 5 work as usual, is the work of supervisors and technicians.
Made the first line will not stop this.
If you stop trying to reduce lines and improve the process without the work of a lovely quality is obvious, this is a concept of the Toyota Production System is a must strictly punished.

(B) If the person or by reducing the inventory, despite the failure occurred very often until now, to resolve a fundamental flaw Sezu, again internally in other ways Teita what is clearly came out on the surface.
Again after a bad front-end process for example, or feedback Tenakatsu fully tapped holes do not match the design problem, and that it was true according to building the self-tapping process.

To these ends meet, the real culprit was abandoned indefinitely, the cost is going up and inventory man-hours to make ends meet.

Results of work improvement that surfaced was the poor These are the opportunities for improvement.
Supervisor and the technician returns to the sections related to the

defective one by one, sometimes going out to the front-end, and ran into the cause, and shall Hakaranakere fundamental solution.

This has to stop cooling scattered chronic appendicitis, for example, is like returning to a healthy body by surgical removal.

In addition, this approach also caused by the failure to resolve a metallurgical worker and type of machinery tools discussed earlier, as it applies.

For example, it turns out bad because of the occurrence of such equipment, it is important to the cause of the failure to stop making the right line.

When you contact the relevant department equipment, do not you easily just because, once you go over in the process itself, will become a regular process as it unawares.

Action at the end of one call and not a piece of written request.

Good quality until the product fully, it is necessary to persevere against.

Poor test 3-4

Why shedding defective then you should consider the means.

Assembly line is defective and is shed the final step, over a potentially large customers defect.

This is the company's credit, it most closely related to product reliability is absolutely not that.

However, usually before the customer defects to pass, it was found that fine-tune the test.

The stronger determination not to be absolutely defective product, will severely test, also frequent alterations.

However, the cost
increase while So.

Engineering task of
checking out through the
inspection process, which
produces the most added
value.

Therefore, those involved in the production process in each取Ri付Kanai defective or that the jig (that this error proofing), and we have addressed the test gauge that is defective exhaustive must be guaranteed.

The work of rework is true there will not be considered.

The more personnel just to outside inspection and rework processes, decreasing the ratio of value added plant, the cost would be up.

"This product is tested to 10 times higher price," and that is totally unacceptable in the market.

Thus, value-added work is a barren waste.

Thus, the original is to be eliminated.

Great pains to anticipate Habui waste directly in the work process, to reduce man-hours can be done, it turned out bad, even reworked to increase the inspection effort with this.

Of zero or more over the net cost savings, I would have a negative if they poor, they far from the original purpose.

These reasons, consider the following.

That is, as alterations can work out the inspection process is wasted.

Therefore, omit the possible.

Minimum test well, is not needed facelift.

But they can reduce the effort and inevitably.

Thus, testing if the situation can be reworked without work, conscious effort is always a great relationship can be reduced, it is very important to strive to improve.

The in-process inspection shall be considered as follows.

In the process, ie, check if you made yourself a good worker, is

absolutely necessary.

This inspection must.

Next step in the customer's sense of what is wrong and should not to be too 一Tsutari.

In this case, how the test should be quite creative.

In addition to visual inspection and the gauge shed, "error proofing" should be considered as well.

Lot for which to work as press speed automatic is also working to shoot a 100 on 50個Nari, inspect each first and last one transferred to a pallet if both defective.

If after bad, look bad experience where I started, and remove it, so that there must be bad打Tane hands.

This is the kind of inspection. Just because it fast, and they do not think you can only spot checks.

Thus, the quality of the process, it is important to build into.

3-5 The aim of the true test engineering

Let's talk about the idea of industrial inspection inspection process we are following.

Those of industrial inspection, is judged defective defective work and give to the process by aggregating the results of previous checks, and often seem to believe that the action taken.
However, this is sufficient enough.
The inspectors, or analyzed in place as possible why such a bad happened, the cause and responsible staff should be considered to stop it.
Conduct examiners marking the end of Acme or do not pass or fail.
Wrong or explain why not teach the same mistake twice against shall be a tutor.

For example, assembling the parts in error appeared on the surface symptoms, the cause is just, "was lazy" is not the only thing more.
You can always order parts are assembled side by side, and Rainsutoppubotan, 遠Kattari call buttons, and other information Minikukatsu or work orders, there will be many causes.
Tracking down the appropriate action taken them this is the first decrease bad.

Therefore, the purpose of the inspectors job is not to throw bad and should be the goal of zero defective products shall undergo review by this.

Error proofing 3-6

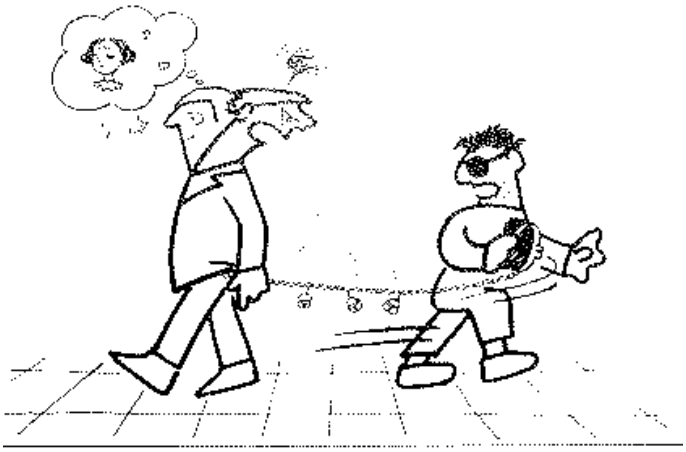
In the process, In order to into making a good quality, or to check any point workers, or to measure any part, cutting tools must be considered as You Kano if exchange time.

Therefore, this problem is to devise a metallurgical worker and equipment fittings, check processing products before, you naturally by obstacles.
That is, in a process to capture error proofing, and conduct discovery of defect.

Then, the standard error proofing, even if the replacement worker, the less effort, it is important to ensure that quality can be stable.

Okonai while working or measuring, checking if the item in accordance with, even care much, I have just inadvertently fail.

Therefore, defective, missing work, and many other problems on injuries, making a natural mechanism that would remove even if one by care, it is necessary to discover the defect.



This is the "error proofing" is.

"Error proofing" to explain a little more concrete,

(B) if there is operator error, how to jig 取Ri付Kanai goods.

(B) if there is a problem with goods, start a processing machine system.

(C) if there is operator error, start a processing machine system.

(D) operator error, and correct mistakes naturally operating mechanism further processing.

(E) looking after the failure of front-end process, identify the failure mechanism.

(F) If the forgetting process, system does not start the next step.

Other possible mechanism.

The following method is considered as a way for this error proofing.

Light a lamp labeling scheme ①, and then viewing in different color, and discover how to make eyes.

Different products or methods not fixing the jig ②, and mistakes to avoid when fixing work, how to devise a jig.

During processing systems trouble Okitara self 働化 ③, stop the machine system, which is "error proofing" may put.

Error proofing, to build into the quality process is very important.

And there are zero defects Neligh.

In order to achieve this Neligh, think of ways summarized as mentioned above, if the error proofing is provided, but the most easy-Hold, and it is important to find the most losses in a place.

Section 4 work improvement and safety

Safety is the first 4-1

"What's done is done," There is a saying.

Various facilities and machinery, even if damaged, can recover the money multiply, the human body can be fully restored when a small injury. Moreover, if such disasters and death, because money is sorry, he should think safety is one of the first and foremost, safety is not considered work improvement does not exist.

Even though we, or companies that we can not suspend operations and improve the means of production activities will not pursue that purpose.

Based on the safety, cost reduction to the extent that we must all consider how to reduce man-hours.

Sometimes, in the name of security, development activities have not seen a better example of its origin back to again review the need to look for work purposes.

"Let sleeping dogs lie Sawaranu" in that the development can not progress there.

4-2 work improvement and security relations with

The idea that the preceding paragraph, safety and reduce man-hours, at first glance, may seem contradictory, is no match.

The waste that can reduce man-hours, irregular, because it is impossible to promote elimination.

That is, most of the disasters in each production plant, this waste, unevenness, which is causing the behavior seems to be impossible.

In other words, not mandatory and may be, or doing tricky, you can let a result, waste, unevenness, and impossible movements, which are considered to cause injury.

Character of the injury, "but we wonder sun."

Suspicious behavior, behavior that is under the injured Mlamli waste that leads to safety Mlamli it reduces this waste.

In general, most workplace accidents, but many daily management is inadequate.

4S · operating procedures that work guidelines, should be fully aware that they are always at work even if it sees no idea is that disasters occur frequently, work improvement work hand in activities to improve the dedicated work, number is less a disaster.

A site which is easy to manage the more you simplify.

The safety aspect is emphasized is 4S why here.

4S will be made on the way those people and facilities currently exist.

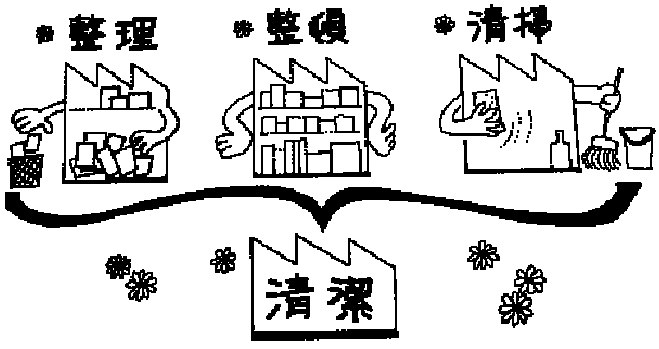
Therefore,多Kattari people and things, and the layout or Mazukatsu machinery and equipment, 4S get enough to achieve the purpose to do.

What is the direction of the original complex, there are limits as to organize.

Moreover, people and equipment in the field, rather than independently overlooked that should not be intricately intertwined.

For example, too many people can be → (inventory buildup), or put away →, or pull out, or store, the more people who need to be more → or rework, and this is a vicious cycle.

In this way, and something more, so more of it with others, and progress in the field is directly proportional to the complexity, by



reducing man-hours, as much as possible to stop the trend toward complexity has become very important in promoting safety.

Then briefly explain 4S.

4S and organized means of cleaning cleanliness, (b) is organized and divided into those that are unnecessary, useless thing is to dispose of immediately.

(B) what order to make it easier to use, is to arrange.

(C) is to sweep and clean.

(D) clean and (b) (b) (c) is to maintain state.

Our disaster 4-3

If you look at our disaster situations, disasters have been more than 800 years.

These disasters, would not just tip of the iceberg.

Work in a state of disaster as happened at work, even more fortunately not happened, work is always at risk, it would be very many.

Two years ago (1971) in a year, if inferred from the law of Heinrich has been disaster cases 878, even not if a disaster, the state close to it, or people feel threatened its very large become a number.

And such a dangerous situation, instead of being little better, would not that still remain neglected.

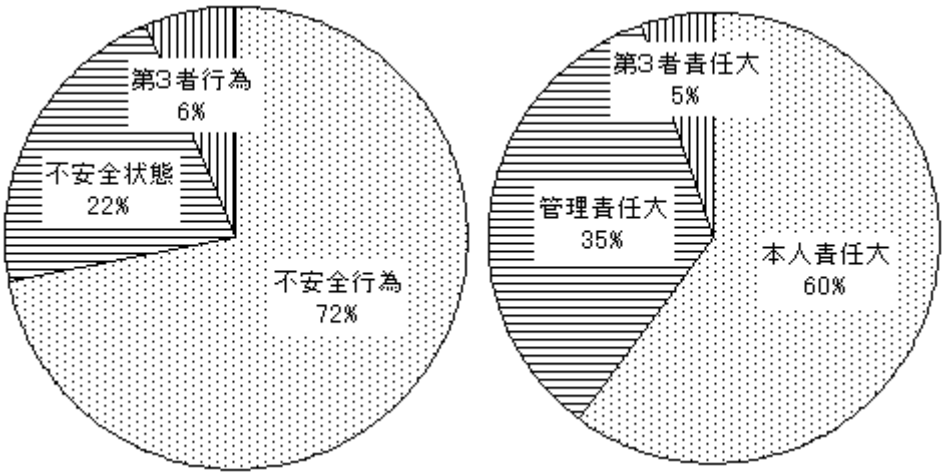
Looking at the thing in itself caused by unsafe conditions cause accidents analysis, the structure is not considered safe (142), adjustments are not maintained (77), there was no safety device (14) and other and it might be concluded that tell the story that there is room for improvement.

From a disaster situation in 1970, hurt layer leader at the time of machine troubles (20 percent), and in factors such disasters are 30 because you forgot to process and switch off% indicates high figure The.

From these, measures to prevent recurrence of the problems of equipment, would also not have a problem with a way of preventive maintenance system.

Figure 2 causes of the disaster Figure 3 division responsible for

situation disaster



These real problem in the equipment trouble is that being left to the production site.

In other words, as well as site management, including department, which has given rise to the need to address these issues.

The division responsible for the disaster situation caused by the disaster in 1971 main Figure 2, is shown in the pie chart in Figure 3.

The reasons for the vast majority of the unsafe acts, 72% of the total.

The division of responsibility, the person responsible for 60% and still overwhelmingly.

The simplified process is almost complete waste Mlamli movement, becomes much easier.

The easy to manage.

In this sense, as if the work is simplified, reducing unsafe acts.

As soon as you manage to find stable work unsafe behavior, that is, even here "look at management," the importance of the cause.

Work improvement activities rather simplistic, is the lead to safety in this way.

4-4 the first step to secure production site

Safe working environment should be required is a company-wide

deployment, of course, the first step is to create a site with no waste Mlamli.

To do this, we need to create an environment conducive to waste Mlamli found.

(B) conduct or work in what conditions.

(B) What steps or conduct.

(C) what time you conduct.

Create work instruction, and tucked (or maintenance) Okonai to build a production site will be safe to protect it.

In conclusion, it reduces the effort to proceed, it will lead to safe, secure workplace making is to continue to work improvement activities.

Here 働化 own problems, I would like to touch on the problem.

4-5 automated easy birth injury

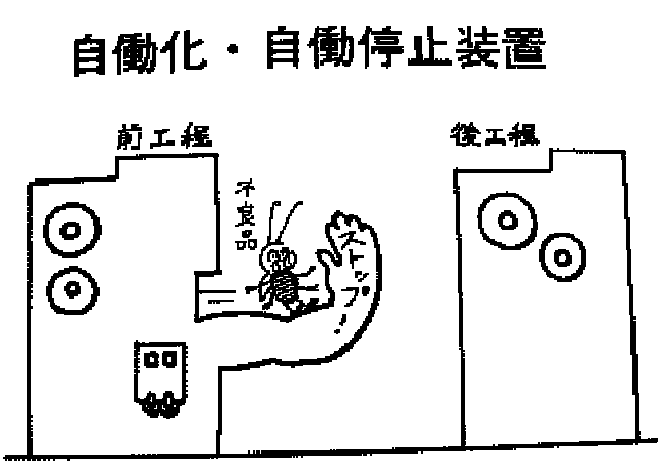
In automation The Company has developed rapidly with the increase of production of the last few years.

Most of the indirect basis, are not pursued because of the need to fully (that is, not to be done thoroughly pursue Mlamli waste), many failures, and high-speed automatic shutoff And yet because you do not have a very dangerous condition.

In other words, is not automated self働化(instead of saving people, for labor saving equipment) and not the role of guards who are fully included in the risk of inaction. "働化self" is "automatic stop device," they are equipped with, the thing that works is abnormal it is safe to say that this aspect is important
from the standpoint
effort.

Can not stop the
machine
automatically when
abnormal, cause
contrary to the will of

the people an unexpected disaster.



The equipment is automated, the less expensive, for fear of damaging the machine, but it tends to put people, most of the person, who also designed the machine, who also made to preserve more not even from people we will be more increases the size of the disaster.

For example, consider the following things.

Around a fully automated conveyor, "When you rise up on the conveyor of the conveyor switched off," said a sign often seen.

At first glance, pay attention to safety, as if it is prudent in making a landing on the conveyor is something that is often on a stick is put clearly, caught on the conveyor.

The worker himself 上Garitakunai really, unless you need it rarely, must rise from the switch off.

However, the poor flow (80% of facilities in charge of a good story will go down) If you go in again soon now being required to secure an absolute yield, while the conveyor switched off as the rule What up.

Regained if a disaster occurs, the operator kept the rules.

It would not be the reason that I did not do enough to educate workers.

The real reason is the existence of imperfect automated equipment, also is leaving.

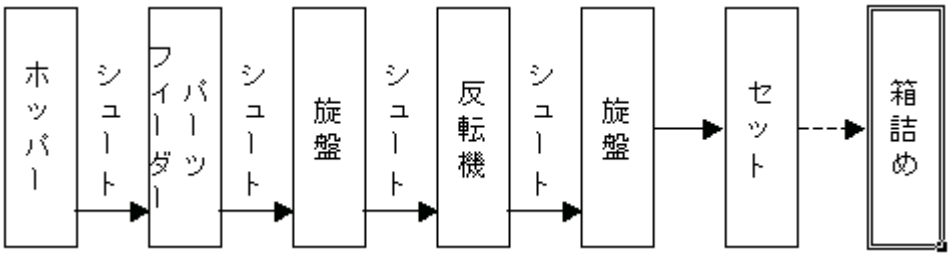
The facility of self work, assuming 100% mobile, not a structure that otherwise abnormal shutdown system must work.

This means that 20% are allowed, as if suspended, should be considered to lead to a serious injury.

4-6 in case of a machine shop

In a machine shop, had the following examples.

This is considered to be a common problem in the field of automated Think about this.



Process as shown above, the finger was cut by the plane flipped.

Normally the workers work only, work is set to work automatically boxed, as shown above the line, the line was about 10, an amount sufficient to cover its work alone.

But the reality is every three to patrol the line they are always four people have a better flow, and not meet a given production volume.

It is very poor flow of the shot, yet, no work, see passage, has not been developed enough switches and work full without having to stop even if the defect, even in a disaster occurs "automatically "To be sandwiched between the moving machines.

Even if this example, upon the question of why one person can be in that position who can fix, if it was watching the scene, the shot would have improved the flow, resulting in and safe workplace can be reduced with a real effort seems to be causing a disaster like this gets to keep.

Quick start 4-7 or dangerous

So far, the direction of thinking and trying to reduce man-hours, safety shall not interfere in any way, rather, with the improvement of conditions for the promotion of safety, have been described that match at all.

As the end of this section, the case is made difficult work improvement under the name of safety, for example, the press would like to mention.

The Company also has begun to touch the machines used to start and press.

The machine shop, which has been adopted a long time, many here have

one idea of the penetration of course, pull out all kinds of efforts, since they think much about safety.
Press operations for the same machine, so even if you are not exactly the same, by slowing growth as the current production is to be considered natural.

Start the presses, hands up if押切Ri BDC as traditional wasted time in between, to be more on top of walking time, much less one with merit.
Does, why until now, if anything had been used both hands to the buttons押切Ri BDC, which had been made in accordance with occupational safety regulations.
Industrial safety regulations, "and press the blade during operation of the slide and shall take measures to limit risks from entering part of the body. However, if the marginal part of the body containing dangerous about the structure and the press to stop the rapid slide and knives This is not as "certain.
押切Ri hands-button system is only according to the second part of this sentence, which does not satisfy the original meaning.
It even hands 押切Ri button for the third party does not take effect if the person starts 気Gatsukane.

Thus, instead of one-touch start wrong, if a body part is the structure must be a sudden stop.

Therefore, the structure enters sudden stop part of the body, and move the machine closer to the start button, and have developed systems to stop, do not care even touch.
However, it must be stopped when it failed to mention safety.
So do I put a body can work even more people.

In the press and automatic welding line, the concept has been introduced gradually in this way recently.
250 ton press for example the bottom of the shutter-clad copper wire, copper wire引Kkakattara limit has heard something, something that does not work and the press, place a stool next to the automatic welding

machine, on which While people on board, then it should not work, there are examples converted to one-touch push button system, respectively.

These are the basic equipment but still much improved if it will be able to touch any buttons.

And come to think this way, even if they stop to think about the rationalization of work convinced myself there is no way to be safe, start thinking about going back to more basic, work and reasonable safety the way, notice that there are some.

Safe range, various methods work, consider the type of facility equipment, and to continue efforts to choose the best low-waste will become increasingly important in the future.

Section 5 and human relations work improvement

Toyota production system is the foundation of 5-1 people respect

Rather general and work improvement, which are often thought to lead to intensification of labor, the Toyota work improvement work is mainly that eliminate waste, which has a stretch-never.

For example, you go to pick up six steps to walk five steps in the line parts, fittings, and have been out many times in the car.

These five steps and walk 06 steps and by channeling the work to create added value out of the car revealed that, it will continue to reduce the relative effort.

As this example in doing the job I think everyone needs to waste a few actions are never profitable.

The unnecessary action (action) to eliminate, what to link that work out more effective human energy, it will lead to respect for human beings.

My precious energy company who are offering their time, disappointing as I never truly effective注Genai work force, and that to do so would be contrary to most human respect .

People focused on useful work, but first take place with a sense of

motivation to work worth doing his job is why they are wasteful, not far from the value conscious.
Of course you would not expect motivation.

Put out of human power is limited.
Can you turn that into how valid their power, and lead to human respect.

Work improvement, the strengthening of labor peals ignored the problem of human nature, either way it's wrong or misunderstanding would have occurred.

5-2 true relationship is the other body

If effort and to reduce the field supervisors and staff, is seriously considering doing the work themselves who were born on the true relationships, and strengthening labor problems arise.

Standing in the morning to the scene, observing people as they see themselves doing the work in the field, if any-see attitude until the end trying to improve, and release of workers in the field will not happen.
On the surface, or flattery, just by taking mood, and get a real relationship can not.

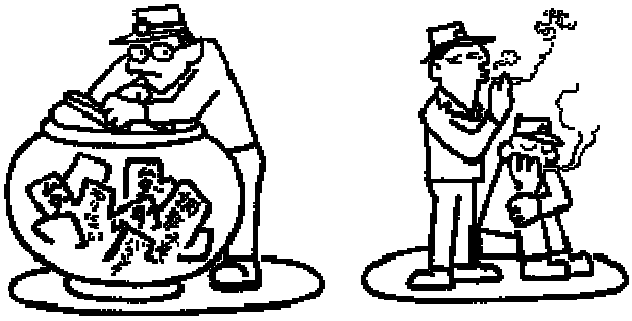
The story is a bit old, is a famous story, because I also help to foster relationships in the company were to dare to quote an example.

That famous volleyball coach Ōmatsu, or never flatter the women, went to pull in the mood and did not take.
Players will wear, which was trained to grab his heart.
And when the
game, the players
made full use of the
director's little
finger, and the
players responded
that the intention of

the director.

The site supervisor, to operate the site as instructed, the relationship of trust with workers and supervisors in the field, that is, there must be a real relationship.

So, we have empathy with workers constantly, based on respect for human beings themselves and supervisors, training and hold his heart,



and take the lead, we need to share against aggressive but intractable problem any be.

Especially important here is something to be sensitive to the problem of where to work, the reality is that someone in need.

For example, "work hard to do," "dangerous," "difficult to adjust, defect-ridden too much trouble to do" "variations downstream pull, not a priority," "Ugly work sheet display, hard to understand." and so on.

These may initially complain that anyone give up and leave it.
This will keep their eyes closed, "people cut back!" "Do better!" Even though this is just a festering discontent.

The supervisor, put it alone must do their own, if only that force workers, and workers distrust is natural that as a person.
Supervisors and staff, is himself suffering with the people working in the field, we have an attitude problem, have a sense of trust for him, eventually, led to the desire to come together better.
TWI's "treatment of people (JR)" but is doing it "as an individual people treated as human beings" is the basis of that that you and treating relationship problems by several, the ability of people they are alive.
This spirit will not change the essence of relationships past.

Eating a meal in the same pan, suffering both a sense of solidarity and confidence in each other pleasure born from both, it would be the missing part.

The work is important to get them back, must be deployed on the work improvement activities.

In that case, the people will participate, will have the opportunity to exchange views and common even consider the idea that together, the important thing to remember.

Concept itself is a very reasonable effort reduction, although it is acceptable can be anyone, or conduct harmful to relationships when it is born of misunderstanding and the occurrence of stretch-out, it Mutual trust is diminished or even earlier, to run towards the Neligh, many trying to understand if there is no feeling.

As an example of this, we introduce the general improvement of the assembly line of a factory fitting.

(B) briefing

1. , In late September 1946, before 3.6 min / 3.3 units tact minutes / units pushed forward. (But who did not increase.)
2. , Late-September to late October, the stop line - 120 minutes 150 minutes / direct occurred.
3. , Hard work, they strengthen the labor unions brought much to complain about.
4. , Mid-October, technicians and technical staff room, entered the line to improve.
5. , Since repeated that need improvement center line.
6. , Stop in mid-November Line 20 to 30 minutes / direct, decreased level.
7. Improvement was carried nearly 100 large and small. The staff is conducted to improve not only the first one, 20%, 80% of the remainder are conducted by field workers.

(B) the reaction field

1. Complaints were hung in late September to early October, all gone.
2. , Was issued from the field more and more ways to improve, were being put into action after another.
3. In November, the meeting gathered more than leader in December (review meeting) is leaned, the following opinions were expressed occasion.

    a. Motivation came out of the scene. Attitude was positive.
    b. There are still useless. Must be improved.
    c. I want enough time to improve the leader type.
    d. Hope you asked for it to do it is very good.
    Will soon again I hope that the rooms are in need of a field technician. The 放Rippanashi did.

4. Motivation in the field this month about one - came out great. "Stretch-out" that the voice was not heard at all.
5. The atmosphere of a recent line

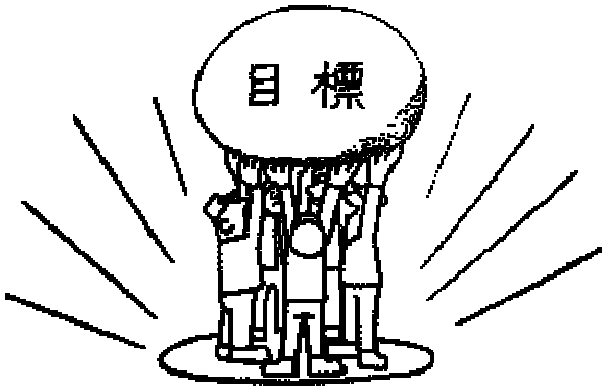
    a. Sight of staff and improvements that need to discuss getting it flying.
    b. "I do this will be better," issued from the suggestion of the operator.
    c. When you perform better, the same players decide for themselves after work, is done with everyone.

5-3 from participation to trust improvement activities

The director and staff, to respect the suggestions and advice from the field, in one scene with people, work improvement activities should be pursued.

By doing so, better motivating everyone to have a better sense of participation in, be excluded from the alienation of people come monotony of work.

This means that the face of a sense of participation can work better myself, to feel that sense of accomplishment and satisfaction could be improved in their ability, confidence is instilled, the better eye after another and that will be used for.



This sense of accomplishment is what human beings away from the confidence and sense of alienation, "I do" What if we say that the source of awareness.

At work like that would naturally be expected to improve morale.

If increased production of a machine shop, supervisor of the relationship front, gradually increase the speed of the conveyor assembly, rear supervisor relationship is an example of what to do and talked to everyone.

This case came up front, but because the amount at first, from where stagnant, but was hesitant the first rear hand, it was finally able to achieve faster production.

Therefore, supervisors and staff, as well as promote improvement activities together with people who work there always participate in such atmosphere for everyone, and should not spare any effort to create an environment.

Each plant is used in "kanban" is a condition that can make management look at.

Therefore, everyone working there, because it is susceptible to discover improvements and problems, also means the improvement of the motivation involved in the individual worker to participate in work improvement all we have to.

Mainly supervisors at the scene, everyone's work, "this process be better this way more", "No, no movement wasted than the" out positive feedback to each other, such as satisfactory Welcome to pursue their eyes shine, and smooth piece of evidence saying that workplace relationships is also a manifestation of the spirit of our founding.

Section 6進Me方work improvement activities

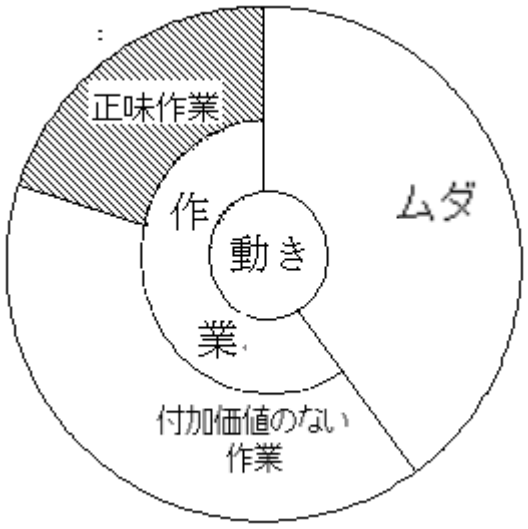
Aware of the contents of field work 6-1

To proceed on work improvement activities, or how to recognize workplace is important.

Ai is also assigned a high utilization rate of the current line of work in a way. That the failure rate may be within the limit.

Isn `t think of it as successful as a whole, there is a desire not to be born better.

Picked off the buds could say that the improvements themselves.



Detailed observations in the field if any, shall be considered work, can be divided more or less as shown.

Have something like the following example if the spot.

a. Continue to work on the waste, which do not need any way. Therefore, it can eliminate.

(For example) waiting to hand handling insignificant (Chikae and bring heaps of time carrying two intermediate products)

b. No value-added-value work is not under working conditions which have to do now. (Really good properties and also waste) in order to eliminate this, a partial need for a change of workplace conditions.

(Eg) walk to take part, cut the external packaging of components, parts, extract the bits from a large palette and Disregarding a button operation.

c. Net work to increase the value

The site also is a work exceptional non-standard work In addition, or bug fixes jig equipment a little, and there alterations of defective products, come to think of it this way, the ratio of working net increase value-added comes known to be less than expected. (Otherwise, the only element of cost increase only)

Reduction and an effort is to increase the ratio of net work.

Ideally 100% of net work, want to know that my goal is to close to it as possible.

Making too much waste 6-2

In the preceding paragraph, if we look at the work site in detail, but explained that the work contains something other than net surprisingly, what if what is clearly visible to everyone so part of the waste .

In other words, doing work in groups of several people waiting to get a little bit and everyone has placed a temporary or insignificant.

In these lines, we remove the waste redistribution effect, reducing a person is not so difficult.

However, in reality, few of these sites. This is not a waste that is not obscured.

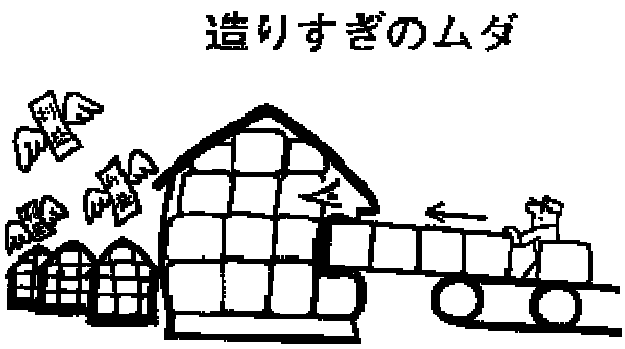
Usually, even in the field where they are most commonly seen is the progress of work too.

Waiting for a time but you have
to get real hands, so they do the
following tasks, they wait hidden
hand.

Repeated after all this, and builds
up behind the lines between
stocks.

By moving this inventory, it can bond properly again, "Work?" And come to experience, it becomes increasingly difficult to identify the waste.

This phenomenon, in the Toyota production system, going to waste too much building, waste among other things, that most do not tell me it is useless.



Because the waste categories and descriptions and detailed in Chapter 2, where saving is, making too much waste in the sense that they hide and other waste, other waste and are completely different.

From the perspective of better terms, but other waste gives clues, too much waste is hiding this building, working towards a better block.

Therefore, the first step to promote activities to reduce the effort is to build without too much waste.
In other words, line maintenance, or too unable to make such rules, restrictions on the equipment (such as full network device) is to set up.

This is the first made, which will flow back to its roots.
What is needed, when needed, one at a time can now, will become apparent as a ton of waste.
If such a state line, as mentioned at the beginning of this section, less redistribution work → People → eliminating waste, and the activities that will become easier.

Tact Concept 6-3

Without making too much like a paragraph, what you need when you need it, is to build one at a time, "when necessary" and should not be and when you do not know.

Will become important in the concept of tact here.
Tact and the number of minutes to one product (s) What should be decided by that time.
It must be always predicting the required number of products.

If you get the following easily formulated.

TACT (Time) = hours per day moving / day required number (pieces)

But how wrong suppose the line tact time to time request.
Effort has been calculated from the tact and ability in being facilities.
That is now the only facility capable of it, because only this person, this is something that one minute.
This is the tact that it is.

This concept is the Toyota production system is totally wrong because it must be careful.

Facility capacity is fixed, but some would, and more people, or by reducing the ability to increase or decrease line.

By personnel from the tact determine the correct meaning, it can even work with minimal human, can do that only humans do that now, in most cases, the accumulated stock Shimai too has the ability, effort lead to a reduction.

Then, as was decided tact, and enforcing exactly do I do this?, Other details as described in section, generally speaking

(B) draw a separator when working on the conveyor line, keep an accurate flow of product per parcel.

(B) inter-process Kanban put, if I work 外Renakere to the rule that is not kanban.

For the kanban, I would like to see are described in Section 4.
Major role in the process kanban is too pressing to make, appropriate tact (if necessary) so that you know that the previous process, should be fully understood.

Redistribution of tasks 6-4

By implementing the above, too impossible to be built, workers wasted waiting

hand, as others come to surface.

Next paragraph 1 (recognition of the contents of field operations) for work and not part of the value-added, less money is much, much about what impact it can improve the previous process.

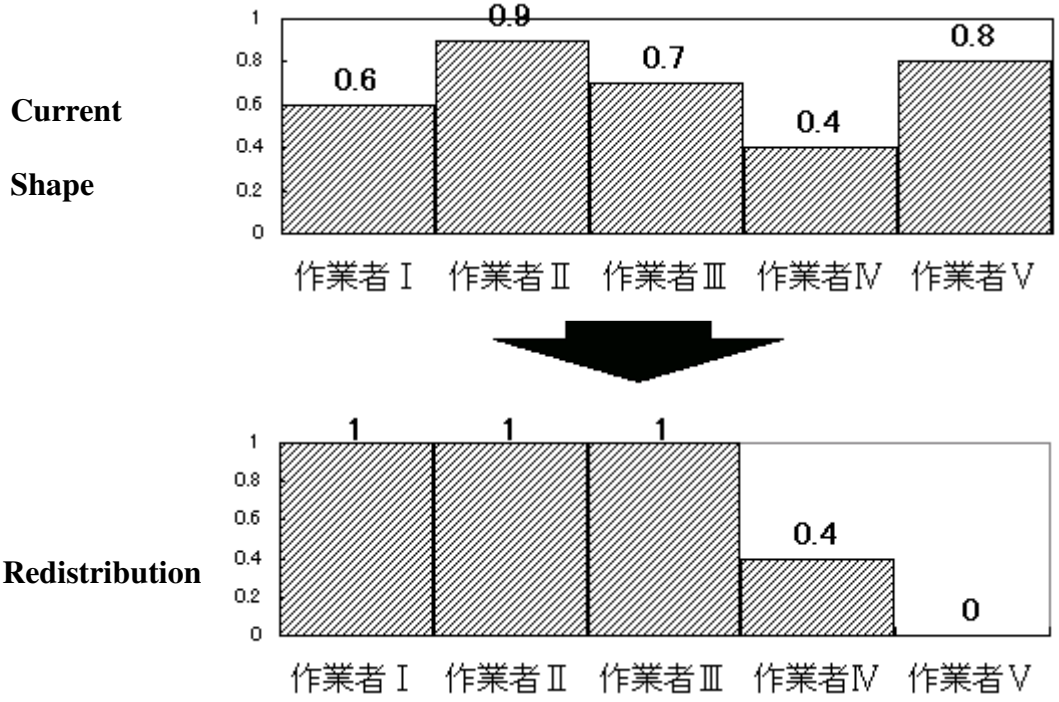
For example, if you do not walk to pick up parts, eliminating walking time to move the shelf parts.

After a line like this arrangement, each person conduct the redistribution of work.

Allocation in tact, will now give just work and work really 省Kenai net.

That the following simple diagram to explain it.

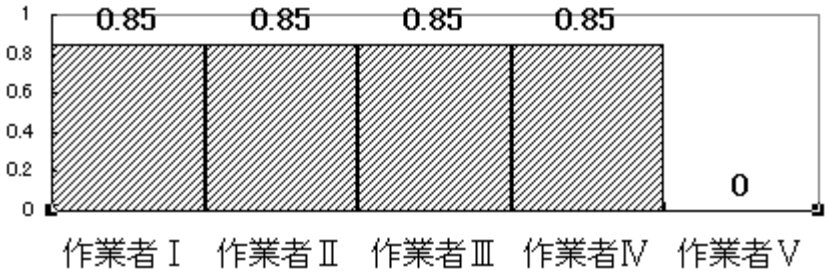
Figure 5



In this case, must be especially careful, as follows: "to distribute an average of four Ⅳ capacity of workers do not" is that.

Figure 6

Bad Example



The reason is that great pains to clarify the waste, the location of the problem is clear to anyone, what needs improvement is caused by the averaging would, because they are hidden.

In addition, all 0.15 each time (= waiting for the hand) and continue to work as of, for example, that even 10 days, they built a pace of work.

So for the next improvement, increased workload, because often it will become harder and psychological resistance.

In the example in Figure 5, the results in order to omit the pure waste in the five-man business, the calculation is easy, it was 3.4 people. But 0.4 is one of people have not even from this.

That one can reduce, and one state is only 40% have a job.

One reduced by the redistribution of the above work. (Reducing workers Ⅴ)

The next important thing is the odd work Ⅳ workers.

In conclusion, the next goal would be 0.4 to improve working to eliminate the artificial.

0.4 To do this artificial waiting a hand to what to do.

Limit it to focus, to come up with various proposals.

In the draft is if the measure costly and that of working itself to the equipment or faster walking made the shot a little like putting on hand to reduce the palette is also proposed cost-saving too.

At this stage, it is important to choose a plan too much.

0.4 The purpose is to eliminate the artificial-minute work.

Adopt an easy run in the most sensitive to weak Oh this suit.

Work in this five-man, two people could be reduced by relatively small amounts.

Then try again to review the line.
Look closely field will find the waste had been overlooked.
Or, apply to work with no value added work, but it will inevitably do, from birth to the money, I think that would not stop somehow. "Anxious" to work out.

After collecting these improvements, the challenge or try another one irreducible.

Now it easier than before and should not tend to.
No matter which plan, or too costly, would significantly affect the process around.
Sometimes it may not be realized.
Give up, however, that this awareness that they see the scene in question every day, inspired by something may come up with a great idea.
The change in tact and also selling, or become the model設変when new needs arose, such as being alive will surely be realized.

Therefore, you can not right now, it is important to patiently work at it.

6-5 order improvement

Once in the preceding paragraph is described in further review of the order of improvement → → half effort by eliminating waste redistribution process improvement for the proceedings.
Looking at the first division of this section, (a) immediately eliminate waste. (B) which produces value-added work is omitted from what can be done easily. (C) Leave the net work. It will be.

However, it pursues the reduction effort is, (b) can be difficult in, we might could do multiply money, (c) works or the net, it reduces the manpower etc.働化self can Yes, if necessary, must be performed quickly.
In other words, (a), (b), (c) in any work, subject to improvement and, in some cases need to run everything.

In this case, when you conduct a hands-on activities to reduce man-hours, once you have fully in mind that: You have to do even better by always preceding paragraph.
Ro, if he did simultaneously more often rises early effect.
Speaking of something to note, from the improvement work to improve the

ordering of equipment.

If divided into a bill, or a rule works, and re-allocation, or to specify the shelter of those "improved" working with and introducing a system that can automate the facility improvement "facility" and divided into.
To implement improvement initiatives to improve always work, devotion to do this, remember that the conduct should not upgrade their equipment.

The reason is as follows.
(B) improvement is expensive equipment

The goal is to reduce the people. I can do the work better, and made a lot of money improving the facilities multiplied, say that approach is wrong.

(Ii) improved facilities are beyond repair

There are better and they can fail when it is the best plan.
There is a slight advance by trial and error element of nature.
Work better if you fail, just here trying to turn So if that is easy if the facility will improve the whole amount of investment losses.

(C) do not live in improving facilities at the site of the improvement work, is likely to fail

Of work procedures, where standards have not been able properly to put his cast-iron chance is probably in danger of failing.
For example, automating a bad press in the field of materials management, and automated systems that break dissimilar types in the mix immediately.
This is in trouble because you have to keep a lookout and the effort to reduce the automatic machine.

The above reasons, the Toyota production system, which emphasizes the improvement of facilities to improve working order.

The idea is, if you simply applied to promote self 働化.
Originally self働化, aimed at cost reduction (reduced effort) to improve the facilities as a means, not particularly funny to say, in reality, as though it was

intended to be of their own work, field work progress and improvement, many patients are advised to independently rate.

Improvement was not enough to work, highly automated money multiplied much trouble, or soup with a lot of bad or very bad rate is just causing trouble moving, or move or have to put a lookout Senakatsu .

Advice of their own people for 働化, it would be sufficient to reflect this area.

Other Notes 6-6

Above mentioned About how work improvement.
Hit the end of this section, add on 2.3.
The next section because this is some overlap with, easy to keep only the essentials.

6-6-1 and you can see the scene
 the location of the problem - it must be to see who developed the site from the usual, it is important that you have standards.
If the problem is clear, the bill suggests that we all can easily be considered.

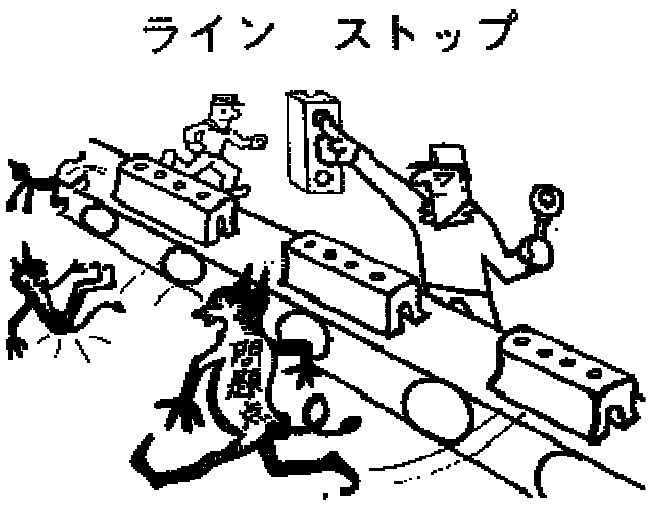
6-6-2 afraid to stop the line.

In the process of improvement, the line may stop temporarily confused.
But fearing that the present situation is not improving.
Consider jumping to bend and stretch, line stop fear, but rather can do so without causing an early stop line, is important as it prepared to make a move.

Dare to stop the line, to deal with the evil in relief, it is necessary, in the process lowered production is also prone to emotional upset people.

The company's assembly lines,
one supervisor was better to take
this approach.
In the process 2,000 units / day of
production volume of 1,500 units /
day down, the stock has declined
during the show.
The manager also said many, lost

a lot of his own mind, you can only believe that this improvement, the results pushed through, the line in about 10 days at 2,600 units / was divided to day.



But the next line supervisor, the line to make it temporarily stop falling efficiency, considered to be detrimental to our company to not let people stop the line.
But then once conducted to improve the line of the former, had just noticeable difference as you can see the untrained eye the latter line is wasted.

This is a case really was, even within the Toyota, and cooperation in production lines, relatively little waste, efficient lines, the line stops too afraid not, well consider needs.

6-6-3 fewer people who happen without the cooperation <br> hard worker even some good suggestions for improvement.
Workers will understand, in order to obtain the cooperation should note the following two.

(B) convincing enough to be bored workers.

The effect of waiting on hand, without doing anything is to play with them for a while.
This will prove oneself and others with free time.
Resistance can not charge above the other tasks.

(B) to reduce a person plans to reduce its outstanding people.

The poor work and often, their hard to use, tend to reduce those unfamiliar, this will not grow even indefinitely in person, and to resist the conscious eye of others.
Reducing low-performing ones will lead to moral degradation, good grades to reduce the other hand, often obtain the active cooperation of workers.

Section 7 supervisors and work improvement

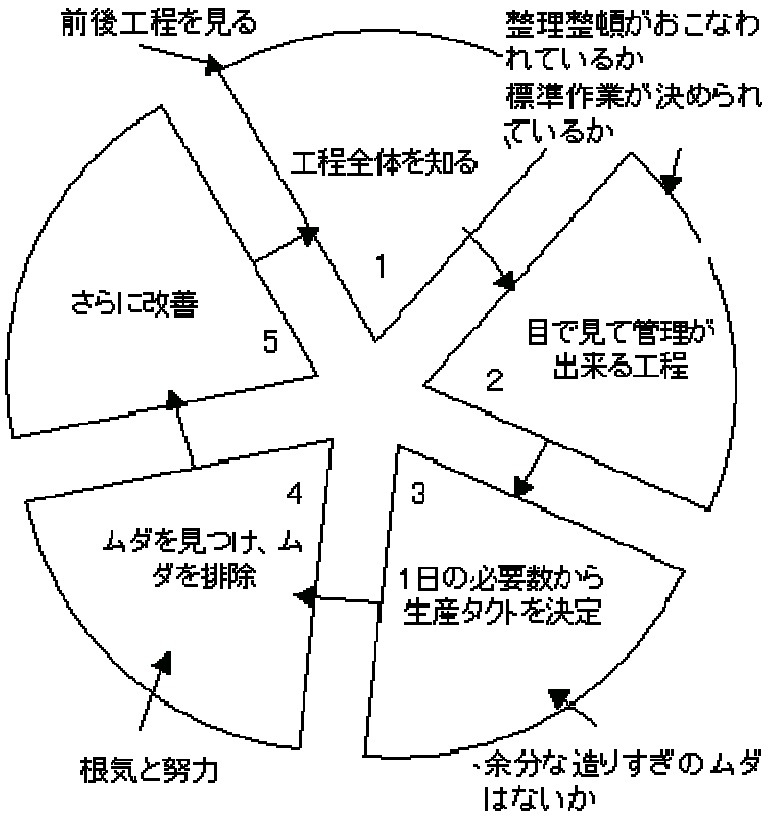
7-1 The role of supervisor

"10% of the cost is just equal to double sales" as far as it is said, cost reduction activities at production sites is important, if, if it is neglected, the corporate is the backbone from the ground shake.

And promote the role of supervisors in fact it is very important, contribute to greater enterprise ratio.

Currently, the Toyota production system is underway at Toyota's plant, standing on this recognition has been made in the following analysis methods.

Figure 7



When you rotate the circle, the attitude is what supervisors are the Toyota thorough work improvement activities should do, or meet business objectives, I will discuss in this section.

Now, supervisors have a role seems to be two basic.
One is the amount secured, quality assurance (see Section 2 and quality of work improvement) and one is better for reducing man-hours activity.

This will guarantee the quality and quantity while on one and told to do this in people and equipment on the other hand the smallest, seemingly contradictory elements are included, which is not so easy.

However, less emphasis on the amount secured, from the first line and prepare to stop production I absolutely have to, people more and more facilities inventory will eventually removed from the original purpose of corporate activity costs rise .
In this sense, the direction to satisfy both of their hardships, it will try to take your own line, who is director of the request.

Management of abnormal 7-2

Line supervisors to improve So what specific ways, the quality, quantity, how can it turned out products to satisfy the cost.

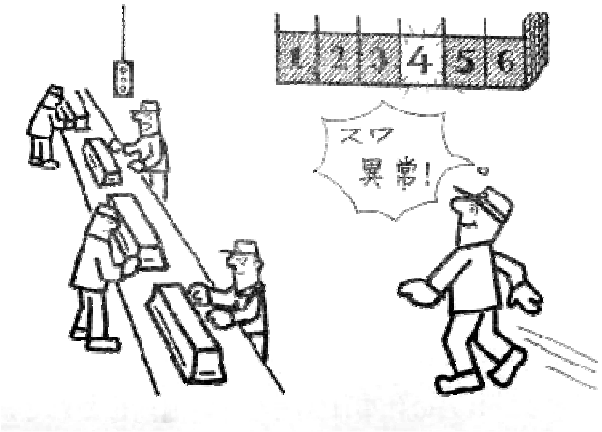
First, let us consider how to manage.

Even just a little thought, subject to supervisory control are numerous.
Plans and change orders and material safety stock facilities achieve educational quality and production planning personnel work distribution approach.
I do exactly this all head, no matter how many bodies would lack.

The Toyota production system, then every standard across all of them, look beyond its focus on the future, namely, that I can manage failure.

Standardization is to work properly, enforcing standards determined work-wise, in terms of materials and inventory, the best is clearly the quantity in the entry instructions "kanban", and the safety treatment and standards, setting rules so that each is to decide their conduct as men.

We have done as the rule in all aspects of the site to organize these things out for the future "problem (bad)" The more you go thorough way to solve a point of control - Administrators what to do - they are clear.



So first thing you need to do as a coach, is organizing his line.
Speaking in more detail, and standards setting, and the best materials and parts, the decision of setting kanban, and the establishment of a button or icon and Rainsutoppobotan and call.

And thus, the "I do it" with the intention of containing the rules is determined that the director, or if it is then run, resulting in the scene or what happens, look at the actual shall determine.
And for the symptoms except that aimed their measures need to arise again.

In this case, what behavior is normal, it is important to tell what is unusual.
Too much trouble to standardize or Wakaranakatsu abnormalities, and the blind eye is disqualified as a director could be said.

For this to be unusual, it is important to find a way to make it to everyone.
The first step in improving the abnormal eye.
Decide to give some concrete examples pulling.

All workers, we work as a standard, zero defects, if during closing of the day, that line should get together quantities required.

But we are not God, because the allocation of work performed, and all

the people from the beginning, that will reach a balanced workload, may be considered unlikely.

Now, A few you can afford to.
He is waiting for each hand. Or run up behind him stock. Or he can start a non-standard work.
These are all, is abnormal. A lack of jobs to you.

In addition, B in time you finish work. He stopped the line. Hold back out or poor quality. Both are also unusual.
B You're too much work.
A B You can do the work in time if you, if that is still not enough teaching supervisor.

C You are working together with the automatic feed hand. (This is the movement of non-standard work) is also unusual.
Do you know the jig has a rattle, it was found that they release the bad hand.
Supervisors should be fixed by contacting employees or maintenance immediately.

After the line was put products not marked with Kanban.
It is also unusual.
Is it too early misconfiguration of tact, and all who work or have too impatient or anything going on in the process after you've made to a standstill pick up (the rule Kanban fault), got a couple of look at it is to do anyway.

More than two to three is an example of this is taken to set up a rule supervisors, who are all abnormal, or if the rule itself is unreasonable to pursue the cause of poor materials and parts, such as equipment defects, and protect the rule that in most cases.

Line Stop and bad experience is directly related to the quality content so that the abnormality is seen immediately.
However, the abnormality leads to higher costs for waste and minor rule

violations, or overlooked and it is often a secondary thought.
This all is an important clue → cost reduction improvements.
In every little thing, do not miss the need to care.

Line Stop Concept 7-3

The first step is said to improve eye abnormalities found in reality, if the anomaly clearly understand the problem, no better than 50% improvement was achieved.
"This is bad, getting back to where" you do to fix that problem, and many experts with specific skills and knowledge, the wisdom of those who gathered to work out some way come.
Then, do I pick a cheap and effective plan.

As I keep saying, "As you can see that you have abnormal," a prerequisite for progress and improvement, and must be addressed is important that supervisors out in full force.

The following will describe the preparation for this.

One is that you have to hold your line at all times.
This is for supervisors might feel that one side of Susumanai is absolutely necessary.

Only if you try to stop the line and also their poor process, poor quality as well as process all seen before, "Stop it Yarenakere" So, to move aggressively to implement improvements possible.

It is paradoxical words, the stop line, stop (a good, strong) to the line.
Is first and foremost goal is to build up the ideal line.
From the line to stop it at the risk of loss because, if stopped, the supervisor must resolve a fundamental problem in desperation.

"Stop line" and not say supervisors, line supervisors stopped three times twice in the same cause, which both flunk.

The line stop, killing one after another I had problems, but take one last

stop line but Taku Tome I would say that attitude as an important director.

"I have beautiful stop line is either Yohodo bad" is the meaning of the word Kamishimerubeku.

Implementation of improvement 7-4

The following will describe the implementation of improvements.

Until now it has been said, the problem could be found.
To improve this, various methods should be considered.

Must be careful as the bill suggests that the order of selection, but that the improvement work to facilities improvement, which we omit it already mentioned in Section 6.

Improvement plan is decided then to do this if you often do not know the results should try this.
And three re-distribution of work to reduce by eliminating one of the four work behaviors such waste, 0.1 really doesn't get much artificial work. Is that so often happens in real life.
You can do this should force the and will work to strengthen their work to anger.
I let go and say it is over.
0.1 How do I save you, artificial wring out the wisdom that only focus addressed here.
If we can not solve on my own really, try to consult with superiors or subordinates.
Or technician may be consulted.

It is important for better results. Do about imposing, working patiently, in the end I want one Herashi.
Were to squeeze in time for about 15 seconds, shortening the distance to walk, or close to the shelter component, and a small palette, or, or a one-touch button (but make a move at the same time in terms of safety), Products and automatic retrieval, and tools hanging from the top, but

things are possible, squeeze the notes from the focus is to keep thinking what to do with perseverance.
When this situation, it is a little tip, often come up with a good idea.

Another important thing, which should be fixable with a better proposal.
Be improved, from today, a new way to revise the standards, which must be introduced.
In that sense, not fixable, it was not useful for day-to-day things.
Facilities, equipment metallurgical worker, at the improvement of species shoot up can use it in its entirety, and Storytelling eye is not, as a standard work taken step-type replacement and cutting tools, to master fully set the rules, including the improvement of the first rule should be thoroughly accomplish.
And thus, improve and revise the standard one end, which is also the start of the new improvements.
The anomaly should start to return to the scene again.

And thus,

Standards - unusual discovery - investigation of the cause - improving - standards

The role of administrators and turning circle, rotated it by continuing, ensure that the quantity and quality and reduce costs, look, can we serve is contradictory.
Bear in mind that as a coach 7-5

Now, you mentioned briefly above requirements to act as supervisor.

One is to always see the scene.
Yet the field supervisor, or lines and watch, or even be indifferent to what is happening or is it just disqualified.
Because this rule will not check my decision, and therefore can not distinguish between normal and abnormal, and should want no better because nations.

Two is better to control the people.

This is as I do my make is to practice.
As we mentioned in the section on relationships, and taking random humor, and good relationships are not allowed to.
Eventually become a coach for men like myself, teach, train, what a strong field to finish as a result of supervisors, and even from the father trusted subordinates.

In the Toyota Production System "was what made this stock, or had made," the question may.
Even if materials or equipment aligned much ability people, the building is important that you do not built.
Let me stop and think as a people, who will move on or out of control and supervision is necessary.
Without this improvement can not be effectively implemented.

Part 3 is to make a decision looking at the big picture overall.

Even if some from becoming self-improvement process, and a negative one Deattari front-end and back-end processes, and outsourcing or transition process is troublesome, we can not evaluate the overall improvement of view is not.

Each line supervisors, line managers believe that their decisions are important to the overall big picture is always watching.

Etc. To try to standard, the results have been improved, now works even if the line is definitely one, "Please remove me" is a good father and most supervisors say.

7-6 to enter the line supervisor for

At the end of this section and give an idea about the line supervisor conduct the work.

Well "to enter the line supervisors or non-Shi or" treat the question.

The Toyota production system "into line, but not leave, and that may not have to participate at all" is the reply.

Every day of the leave into line supervisors, workers and change.
This is because education can also teach important as improved management and supervisors.
I say what, at any given time, so that I have to be lines that are worth a regular basis, should be able to afford the person must have.
I would have been better to continue to work to eliminate waste, at times, forced into a situation that caused the line, and could say of course.

However, we have no choice to enter the line should not.
As stated in paragraph 1 of this section, one of the important role of supervisors is to reduce man-hour improvement activities.
Off work to see the entire line supervisor is to be done Iku Tame improvement activities.

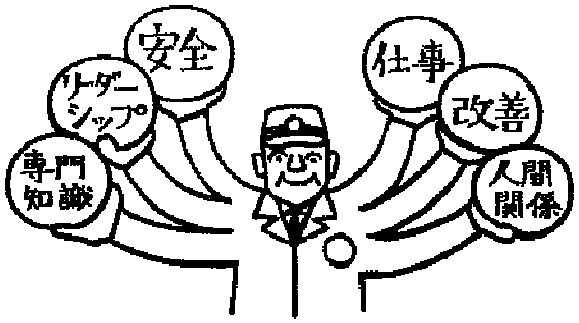
In order to be done to improve, however, must often knows the difficulty of the tasks and procedures.

For example, new employees are un-original, or if you change work procedures to improve the process, showing how to do best with less waste of course, must be leaders.

Also, just seeing it being wasted Mlamli really notice.

You can teach people this way, changing the steps to think, to find or improve waste meticulously Mlamli or may not enter into line with the means.
When forced into a line in the absence of such workers is one chance in this sense.

Supervisor is Almighty



I do not think that way, friendly competition, and I want to go try to find improvements, this difference shows up as a very big difference.

This not only continue to improve just one senior and the rest for example, might also prevent the phenomenon could become shaky.

Therefore, the idea is harsh, but if there is a chance to enter the line supervisors are always learning, always improving the awareness of the positive that is the line of work to be done.

Chapter 2 Efficient

Section 1 and the efficiency

As already mentioned in Chapter 1, who work for our manufacturers, we first omitted the efficient production of waste, thus reducing the cost to be the most important thing.

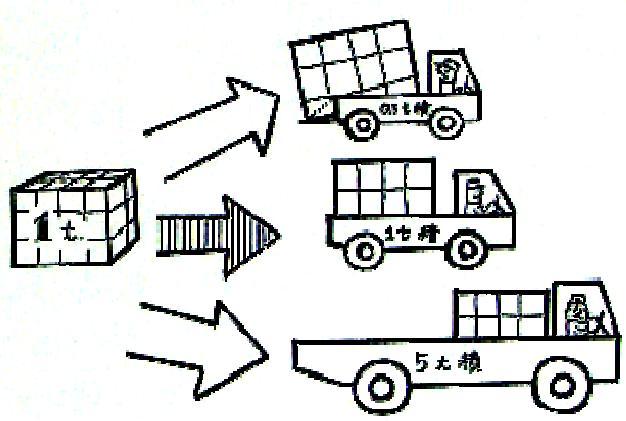
So, care to eliminate waste on a regular basis, must strive to increase production efficiency by improving constantly.

Result of efforts, and weigh how much you increased productivity compared to the past "yardstick" as generally "efficient" is used.

Different point of view related to the efficiency for the idea is to make a right we must organize on a regular basis. How to use the

wrong yardstick, not a correct evaluation improvements.

Were raised up with the cost efficiency in fact, even if it might come out as.



Therefore, this chapter focuses it will take the concept of efficiency.

Efficiency and efficiency 1-1

First think about efficiency. And efficiency, "say the ratio of energy supplied to 100 minutes and the machine can work without the actual machine. Therefore, as indicated by numbers within 100 percent" means. This idea was applied in production, we have to say it is the efficiency of production, which is "about a product, the product was (or advanced process) labor (= energy) and to build it compared with 100 minutes out of the labor force "is that.

Production efficiency of 50% is put out of force out of work, building a product, but only half (or to carry out the process) is not helpful in the remaining 50% is wasted power put, that means. Speaking of approximately 80% of production efficiency, 80% of the workers out in force that has helped, Peru and the production efficiency of the saddle is considerably higher in the previous example.

Thus, in a high production efficiency, the majority of the tracks is a force that thing out of everybody (ie, high value-added) and that it is a force, which is very desirable.

If you think that you work hard to get anyone to the company. By the way, and noticed that the content of this work, for example, unstacking away the goods or arrange to here, or try out in bits and parts from the palette, and once seen, is about process and progress of work unrelated If you have sweaty. The products are tsukuri and

after another with great rapidity, or it takes half rework defective. Although these are working hard, which lead to a bad case of value-added efficiency. This is a waste of the precious energy, can not be true for leveraging the power workers.

Way to decide who is the director of field work, work that is inefficient, managers and supervisors is the responsibility of the staff. Managers and supervisors and staff, the contents of the worker is doing work on a regular basis, which must continue to improve efficient.

Second, continued efforts to improve this result, suppose now it could be a lot of relatively higher efficiency than conventional production. In this case, we work efficiently it up better than before.

Efficiency and is given time (eg per hour) or anything made in many pieces, and used it to compare the volume. In this case, the reference (standard) becomes the average or previous month or the past six months, often from the achievements made so far. "This month is 15 percent while the standard for efficiency," so that the usage. Thus, unlike the case of efficiency in efficiency may even exceeding 100 percent.

In general, try to represent how the percentage rate of success of the work and effort, seen in the company around. For example, the "efficiency" Besides, "utilization" or. "Labor productivity" or

"SPH (output per hour)" also became such, the evaluation of whether all going to work efficiently, "ruler" is used as.

Such a "yardstick" of performance times to work, in particular - so be careful 2 3 Paikenaikotoga describe it next.

(B) even if the occupancy rate even if SPH, and this purpose is not to raise itself.

Again, our objective is cost reduction.

Increase production efficiency and to ignore all conditions, SPH will be high and, in some cases would increase the cost. For example, to raise the utilization rate line, or to have each process WIP middle enough to cover if equipment failure a little, as affected by shortage of front-end, with a lot of parts all types of work in progress If we use the way things are aligned and form a part of the way, perhaps, on the rate seems to be working. However, in many cases this approach may increase the costs, known in the past 30 years site management experience. So when you use them, to clarify whether you are always consistent with the purposes, first to understand the effective range of conditions, "ruler" that need to be used as storage.

(B) What to make of that ability is very important.

If machinery, machine cycles generally highest capacity (continuous beating time) is. Currently using the machine, and you do not see clearly which side has an ability, capacity, if necessary on the need to raise awareness that it can.

If the person is required to try to separate work and movement. Can move to leave the author moves in cycle time, and it is really needed, which normally can not be divided either. The former movement is increasing the value added (in the Toyota production system and it is good work has been distinguished from mere movement) and movement related to indispensable Pikoreni of your own work outside of the latter it , that is, there is no hindrance to anything that moves omitted.

Pu and call it a waste.

Detached from the camera captures the movement of waste, the ability of people think it should not.

(C) faster than a sense of time, it is important to consider what it means to do well.

Faster than that to work, can have more processes by which people can work in less overall, meaning they are far more binding Pitsuitehajimete.

You can build more products faster than that, efficiency goes up for this. However, in some cases this is not pay.

As mentioned before, the efficiency is strictly a "ruler" is. Should aim to use it against the last.

Cost reduction goal 1-2

Order to improve efficiency as described in the preceding paragraph, the reduction in cost.

Therefore, the aim is to improve the efficiency is probably likely that the overall operational mistakes.

And low cost are consistent with high efficiency, meaning that arise to increase the capacity first.

To this end, the attention is always to match, if not the action is not taken.

For example, SPH (output per hour) and often find sites that aim to improve management.

(Note) This rate is not being used in terms of productivity as those Kishimen would look good with the same idea.

In one line, place the lines after the board has a way to write the volume every hour.

And continues to this site, imperceptibly, SPH falls into the illusion as if the goal is to raise itself.

SPH replacement with less as possible to increase the stage, produced

in large batches.

As long as you've done, time of day minutes, the next day, two days later beat away a minute. SPH is certainly up, I wonder if it really cost reduction.

If you were, but I think that making profits from the high efficiency is really only halfway done with the mountain of post-process inventory.

In this case, responding to receipt of the next process in batches as small as possible, but only as needed to produce, a condition of this line First.

In this condition, SPH can be done on a first Nakaru about cost reduction. Remove this requirement, SPH's just simply increase is rather negative look at the whole plant.

With high efficiency and low cost is always equal to that in this sense is not.

In relation to this concept, the Toyota production system has to distinguish the following rates for Kadou.

1-2-1 utilization rate and mobility

Utilization and the machine is fully operational when its current production capacity to be proven.

Therefore, it is down due to the monthly production volume, and lower selling snow is bad if, as many as quite the opposite order, or do shift work long overtime hours, even 120% 130% should feel sometimes. (Fixed as 100 hours at full capacity), so when the operating rate of increase is not necessary to be a big loss.

The rate of movement is good movement whenever you move them to the state, which is 100% ideal. To this must not be done to ensure that preventive maintenance is, quite Rarenakere taken steps to

shorten the time of each other.

And moving the capacity utilization rate, we must strictly separate. To understand this concept is easy to understand and try to fit in your car with this.

Mobility rate is expressed at a rate which works better shape if we take the state at any time when you ride, it should be 100%.

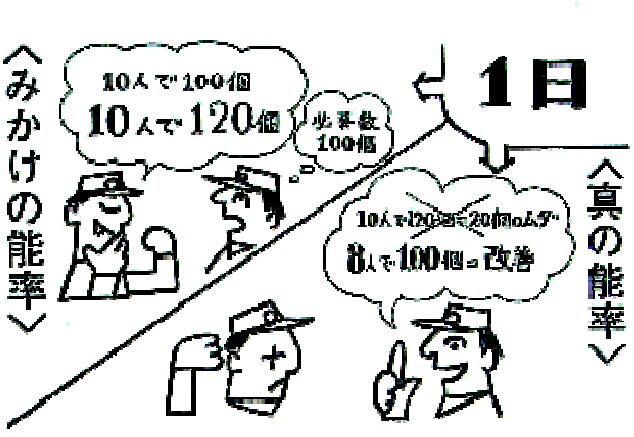
Meanwhile, capacity utilization is the percentage of time that the car how much of the day. Will get into a car from anyone only when needed, can not say 100 percent is ideal. Rather, if you ride all day for the hell of it, you will consume more and more gasoline and oil, also increased the probability of loss because of failure comes.

Then, the same can be said about the relationship between yield and number. If you build a relationship expressed by some efficiency in many of the cost reduction is directly related to that one.

Again, efficiency improvements and cost reductions, the state that equals should not necessarily.

I-2-2 real and apparent efficiency (computational) efficiency

Consider the following example. There are 100 lines in 10 / day are building products. Improved results of this line, if it does 120 to be more capable of 10 / product can now days. This is up 20% efficiency. It was consistent with the increased production of this improvement was carried out just 120 from this month / day and production planning.



In this case I might have to increase by two,

the number of improvements in production volume because Fuyasazu got up, and lead to profit improvement.

, The production plan 100 / 変Waranakatsu or day, or cut production by 90 / What happens if a day. Efficiency goes up even just because this time, 120 day / and you made each day, 20 products would spare each day - 30. This material costs, labor costs as well as where to eat, a growing number pallets and shelter plants and effort to manage inventory, the company has become a drawback. At this rate does not contribute to performance improvement, rather than "revision" is.

As this example, even if you reduced the number of 変Waranakatsu necessary to gain efficiencies is leading to what should I do?

In this case, 100 / day in eight (90 units required / 90 if the day / seven days on) to build, should improve the process. To reduce the cost even if it improves efficiency.

In this way, but say the same efficiencies, 120 in 10 / and make way day in eight of 100 / 2 as a way to build a day. Efficiency improvement is around 20%, both of which way you take, the production volume (number required) is determined by some means. In other words, forget that the production volume is not a prerequisite.

However, if you run the calculation on the actual line are two ways this can result in significant differences are similar. Way the number is now increasing efficiency 上Keru, most supervisors are relatively easy way to increase efficiency by reducing the number of times a person can do it hard. So, improving efficiency rather insist, how come the former tend to take the required number to ignore.

Others, including many in the field, with products built under the fast increase efficiency s voice, the mountain and see that the stock after the line, but it assumes that the required number forget that and the other one, easy way to improve efficiency now increasing the amount seems to be that there is just cause.

However, the improvement in efficiency in this way during the production cuts, but revenue has declined, while spending will be Fueru the other hand, the worst case, could lead to death of the company (in particular SMEs blow Sai have something big like this way.)

Thus, the number can be 変Waranakatsu, while reducing production, the way to increasing their efficiency and raising the volume in the Toyota production system, the apparent efficiency (ie, up only on the efficiency of calculation) call, do not have that.

No matter how much difficulty, you must improve efficiency and reduce the effort, it should not be challenged. Rather, it should allow me this way, improve the efficiency of the production period is that very easy. In this sense, what managers and supervisors of production cuts and staff would say that the chances get stronger.

1-3 "of production-necessary" is premise

And said come this far, we have to think about what that number absolutely necessary.

As mentioned in the preceding paragraph, there are ways to improve the efficiency of the two. Hiroshi Saku One is that production volume, the other one is to reduce the number of people.

Real line, it turns out to be a very good way to improve efficiency both lines will take most of the increase in production. Resistance not less troublesome because this approach better.

However, this approach is that the increased production of monthly line have been forced to work overtime due to lack of capacity before but good, except it occurs and waste too much structure, lead-up costs is as mentioned earlier.

I say many times, because that goal is to reduce costs only and must be taken to improve efficiency also consistent with this. In order to

reduce costs and eliminate waste from the building too, must be equal to the number of production and should not be.

, The number determined by what you need. It is selling snow. In other words, would be determined from market trends. Therefore, for a given scene is, and should not be considered arbitrarily increase or decrease the volume.

So, even assuming the required number Okonaubeki efficiencies in production sites must be achieved within this range.

Efficiency when used as a yardstick, the underlying thinking must be more like. If it is well organized, can cause build too much waste is prevented. And efficiency-improvement that will reduce the cost.

The required number of similar or better before, when reduced for improving the way, let's look a little more concrete.

In this case, means to improve the efficiency been trying to reduce man-hours are omitted in the process waste in the production tact was calculated from the number you want, as much work (work) or get one or , and some of their own work the work of people like to see it the minute another job, then this gathering is realized when the first production activity in human conduct less. In this case, tools and machinery, transport and equipment, which had already paid for, even if the future cost of what use are not affected. Which would be nice if it is used as calculated from the number of production necessary tact, it would also be determined by utilization of the machine.

This is about as described in the preceding paragraph.

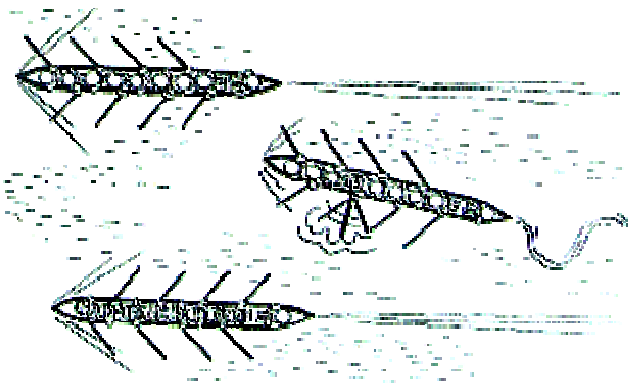
Efficiency and overall efficiency of the individual Section 2

The previous section discussed the general concept of efficiency. Before the concrete plant to denominate it, let us consider one

example below.

Each fall, but our boat race is held is a very interesting example to think about efficiency. For example, the first eight in total synch rowing eight hands, great speed to get out. Pitch of about 40 to 50 (of thrash per minute), but according to the sign of Cox firmly defend it. So. Boat is even potentially competing for superiority in that only one of eight balanced. By the way, if one person in eight, "I am good at power also holds up against the skill. The 60-riding bitch to do so", saying it will happen faster Koidara own. And collide with people all around, lose the right balance, the boat begins to meander. As a result, I was going to speed up more and break the balance, it would be rather slow. In other words, the total force is trying to drive the boat at eight, but a little Fueta, is not talking-down efficiency. Koidara out in full force apart let alone eight, the port is no longer proceed. Port competition so that all solid pitch to keep pedaling, and the most efficient way,

only one faster is a bad one just as much slower.



Production mechanism is also in the field, rowing and have something very similar backgrounds. Tak and the pitch is to fix the production, to raise the overall efficiency and productivity that will protect them.

Ignore the tact, work that 者Nari, and speed up production lines there, the individual computational efficiency is also improved, the overall efficiency falls.

Let us consider a concrete factory fit it.

The smallest unit is factory configured for each individual worker, and one facility.

Grouped around a single component which will process, I have a line. In addition, Group or black lines, and the maintenance and inspection staff and transport engineering sector and surrounding this, one factory is established.

Efficiency when considering the cost reduction goal, it is necessary at all levels and raising the efficiency of this. I mean, in every single scene can also process the individual worker, are all closely related to and fro, from those that exist are rarely alone. Therefore, the way some people work influence the others, but the making of a line, often working to regulate the transportation process and the way around.

Discover the waste, and to seek to eliminate this reason, quite a few number of issues that reach the front-end and back-end processes and transport processes. This is his (or self-process), not only streamlined the process of around Yoshiashi have shown that having a considerable influence.

In order to improve efficiency leading to cost reductions, even as he was in this sense, if not done in an efficient manner at all levels must.

In this section, ideas for improving efficiency in YokohamaProgram levels.

2-1 working efficiency of each person

The important thing at this stage, "the ratio of value-added" is the idea.

In other words, have done work in the worker, how much to increase the proportion of value-added work, all that, the larger it is highly efficient.

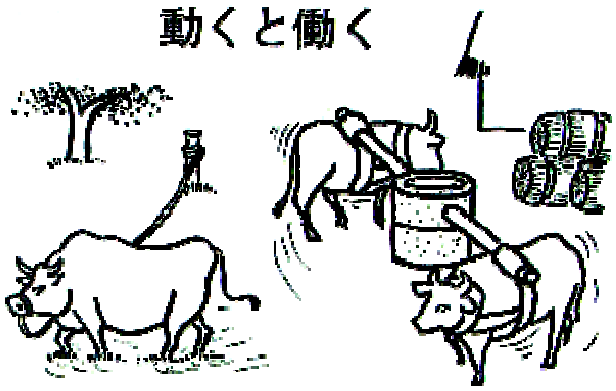
For example, you transshipment goods, packaging or expiration time, the task of wrapping paper folded Dari is essentially what is not necessary. Omit them, by collecting only the absolutely necessary

work, the ratio of working to increase the value in one cycle will come flute work. Related to this section as in Toyota production system has the following ideas.

2-l-one work and work

Japanese compared to Westerners, just move it to a small pea. Moreover, labor productivity is often said that Japan is more inferior.

This is not working very moving. In other words, be said that means a lot of inefficient and wasteful effort.



For example, we are moving production activities in production 07 hours 30 minutes a day (which worked), but surprisingly often it is not working time.

Toyota production system in the expression, really builds on that work processes proceed (rising VAT) when we were out, saying that worked the first time. Work is about the wisdom of human movement, may also say that the wisdom of men attached to the supervisor.

On the contrary, work mishaps or hindrance is also omitted (not raise the value-added work) and the work can not be said that will be moved.

2-1-2 labor intensity

Is important to make efforts to move converted to work with everyone, it will lead to reduced conversion to make the effort.

The labor intensity in production system Toyota (worker / labor) and has therefore, that the higher it is for pretending much work you really

need the energy out of work, it is desirable that There.

This word, in fact will be done to reduce man-hours, or do I focus on what you keep out of here because the clearest example.

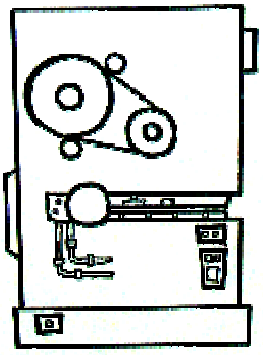
Automation and self働化2-1-3

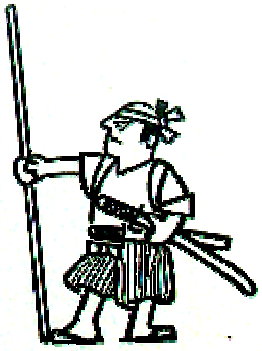
Automated machine even if the person moves. But as important move is to stop if they are abnormal.

Refusing to stop the machine continues to reject, and is likely to malfunction and contamination by air strike. So I really should not have to place a lookout. This watch is not any work to increase the value.

The Toyota production system, the machine just works (automatic machines) and machines with automatic stop (self 働機) are considered separate clearly. This is since the invention of the machine itself Sakichi 働織 is 働化 own spirit has been traditionally under Tsuga.

Aiming high bets that 働化 self, just return it 見U (reduced effort) must have. You've finished the trouble is all





the more automation. Improved continuously improved, efforts should be able to have a self 働化.

The wisdom of the human self 働化 (Ninben) and equipped with automated person (Ninben) may have to learn that the watch is missing.

In addition, more extensive interpretation of these ideas, many of the

manual, even if for the conveyor assembly, informal self 働化 be done. In this case, "self" is his own self was a worker is doing his work "This is not" or "poor" if the thought is to stop the conveyor to the workers themselves . Means and extremes, the line has a stop switch is one person to work immediately to stop the line if you want a little strange. Defective, it will not build a product that failed to work. In other words, not even that worked, the idea of another self 働化.

2-2 lines efficiency of work

The important thing at this stage, the following two.

2-2-1 balance between workers

It other words, we first as a production tact is not to build too.

Aims to create efficient and fast enough that their own work, workers accumulate the goods before the next process, it would clean up the flute work.

And the feeling impatience sometimes be spoiled Fueru. If you see this whole line, or actually causes inefficiency falls.

I have a few people working in the general order, there is always hindered by working process, which is the ability of this line. To improve the efficiency of the entire line, and neck to help the worker process is not, in fact, who can build something faster, because they have more and more, which builds up in front of the neck process.

Gosh this is contrary to pull the legs, is like dropping efficiency. To prevent this, clearly determined by a standard work, standard hand, tact, and keep the work order, the wait can get through it, the organization s to be done, must take the balance.

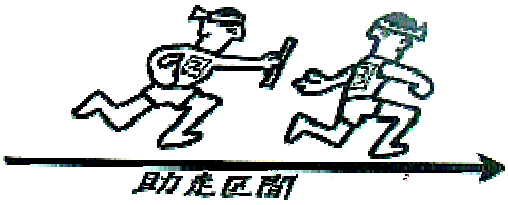
To work side by side as the press, one Tsukitara parts on hand, it is necessary to stop the conveyor and twist like.

2-2-2 helping each other (swimming and sprint relay)

Above way, the balance between their work is often not quite complete. The line work is done by several people, a small imbalance is inevitable. In this case, by a little slower than help end soon, it is possible to improve the efficiency of the entire line. The process can be done

割Rifuri, its borders should be to help each other mutually.

For example, before the process is finished a little faster, and to



devise better ways to do the first step of fitting into the next fixture products.

As for this idea, so you introduce a reference Patontatchi way relay swimming and athletics.

In the swimming relay, the swimmer has to touch the pool first, second dive the swimmer. In contrast, 20m in track and field baton zone, handing the baton may be anywhere in this.

So, if people are swimming against the late 受持Tsu 100m people by the early case of land, the people running fast 120m, and 80m people running late this l "strategy" becomes possible.

For field work, the land must be relay. Supervisors to improve the efficiency of the line "strategy" so that you can Build a desirable zone that you create a baton.

2-3 overall plant efficiency

The company is focusing on one very efficient person to work up a spit

sometimes are examples of whole-plant efficiency. It is a wonderful early manual worker in a factory stock is a mountain, many people dismiss it, that the cost is up as a whole rather than cost reduction.

This,'ve only just fitting the individual rate of those that work productivity is not considered from the whole.

Worker efficiency, line efficiency as well as, or higher efficiency of the entire plant, the greater impact on cost. So the whole plant level improvement in efficiency, it is necessary to conduct the most preferred. In order to carry out the entire plant efficiencies, we need some rules. Because this is simply that the director and staff, because no one. To move toward the same direction, everyone comes in thinking is necessary standards. The reference in the Toyota Production System is "production smoothing" is.

2-3-1 leveling production

Mean field generally occurs when the flow of waste products Paparakkuhodo Baratsuke better. It is to be prepared according to the Beak equipment needed to produce other human stock.

Various elements, because peaks are always more prepared.

Therefore, if you build a case out of step process that any waste generated or, decreased efficiency, it's that stopping the problem, before and after the process, affecting particularly significant front-end.

To explain the obvious example, that the efficiency of the process in their own final assembly line today, sedan, hardtop tomorrow, the day after tomorrow, but what if you sink like a van.

The line is doing the work of front-end sedan, has stepped into a job today, the top line of hard parts, each tomorrow, there is no work until the day after tomorrow. Stock with no choice, as there is work to reschedule every day, coming in at least three times if the average

assembly line is crossed every day that requires four times the stock.

None of this is unexpected and improved efficiency. The production of meaning is that this leveling. The equalization system, and variations in the type of goods, in addition to that amount without the Paratsuki, carrying lots of small, variability, including eliminating.

2-3-2 small-lot production

Automobile manufacturing process, there are many processes through to final assembly and welding, painting, assembly and intermediate processing machinery castings forging press and rough shapes. To encompass all these processes, where we can do to achieve equalization is nothing more than that far Uruka improve overall plant efficiency.

In particular, the casting (die casting), forging press heat treatment process, the lot has a compulsion to produce, despite the leveling process must put the most power, traditionally treated as separate issues We have many cases.

That is, batch production parts SPH (output per hour) or, as is too obsessed with working hours arrangements, to increase the lot, as if to lead to greater efficiencies, which were judged.

As mentioned before, increasing the batch process before and after the (non-batch production process in this case), confusing, and that is causing a lot of waste and excess inventory.

Thus, in batch production parts, even more so, a lot smaller, and we must strive for leveling production.

Improved efficiency in eliminating waste Section 3

Useless waste of capacity 3-1

When I had once said that Section 1 Section 2, is as follows.

(B) Improving the efficiency is tied to meaningful cost reductions first. So, just how little human or invent what you need, we must have a direction.

(B) workers each person to efficiency, line gathered it, and even with on the eyes of the whole plant to the center line, made to improve efficiency at each step, the results as a whole over the Such views go up, the idea should be pursued.

Then, more obvious, what can I do about what, exactly, I would like in this section.

Now, let's take for example a line.

This line of products is building 10 100 per day. Given this situation based on the ability of this line is 100 per day, per capita productivity is 10 / 1 is.

However, if we try to observe this line will be Komakaku workers, or have pending or have too much hand-building, or find the time and day to day variations.

Artificial man-hours were reduced to two to improve it. In this case, seems to have increased capacity compared to the previous new. (It can be cut to 125 a day two, or seems to increase the capacity of 25 minutes), but the ability to build 125 co day before had really is. 25-minute capacity, however, was only building and is wasted by too much unnecessary work. In other words, pretty useless because they were included, 100 in 10 / 造Renakatta but only a few days, it is reasonable to think that. Even at the individual worker, but found the entire line, only what we really need work, waste and if you think otherwise, this relationship is as follows.

Current capacity = work + waste (work = work + waste)

Omit the waste where the job just that much Fuyase Pafuyasuhodo ability of the present "real power" (100% true if work ability is called) to

come up. If so, will allow more products in the same line configuration.

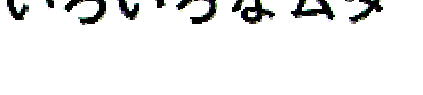
However, the building should not only be a few. So what is to be commensurate with the ability to just too much to reduce the number of people. This is for one person to work for line, and exactly the same for the entire plant.

For every one person working, value-added work and to cause, just squeezed into the absolutely necessary work associated with it, and eliminate waste like all other. Line for the efficient allocation of work order these improvements will eliminate half the effort. Moreover, the entire plant, the entire balance of the center line of these lots as small as possible, to avoid causing extra handling and production leveling be done. At the same time, and we will improve and increase the effort to eliminate the multiple direct such inspections hands defective.

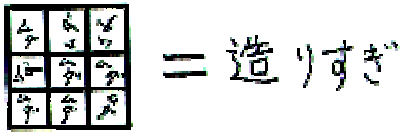
Hopefully these things are being done, gradually eliminating waste, factory line workers and even this amount would be able to work. That is, the ability to come appeared he was hiding. If Okonae effort to reduce this time, the efficiency as described in Section 3, Chapter 1 up.

And we get this way, improve the efficiency that is, after all, is to eliminate waste, understand that.

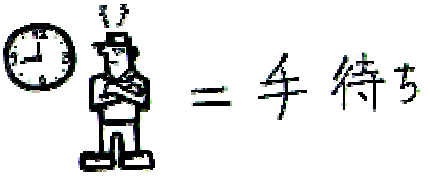
Thorough elimination of waste is the most basic foundation of our Okonawane it should.



Waste types 3-2



We, as we progress in our efforts to reduce man-hours, and give what is called typical waste, which the following four social identity.



(1) waste of making too much

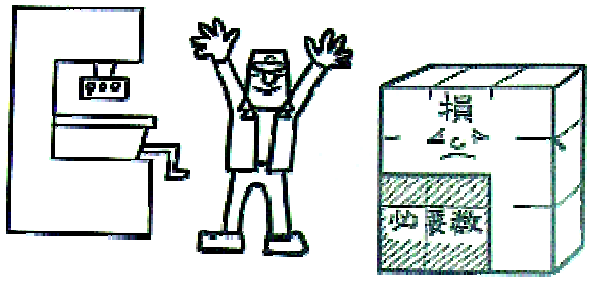
(2) waste of waiting for the hand (3) waste transportation (4) waste of processing itself

Following describes each.

3-2-1 making too much waste

Waste is to happen to build something extra too. Too much waste in this building, if normal, resulting from too few cases, progress of work. It should be a waiting time of the original hand, would do the following tasks. For example, between workers and workers, and lowering a bridge piling or stacking as seen in step with a step, they are making a wasted effort on the cause. In addition, transportation costs, interest costs and the replacement of large warehouse worker eating waste materials where expansion of the machine is making too much waste in the process not only their own, causing even more waste of invaluable is the illusion that they even if they work itself.

Structure cause too much waste, there are many other. For example, (b) Give space to work or if there is a waiting hand, if more work is needed to progress this time, (b) machinery (equipment), the ability of

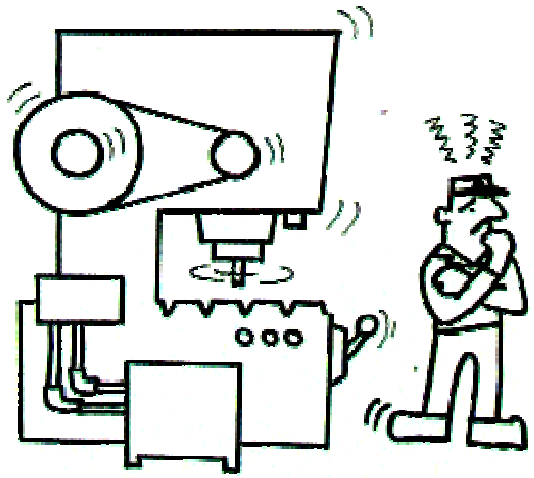


Just because there is room, when you catch up on building, (c) SPH (output per hour), so that purely increase, if they ignore the efficiency of the whole, (d) utilization because expensive machines Depreciation and can not raise, and if possible have a mistaken idea.

3-2-2 waiting to get wasted

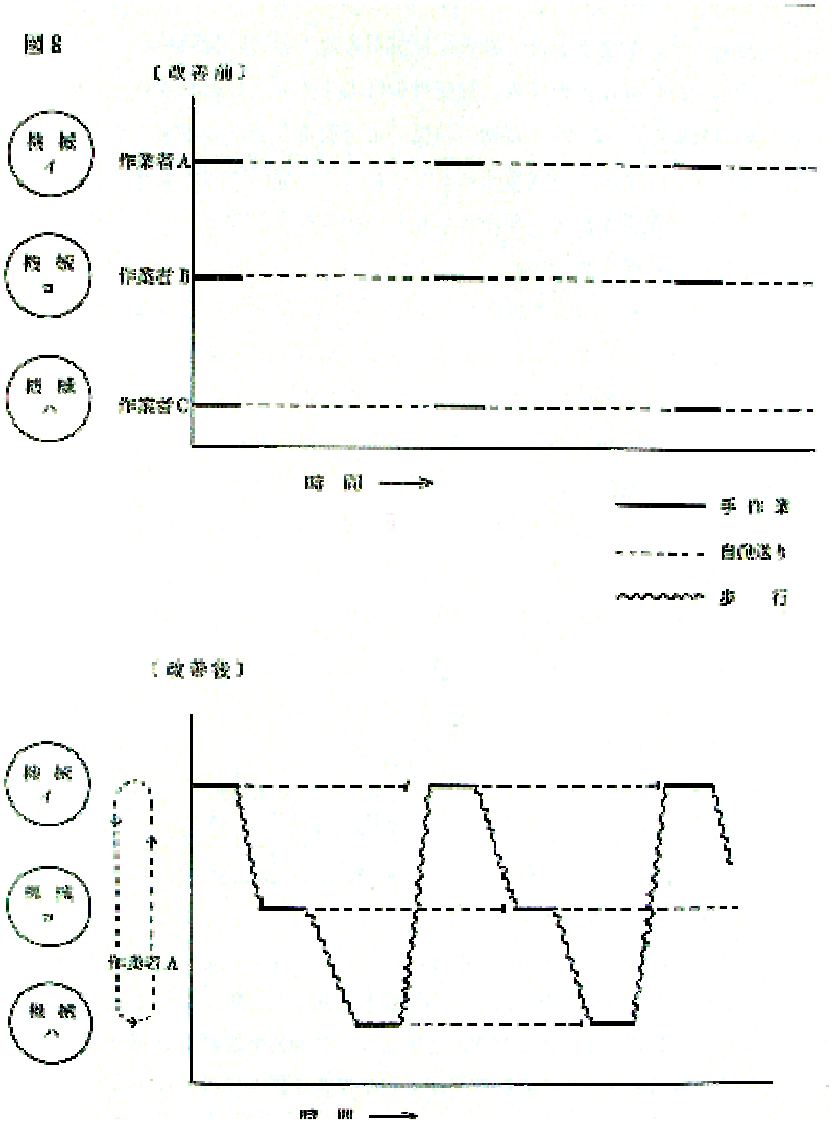
While the machine is automatically processed, and whether the machine has a guard standing just around the machine they want to work but is that because of the prohibitive waste arising.

For example, as shown in Figure 4, before improvement (b), (b), (c) Each worker was attached to each machine. While working machine that processes these workers just standing idly by, but not even want to work. Therefore we have generated is wasted waiting for the hand.



We wait to eliminate this kind of waste, the operator A in order to get the automatic feed operation of the three machines.

That is, worker A is attached to the material for the machine, pressing machine from the start switch (b) to move. Machine (b) to set the starting material. Then the machine (c) go to (a), (b) as well as machinery (c) Set the machine will activate the material (a) Return to. A machine operator (b) when returned to machine (b) will have completed the work, worker A can get started working immediately. In other words, waste is not generated waiting hands.

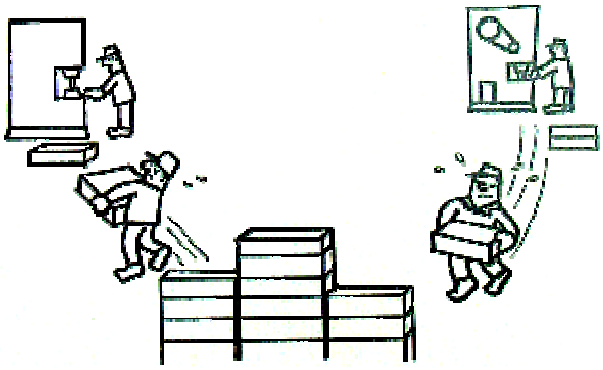


Thus, by eliminating the waste of waiting hand, can cut two workers. Also, air movement, "work" but also so that movement in Deshinaku would consider putting into this. (For a combination of work, detailed in Chapter 3 standard work)

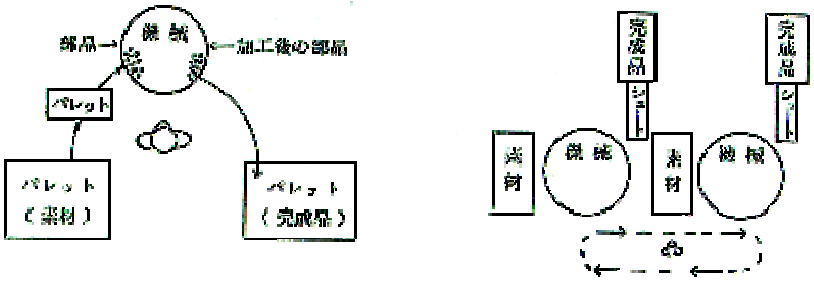
3-2-3: waste transport

Waste and carrying it away than necessary transportation, temporary or provisional place is that the waste

produced for transshipment and movement.



To eliminate the waste of transportation, (b) the shortest distance transport. (B) is considered a temporary provisional rid the place. Should I give one example, traditional palette large parts maple transferred to the palette a little on the machine even (on the bed of the lathe) and a place temporarily many times, and had be done processing, pallet By creating improved, to eliminate these temporary place (elimination of waste transportation), which was to be able to operate two machines one worker.



Also, from the factory warehouse into the factory machinery, and has been repeated many times to move the hands of workers and 積替E from the machine, transporting waste will be safe to say as well.

3-2-4 waste processing itself

For example, because of the lack of a guide pin jig, and moral support to work with your left hand tool, it does not go smoothly for the processing of goods that are spending unnecessary time. This is a waste of processing itself. As if these improvements, it is important to repair the fixture as soon as possible.

3-3 is the first step in finding efficient waste

Central to the concept of the Toyota production system, eliminating

waste that is not mentioned, and the waste is divided into four separate paragraph with a large Zabbani. And consider each of these four waste and straightforward, it is wasteful and confusing.

Regular basis, which let managers and supervisors have to waste a few people and thinking. I think that most or even necessary in many cases can Wakaranakatsu.

I waste too much Shiteyarou eliminate, as it was in the waste do not know what is not working well as eliminate waste. Therefore, it is important not to waste anyone's eye is wasted, and that clearly indicates that.

The first step to improve this efficiency. The most obvious during the preceding four are awaiting hand.

For example, the waiting hands of one minute 生Zure in tact every three minutes, as well as the supervisor there, shows that senior managers can afford all that work himself.

However, it can be a bit confusing, as movements Mawa one minute of this job. (Waste handling, waste processing), Moreover, the following items will be processed in one minute, the waste will not know whether anyone at all. (Building waste too) So, four waste need to replace all the waiting hands. If this measure is relatively easy to get.

For this purpose, (b) help set a firm standard work, otherwise you do not. (B) to regulate too much. Kanban method of production. (C) specify the work area and conveyor line, is considered as a way to stop 手Gakeru early. ,

These explanations as to other chapters give important thing here is to eliminate waste is to be fully aware that the first discovery waste. Then, as the waste is easy to find, is to constantly improve the site. One by one it may be fine. For example, the time would sometimes be a problem during processing single stock. However, cost reduction has led to more → All these efficiencies, not the only one, and why he's had

done, it is important to have a question. Can sometimes be a clue that this is better, because quite conceivable.

In this section, above, and improve efficiency, said that the conduct by eliminating waste. How to identify waste, but there seems to be yet another way, even some waste, in essence, is to replace the waste of effort to get easier to find all waiting. Repeatedly emphasized that this is the first step in improving efficiency.

Chapter 3 standard operation

Section 1 standard operation

Standard tasks 1-1

Our equipment, machinery alignment, the study of processing methods, like the Ku 働化 self improvement tool metallurgical worker, due to optimization of study and work in process on hand to transport, we first completely eliminate waste, and error proofing In addition to the wisdom of the field and prevent the recurrence of defects have been diligently working to efficient production.

Being the scene and to increase production efficiency, will require further improvement becomes a cornerstone. It has become a standard work.

The standard work, consider the conditions for carrying out the efficient production, goods and people and machines, it is necessary to combine the most effective.

We, the process of combining the "combined operation" and called, and the aggregated results of the standard work for this combination.

Standard work is presented at each workplace viewing as a standard operation sheet plant, and work instruction for the first time when a new worker. In addition, older workers are familiar with its work, will also stop such standards do not work out. Bud and make out better the next disabled when working on more standard operation sheet is to be made and work instruction manual is a new standard operation sheet.

The administrator so have been posted standard operation sheet and instruction, whether or not you are working right worker, or whether there are deficiencies in work instruction manual, so at a glance that such has.

That work to protect and guarantee the quality standard, can be said that determining the amount of costs. However, once you have

determined the standard work, keep in confidence and should not be neglected.

Standard work is always alive, which contains a lot of room for improvement. I believe progress is not absolutely perfect, which runs counter to the creative spirit of Toyota.

Standard work and work standard 1-2

The standard work, but is easily identified with standard work and work and work standard is separate standard.

Working standard, a standard means for performing various standard tasks.

For example, the other type of coolant temperature and time when the heat treatment process for material, and cutting material size and shape cutting-byte format when machining, cutting oil and other necessary building quality to burst, is determined as the standard work on the economic conditions. This is a standard work.

In contrast, the standard work, to build a standard product that is similar, and even out of nothing 成Ritatanai There are three standard handheld work order cycle time. Safe, good product, cheap to build, that I must work Shitagawane is of course standard. The cycle times are coming where this is a major feature of the standard work, work is also different from the standard.

One other feature of our work is that the next standard. In other words, the standard working party members in general who is a third technique, IE seems to have created work based on the results measured using the method. However, we have created is that the main boss himself.

That is, what standards and self-appointed boss is a standard for enforcing the teaching workers.

Of course, standard operating boss at the proper speed, you must show great Dekine for workers. And the speed is certainly fast and fair third party, must be found.

This standard work, such as machinery and people to build a number of things that needed to produce, would be determined by a combination of the economy.

Standard work and 1-3 supervisor

The director is always on site workers, "the standard work, which must keep" it must strive to create ambience.

Enforcing standards to work from a director's job, but that abide by the standard operation, to meet quality objectives, moreover, can lead to an inexpensive product to produce safe, workers must understand people.

The director is responsible for processes in the field was left to me, we've created a standard work of knowing the most common, of course, and should be able to do yourself, your subordinates, letting it work this way, it is important to have the will to be included.

And what has been done to ensure that standard work, poor conditions and investigate the tricky point might have to really comprehend enough.

The standard work alive, and always incomplete, which always has the task to be 作Rikae. Even supervisors set a standard work, workers and the general compliance with it, In order to improve progress to each other in mind improving always work, based on its improvement, it is important that we repeat the revised standard operation There.

The standard operation sheet revisions are not done, supervisors at work forever Purasagatteiru for improvement "lame duck" which would like to prove myself and from.

The supervisor, says that to protect me and pleas are often subordinate to the standard operation, in order to protect his people, when you create a standard work, work that is working in the field know best who will participate and is also important to give opinions.

By doing so, they made their own standard work is one strategy that can enhance a sense.

In any event, the implementation of standard work is to protect the work standard is to improve the revised standard work.
If compliance with standard work, work if you find something wrong, you can easily pursue the cause, and you can find clues to the whereabouts of improvement and problems.

Supervisor, as one of the factors which influence the quality, never forget that there have to be a standard work.
The standard form of the various documents mentioned in this chapter as an example, what is picked mainly used in the main plant. Slightly different depending on each plant seems to have. But I think basically the common. Each plant is a standard form should I use a style for each part.

Section 2 Creating a standard operation

2-1 three elements of standard work

Note that the standard process for preparing a "standard set themselves to their supervisors," is that. Therefore, the boss who is the director and leader must understand the three most important factors in the standard work.

The three elements of standard work and cycle time, ①, work order ②, is that the standard hand ④. One of them even lack the work of the 成Ritatanai standard.

2-1-1 cycle time

That cycle time is one minute or one pieces, and they must do with the timing of certain, at that time, this is what invariably comes up time and the production quantity.

To determine the cycle time is divided by the quantity of working days per month should seek the required quantity per day, derived from the daily working time.

The required number of months required daily quantity = 1 ÷ working days

Cycle-time required number of operating hours per day ÷

(Note) working hours per day, if there are differences in the number of allocated time is calculated directly.

And cycle time is fixed, the amount of work of each person to decide to work in that time, in this case, the general operation of such a study, which is a percentage of the time, especially 見込Manai.

The early work in this case will set a standard of proficiency and their own boss. That is, when that person can do for new boss at the same time, the public was not one.

However, cycle time and try to determine these individual differences emerge by building people. From that time no one expects And see who understand even if there is waste, which will help improve it.

That is, when the protruding slightly from the cycle time, if any improvement, I can push in the cycle time, which gives a better clue before.

Work Order 2-1-2

Work order that, if a worker objects to process, gradually changing in

the course materials and products, carrying goods, machinery installed, and then remove or, with time and work the order which will, in the order means the product will not flow.

If it is not clear and this work order, I accidentally working order according to each person their own way, even by the people, and work even if the same people, different order each time they often.

The Failure to do this sequence, then the process flows to forget those mistakes, and installation process, or damage to machinery or to stop assembling line, the worst case they will be recalled out of a car.

Meanwhile, work order, work when creating a standard, so as not to waste Mlamli, concrete understanding of the situation, namely, the division should be made to quantify precisely. For example, to clarify the position of the leg work and catching people using both hands to convince the workers, it must be standardized.

And "I have been working this way," that clearly manifests the will of the people who created the standard, resulting in safe, good things should be working order as soon as possible can have confidence.

2-1-3 standard hand

Standard hand and, to continue to work, only that it is good that it should work in process in the process, including those Teiu is attached to the machine.

Standard hand-held, by way of placement machines, and the determination of the order will change the work on the proceeding, the texture and hold work pieces without any WIP anywhere and everywhere, that Kimatsu come from.

Standard hand-held, generally, even the same machine placement, if the conduct of the process along by cutting the work is only good if 取Ri付Ita each machine, while the processes have on hand. However, if

the process is working in reverse order, one by one during each process (when the two are connected by two) is needed on hand.

Standard hand-held, or many pieces must be about where to check the quality of work or can not fall below a certain temperature and that, so if you need something to cut the pieces to work with oil is the minutes will be included.

Ability to create different parts of the table 2-2

To create a standard operation, each process first, the ability to fill the table by component parts for production capacity.

This component has a different capacity in the table, and processing capacity to fill the number of times the base times number of machine cutting tool replacement process sequence step names.

Capacity table by component, to create a standard work, which is important from a combination of baseline to work.

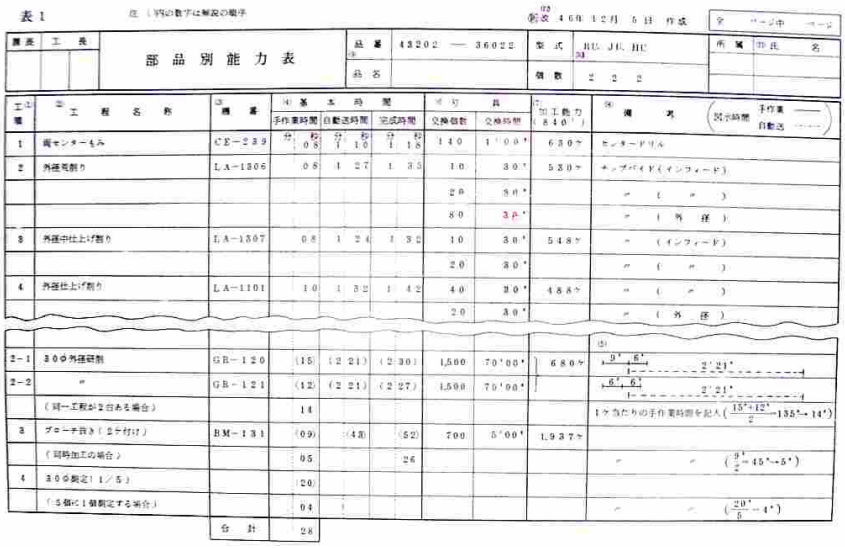


表 1

部 品 別 能 力 表

工順	工程名称	機番	基本時間 手作業時間	基本時間 自動送時間	基本時間 完成時間	刃具 交換個数	刃具 交換時間	加工能力 (840')	備考
1	両センターもみ	CE-239	0.8	1.10	1.18	140	1°00'	630ヶ	センタードリル
2	外径荒削り	LA-1306	0.8	1.27	1.35	10	30'	530ヶ	チップバイト(インフィード)
						20	30'		〃 (〃)
						80	3F'		〃 (外 径)
3	外径中仕上げ削り	LA-1307	0.8	1.24	1.32	10	30'	548ヶ	〃 (インフィード)
						20	30'		〃 (〃)
4	外径仕上げ削り	LA-1101	1.0	1.32	1.42	40	30'	488ヶ	〃 (〃)
						20	30'		〃 (外 径)
2-1	30φ外径研削	GR-120	(15)	(2.21)	(2.30)	1,500	70'00'	680ヶ	$\frac{9' \quad 6'}{1 \quad 2'21'}$
2-2	〃	GR-121	(12)	(2.21)	(2.27)	1,500	70'00'		$\frac{6' \quad 6'}{1 \quad 2'21'}$
	(同一工程が2台ある場合)		14						1ケ当たりの手作業時間を記入 $(\frac{15'+12'}{2}=13.5'\rightarrow 14')$
3	プローチ削り(2ヶ付け)	BM-131	(09)	(43)	(52)	700	5'00'	1,937ヶ	
	(同時加工の場合)		05		26				〃 〃 $(\frac{9'}{2}=4.5'\rightarrow 5')$
4	30φ測定(1/5)		(20)						
	(5箇所1個測定する場合)		04						〃 〃 $(\frac{20'}{5}=4')$
		合計	28						

Next, how to fill in these forms.

Ability to form different parts ordering table

(1) that the order will be processed according to the process by industrial parts, and write ... 1.2.3.

(2) Name of the process components will be processed the process name, fill in chips as well as conduct inspections once paid several times, filling out along the frequency.

(Note) ① In the process, if two or more machines in the same process, fill out separately.

If you like Odori Odori 3 2 1 ② is the machines, and fill with three Dzuke Dzuke 2.

(3) the number of machines that channel number, CE-239, LA-1306, MI-865, write and.

(Note) If there are two or more machines on the same step ①, fill out the Maple line.

(4) automated feeding time hour hand time base, to fill three hours of completion. The total time field Basic hand the amount of time to fill.

(B) removal of work from hand time machine, install and put the feeding time, walking hand-made by the fill time workers are excluded.

(B) the time required to fill the time machine to process the automatic feed work.

(Note) ① In the case of machining, the automatic return to fill out automatically, including fast-forward.

Automatic lubrication equipment and machinery assembled nut runner type automatic welding machine press establishment ② The time to complete tasks to complete each objective from the start button.

(C) completion time machine (or process), the one (two when the two Odori) in the time required to complete the parts, in general, hand-hour automatic feed plus the time that would, in fact, the original and three at the time described the following illustration, one of these, or will a combination of three.

To fill the time ① parts per hour to fill in the basic general care.

Each Odori 2 ②, such as when three Odori is the time to fill out the brackets.

The same process ③, form completion time when using more than one machine to another machine is performing, the average completion time as the process does not ask.

④ time to fill out the timing of certain binary and 60.

⑤ The total field form, Odori two, three or Odori, if two or more machines using the same process, or chips and conduct inspections once paid several times the one used to fill time per hand.

(D) The line shows the relationship between time automated manual transmission Ri hour completion time indicated time, manual time solid (——), and dashed the automatic feeding time (... ...) shown in.

(Eg) three basic types of hand 30 hours ", 1 hour automatic feed 'case

(B)┤ ——├... ... ... |

30 "1 'after Chuck, press the start button a worker, which then automatically feed through machine processing, in this case completion time of 1'30" is.

30 "

(B)┤ ——├

| ... ... |

1 '

Such as rotary milling machine type index, where the work has been mounting in the other fixture, while the feed is automatically cut in, if you allow desorption of the work other fixtures in this case completion time of 1 '.

20 "10"

(C)┤ ┼—├

| ... ... |

1 '

In working with the grinder, desorption of work (20 ") and a surface finish of the work to cover the next wheel (10") in such cases, when the completion time is 1'20 "is.

(Note) need not fill in all the remarks ①, which have not shown, or automated manual transmission time ② Ri may only meaningful way illustrated (many seconds anyway) to fill out.

(6) cutting tool cutting tool field, a complete replacement cutting tool change time and number.

(B) After processing 取Ri替Ene as many pieces of stone cutting tools cutting tool replacement does not indicate the number or not, fill each wheel cutter.

(B) that the time required to replace one wheel cutting tool and cutting tool replacement each time, minimum time to fill.

(7) processing capability

The number can be scheduled in during the day, call completion time divided by uptime.

General formula and,

Processing capacity = (uptime - total time of cutting tool replacement) / completion time

(Note) ① The number of decimal places rounded down.

When two or more machines in the same process ② is calculated separately, write the number in each stat.

(8) Special Remarks fill.

(Eg) basic illustration of the time, and the type of bytes.

(9) Fill in Name No. Name No. of parts machining.

(10) the number and type of vehicles using the number type used to fill each type.

(11) enter the code number of the group member relations department name, the author field name (the name of both direct boss) of your name.

(12) Date created when creating a new "new" mark ○ enclose, or revised existing ones is "improved" around the mark ○. And dating.
(Note) ① is partially correct, and correct to append the part in red. The item is no longer needed to kill the red line, who conducted the correction to seal the point, you'll Pi, dating it.

Combination with standard work combination 2-3 vote

Fill out the production capacity to the table skills by parts from the working time and the number required per day next indexing cycle time, decide whether we are working in what order the operators of each person at that time . In that case, if the simple skills can make a different component from the table directly. However, it will be a little complicated, in the middle of the order texture will work, this machine would not know whether the automatic feed is over already.

So to be able to look at this temporal course, on the rock as a tool for work order "standard work combination ticket" is in use.

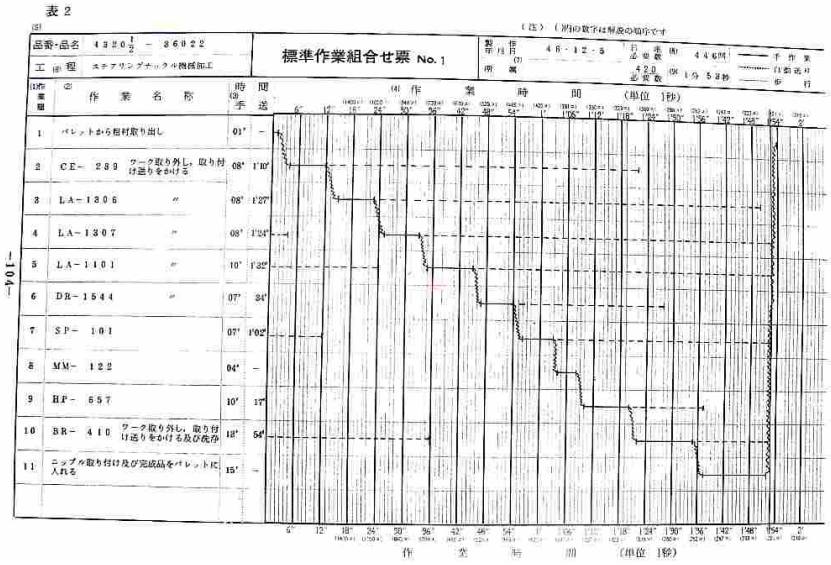
The standard work combination ticket is supposed to fill out your work and work by work.

The work space is located and the scale of a second, two minutes a piece (13 minutes by the media) have been able to complete work.

More than 2 minutes of work, or work on something that many items can be added if filming in one vertical and the horizontal line.

How to fill a standard work combination 2-3-1 vote

表 2



Next, a combination ticket covers the standard operation.

(1) the order of work will be done by working with a number representing ... 1.2.3.

(2) represents the channel number and name of the contents of the manual work.

(Note) as small as possible to keep each unit ①.

The two machines Odori 1 ②, if you like the three Odori map their two, three Dzuke marked as such.

(Example) (b) SP-377 make a feeding installation work removing.

(Dzuke 2)

(B) Pi cap and fit it into your parent metal cylinder block.

(3) Time (Ri automated manual transmission)

Automatic manual feed time to fill out another part of the table skills.

(4) hours solid work manual, automatic feeding time represented by dashed lines. Walking time to move to the next machine is represented by wavy lines.

(5) Name according to the table skills parts by part number, part number, part number represents a process component.

(6) working under the name fill out a standard work about the

combination of Engineering, representing the name of the overall process.

(7) date and production date a member of this new questionnaire, representing a set of code division clerk author's affiliation.

(8) Nissan required number
The quantity required per month, representing the number of operating days divided by quantity.

(9) cycle time (420 / number required)
Divided by the number representing the time required for daily working time of the day.

Above, explains the contents of the votes were combined standard work, and then vote to how to fill this standard work combination.

(1) Write cycle time.
This part is what you need each day, from that, calculate and fill in a few seconds or many minutes should 造Rane 1.

(2) draw a red line cycle time.
Standard work combination of votes, draw red lines on time scales of work cycle time.

(3) per person pull a range of processes.
The red line shows the cycle time, total time roughly equal to manual labor, and other parts required skills in order from the table (it adds a bit of time walking, and enjoined it), to which area of approximately Can you pull a person in charge of the process.

(4) summarize the contents of the manual.
Name field work together to fill the contents of one line for each hand.

(5) hours to fill the time field.
Try your hand time to time table automatic feed capacity by parts, posting a combined vote of the standard work hours field.

(Note) In this entry. Skills base of the table by the time component of the three basic types mentioned above (b) (c) like the time to understand the relationship between the manual completion automatic feed had better illustrates It is convenient to combine's plans.

(6) Fill in the first hours of work.

Work in order to draw the head, to fill the first work, completed in time for a solid hand, if you have time to write in dashed automatic feed.

(7), pull a second operation.

Where do you think of the second order work. Usually will work just below.

While they are away from the machine, if it takes 3 seconds to walk, to fill in the middle of the field angle ray the next step hand finish just three seconds from the beginning.

And thus, in order to continue the next step.

(Note) If it is divided into two work machines in one, yet, or if that is doing a separate task, and in Dzuke two processes almost as Dzuke one part If you have. In this case, from the finished work of the two, or you would move to the next process after repeated twice to process Dzuke one, working one (minute or 1) automatic feed of Only time will wait for the hand.

If so, we dashed into the end of the automatic feed or watching the time.

And if you run into going back to the dash, auto-feed machines in yet, which show that the waiting hands, it will seek a further order under the next section.

(8) determine the combination of work approved.

When we process the order and texture after another, what Tsukiataru'm drawn to the first red dashed line automatic feed. In this case, just draw a short dash from the starting position of the automatic feed. This is to see whether the combination is approved. If you run into a solid manual before filling out this dashed line, this combination will not be approved.

(9) examine the relationship between cycle time and planned scope of

work.

Owattara illustrates the process expected to hand up first, to recover the initial field work. And drawn a red line that went back to the first point, find out what that relationship.

(10) to see if the proper effort.

If the match went back and just point the red line is a suitable combination.

If any such work before the end of the red line, from which a small amount of work to consider what if in another machines.

Conversely, if the red line would overflow, would be reduced only do Excess minutes, try again gathering for review and individual work.

For example, the position of shelter materials and tools as appropriate crude would better position to work or study and would have been easy to work placement.

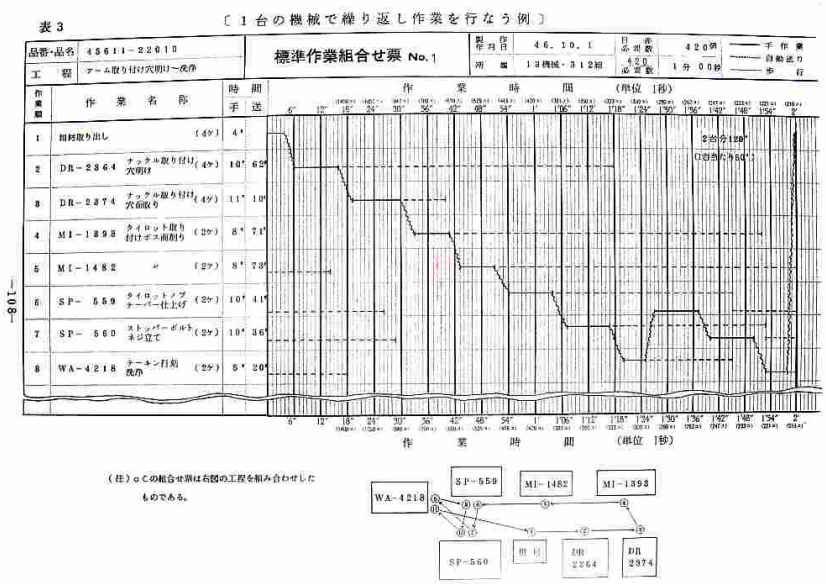
In addition, the spacing of the machine or not too far away, one somewhere and I can not work out the process automatically, continue to pursue improvements.

've Reduced the number to one with the machine briefly, it will kill the buds of long-awaited improvements.

(11) to fill the work order.

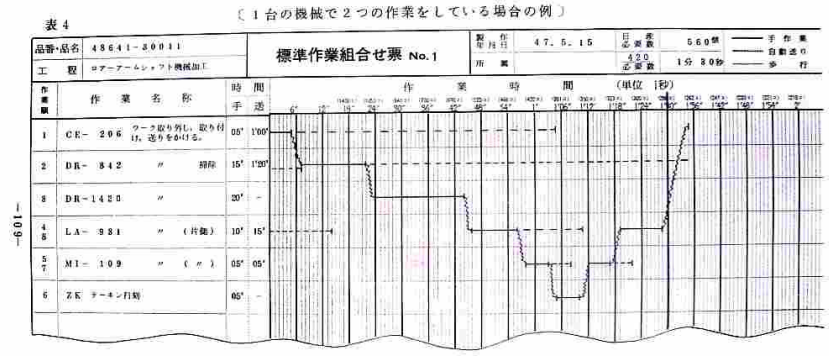
After the combination, was shown on the last work order number to the shelves according to work order to fill ... and 1.2.3.

表３　〔１台の機械で繰り返し作業を行なう例〕



〔１台の機械で２つの作業をしている場合の例〕

表４



（注）○第２工程のＤＲ－８４２の時間は、サイクル・タイム（１'３０"）より５秒超過する。
したがって、このままでは、時間内に必要数を生産することができないので、ワークの取り付け、取り外しおよび送り時間のいずれかで、短縮するような改善をする必要がある。
○改善により１'３０"以内に短縮するまでは、とりあえず不足分を時間外作業でカバーする。

表５　〔自動機の例〕

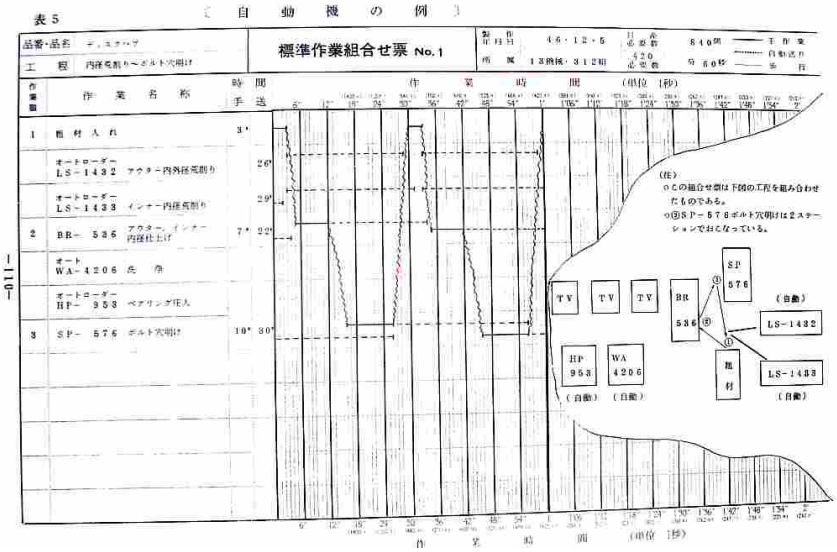
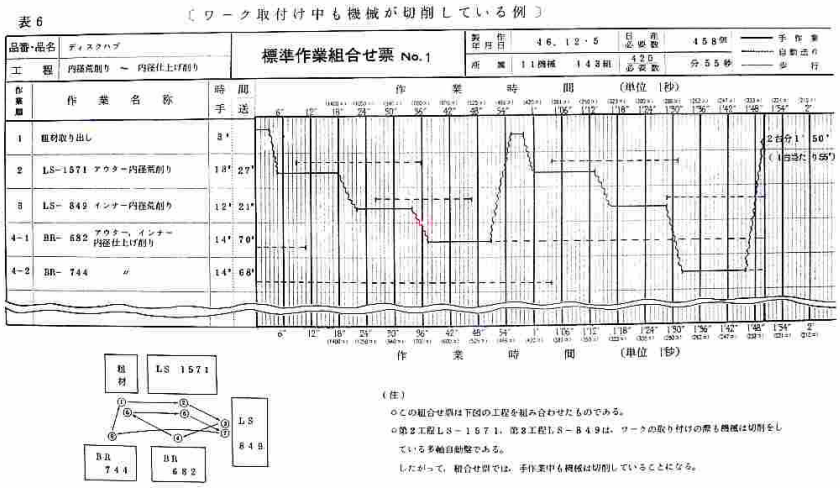


表６　〔ワーク取付け中も機械が切削している例〕



Created this way, the standard work combination ticket, try to work it myself. And, in that order, see if you can work on the cycle time.

Vote as a combination, as they become better luck, all you want workers, their work TWI "teaching work" (JI) to leverage, it is important that we teach effectively in today.

2-4 The combination of skills and work equipment

Even the parts that make up every car is finished by the hands of many people. It is obvious, one engine, one mission, and as one body, the parts and if they have one minute, the car can be a fine one.

For example, four-cylinder engine, the block 1 1 - 1 - camshaft crankshaft - connecting rod 04 - which consists of four components such as pistons. By the way, temporarily, causing the cylinder block machining line failure, and stopped trying to block production.

At this time, other people crankshaft machining line, or what will move.

Isn `t continue to produce each part, and only at this time.

The shelter was textured, the texture is good to count, and let me in many processed one, bring a box from somewhere in the pickup box, "the dwarf Fueta hand in Oita, with this feeling of relief ... "something like that would not be happy with either.

The one car, and when it is assembled on the assembly line, in which the to be assembled if only in parts - one to configure the car, 2 car, even put something or more not necessary at a time. This is not something to contribute to producing anything, just wish people to be divided to the following car assembly line ... is that the only reassure.

What you need, when you need it, they just as necessary. In other words, from the assembly line is crossed going in one by one, according to the timing, you have to do is gather enough parts for one vehicle.

Then after another goes well this time, even 100 units a day in 1000, is a well assembled. Parts of the supply conveyor hanger is that these means.

When you use other transport equipment, the box of parts, or that it was too uneconomical to transport one minute each, several or a single

transport units Rainsaidohe luck dozens potatoes may be placed.

In response to such transport, before the process will be producing parts do I need only.

Line 2-4-1 formation

Next, consider the relationship between plant capacity.

Capacity of equipment is prepared for production, production quantities commensurate with facility capacity is most desirable. However, the number is market demand is fluctuating, the prediction is very difficult, and in most cases, greater ability to do the required number of production facilities or small in either There.

Responsive to fluctuations in demand, production capacity is preferred over some slight.

Many plants, are often possible to have the capacity to plan production capacity.

If you keep up with growing demand for power equipment, or if you can not demonstrate the expected machine capacity, the economic and other reasons, which arise even if the number is less need for equipment capable of producing be.

In summary, these results are as follows.

(B) If a higher production capacity than the number required if the facility is larger than the number of production facilities necessary skills, appropriate to consider the use of production facilities required to be a combination of the waste is not staffing There.

(B) A large number of producers need more production capacity for large number of producers need more capacity in the process become a bottleneck, especially with considering the means of upskilling, mainly to make running the full facilities of this process it becomes necessary

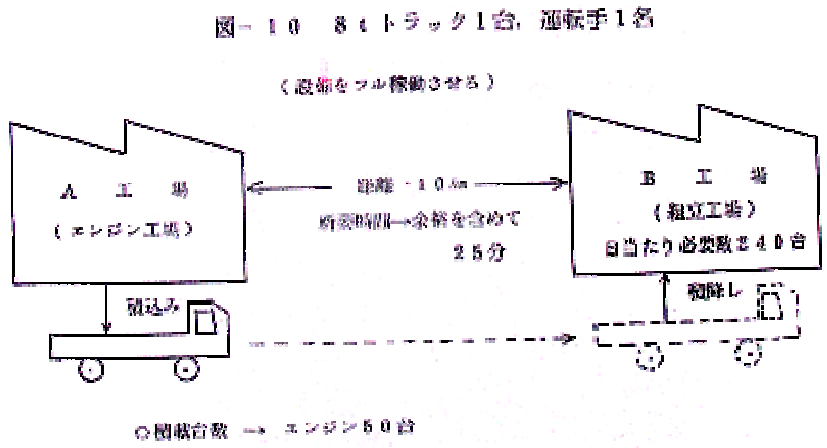
to combine with the staffing.

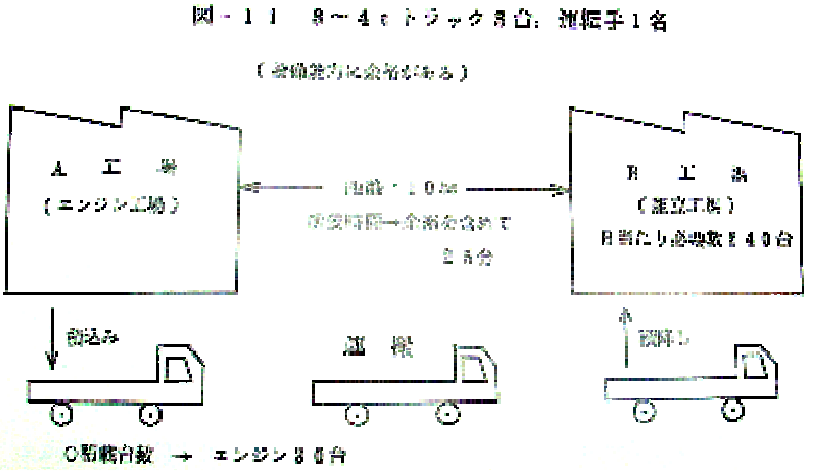
The following example of a transport truck in ○, the assumption that machinery and equipment if there is room and I see the relationship between the number required if no effort.

In some plants, 3 ~ 4t be done to transport the engine was in one car, and that lack of ability with increasing production volume, 8t per car (293 yen) or better to carry on, 3 ~ 4t car (one ¥ 135.4 million) compared to the case of two or more 増車 be better to be as follows.

Figure 50 -10,8 t 240 from the loading capacity of 240 units required per car per day if required = 4.8 units + 50 5 ≒ car trip.

Figure -10 8t truck, one driver (the facility to full operation)





Minutes travel time - 25 × 2 (round trip) × 05 = 分Tonaru 250 cars.

Product down the loading time - (day)

(A) If you let down product in one driver, 45 '× 2 (loading, grated area) × 240 = I 360 (b) in each plant, down the product driver with grated

product of one each When you or, 30 '× 2 (loading, grated area) × 240-minute 240 (c) you grated product driver with grated product of two each each plant, 20' × 2 (loading, grated product) × 240 = 160 分Tonaru.

Therefore, the time required to carry the day,

(A) If the running time of 250 minutes + 360 minutes 610 minutes time-grated product loading

(B) If the running time of 250 minutes + 240 minutes = minutes time down loading area 490 (c) case, 250 minutes + 160 minutes running time down at the Orchid product loading = 410 minutes

Nearby vehicles because there is only one (I can not afford to plant capacity), and time should be shortened as much as possible down the loading area (to full production capacity must 動Kakinakere) (c) If you take and loading the product they are down two people each, it will take time 410 minutes.

Figure -11 3 ~ 4t day when the required number of three-car units 240 +30 8 car will be 08 round trip.

Running time - minutes, 25 × 2 (round trip) × 08 = 分Tonari 400 vehicles, down where the loading area, car is put in each one at a time, so that one driver running in relay, one plant by the loading of one, the plant towards the other person down the product of one during the travel time (between 50 to return) loading with a spare, so you can make a grated area, minutes round trip 8 You can finish working on the 400-minute running time.

Straw is, the

Vehicle purchase price per car - 8t (million yen 293) -3 ~ 4t two cars (¥ 270.8 million) = 22.2 million yen to working time, 410 min -400 min = 10 minutes / shortening Sun - 2 lifts and drop down and two persons required for loading the product down, 3 ~ 4t is superior to three cars.

Another 2-4-2 combination of work

Mentioned in Chapter 2 is 2-2-2 in helping each other, the combination of work, so they can have better combined linkage between each

process.

That is, those without a permanent working properly the scope of each person, we charge a range of wraps, and teamwork to make a good combination.

For example, if a fixed scope of work of the individuals who work fast fast work of promoting their goods will be stacked in front of people who work late. As a result, people who work fast and produce waiting hands, who will work to slow the process after a defect caused Suhe Ryuu hurry. In addition, they determined by the number of producers who made slow work high.

Therefore, to avoid such shortcomings, we wrapped the scope of work of each person charge shall be easy to do state work. (Not swimming relay, the relay in athletics)

In order to change the condition tends to do the work, they too Hanare distance between workers is hard to be a partnership, shrunken intervals machines as possible, and to come together to work closer to each person, per insisted on a combination of machine placement capability, the need to avoid. (So-called "Kojima Hanare" available)

Such thinking is hopefully wrap scope, if the convenience of working with something if separated workers, or even If you get such as absenteeism, workers covered by both sides in time production is not even be reduced, by this time to stretch, which can ensure that one.

I like a lot of manual in line with the group, this effect is especially pronounced.

Section 3 Guidelines for preparation of work

Work instruction, 3-1

Instruction, work, work processing and assembling of parts replacement stage s cutting tool replacement machine operation, based

on scientific thinking, accurate, fast, easier, we decided to do the work procedures and safely as , which is written for each step.

In other words, the instruction sheet that includes the work of specific relevance to the specific goals are expressed and essential procedures to be followed. Therefore, the work instruction sheet in order to complete their work tasks, write instructions for performing a vital part of its work and for further clarity, and to include any details of your sketch.

Especially for the linchpin Avoid abstract words, as concrete as possible, they should write to quantify.

3-2 point to fill out work

How to fill out a work point.

(1) Fill in the name task name for work.
(Example) cutting tool replacement, assembly and setup.

(2) Fill in the name of the processing and assembling line line name.
(Example) RU knuckle machining line, 5R line and the engine assembled.

(3) ability to fill different parts in accordance with the table name, date created by engineering professor name, channel number step.

(4) NO
1.2.3 work procedures and write ....

(5) work procedures for work to proceed, ie, by filling out a work task for each element. If so, write complex expressions Avoid succinct representation possible.
Basically, the "noun + verb" led by the "what the people" will be called.
(Note) If you include measurement and gauges, to fill that.

(6) where someone lives suddenly, there are three conditions for

success or failure of security easier, accurate worker, a conscientious and safe to fill the key to quickly go to work yet.

The key point, the procedure "How To" I will do that.

(Note) The third condition is the key point, the following means.

Whether to work Deki上Gara success ①, influence or ruin what that is, those related to the success of things.

If safety work ②, behavior that could hurt.

To facilitate the work easier ③, ie, respiratory or intuition skill tips, and an extra bit of knowledge.

(7) in representation of the verbal sketch sneak operating procedures are often insufficient explanation because, to the mounting position of the work placement mechanical work tools required for the job and, clearly illustrated.

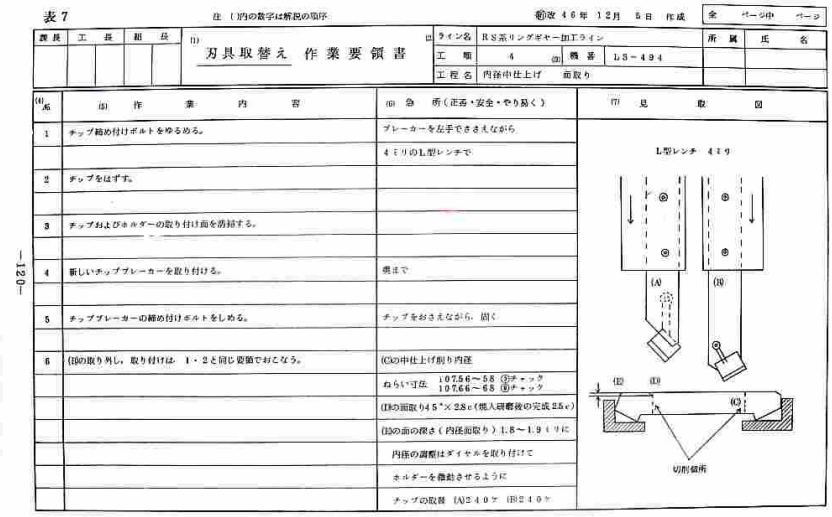


表 7

注（）内の数字は解説の順序

(改) 46年 12月 5日 作成

全 ページ中 ページ

課長	工長	組長	(1) 刃具取替え 作業要領書	ライン名	RS系リングギヤー加工ライン	所属	氏名
				工順 4 (2) 機番 LS－494			
				工程名 内径中仕上げ 面取り			

(4) No.	(3) 作業内容	(5) 急所（正否・安全・やり易く）	(7) 見取図
1	チップ締め付けボルトをゆるめる。	ブレーカーを左手でささえながら	L型レンチ 4ミリ
		4ミリのL型レンチで	
2	チップをはずす。		
3	チップおよびホルダーの取り付け面を清掃する。		
4	新しいチップブレーカーを取り付ける。	奥まで	
5	チップブレーカーの締め付けボルトをしめる。	チップをおさえながら、固く	
6	(1)の取り外し、取り付けは、1・2と同じ要領でおこなう。	(C)の中仕上げ刃り内径	
		ねらい寸法 107.56～58 ③チェック 107.66～68 ⑧チェック	
		(D)の面取り45°×2.8ミリ(焼入研磨後の完成2.5ミリ)	
		(B)の面の深さ（内径面取り）1.8～1.9ミリに	
		内径の調整はダイヤルを取り付けて	
		ホルダーを傷おさせるように	
		チップの取替 (A)240ケ (B)240ケ	

(A) (B) (B) (D) (C) 切削個所

Section 4 Creating a Work instruction

Instruction for 4-1 operation

Tutorial work, the union will vote to create work based on the capacity table by component. For each line, commensurate with the work of one person on production volume, according to the order which was clearly a vital part of safety and quality of work.

The tutorial work, illustrates the placement of one person working on the machine, a standard quality check stock in working order cycle time, where you fill out the conduct in any way. The key point is determining the criteria and also safe somewhere.

And with progress in our work and resources were directed to worker instruction shall be kept as soon as possible to ensure safe working.

Typically, the machine layout by filling out the form in this A3 size, safety and quality checks items to fill the net time the order cycle time standard work hand in it. And field machining line in its case it has assembled what is holding the line "standard operation sheet" is called.

"Work sheet" standard set forth by a supervisor that it will work this way, it will represent the will.

Supervisors are not many people have, and remember all the work given to each one of his followers is that very difficult. So "standard operation sheet" by looking, as indicated by the work, you can determine whether the work be done correctly.

The work itself, the standard can be put out to pursue what they see new waste and defects.

The administrator of this "standard operation sheet" by a supervisor with the ability to evaluate. You can also find out whether the standard work be done correctly for each worker in the field.

Wrong when workers work as a basis for this standard work can be done with care to point out the mistake to the operator. In other words, "look at management," but they can.

How to write a work instruction 4-2

The following tutorial explains how to complete the work.

(1) the ability to fill different parts according to table No. Name.

(2) the required number of field decomposition numbers required to fill in the required number of votes per day according to the combination work.
Decomposition number of workers they have some one line, or represents that many of them first.

(3) ability to fill different parts according to the table member name.

(4) NO
1.2.3 Work order and write ....

(5) votes in accordance with standard work combination of work and conduct operations in order to complete your work.
(Note) ① machining, the machine always indicate the number and put the feed material removal installation, in order to complete your work

tasks. But when you write expressions "CE-239 material sent out with" good and simple.

Assembly, if the assembly is "putting the mast jacket, and tighten the clamp," and so on, to fill in detail your work.

Teaching work fill up a work ②, the worker who "work area" one, and usually represented by machine name and process number.

(6) quality (b) the quality of parts machining and assembling with a check each one to many (or one) or check to record the frequency of people.

(Example) 1 / 1 ... Check for each cycle. (This is usually put into your work.)

1 / 10 to 1 ... 10 check.

2 / 2 times the first shift direct check.

1 / D · · · check once a day.

1 / H · · · check in one hour.

(B) to check the quality of the gauge components, measurement tools which (gauges) to record the people that do use.

(Eg) C · · · C to check the gauge.

Measured by calipers calipers.

LF · · · LF of checking the gauge.

Visual visual check.

(7) where anything short of good quality, quickly and safely precisely the key point for building a reasonable addition to people specifically 記. (Equivalent to the work instruction sheet)

(8) hours needed to conduct their work net time (time required for each step), which represents a different part time capacity table manual, plus the walking time.

(Note) ① walking time is included in the next step in order to work.

Once or several times conduct measurements ②, work and cutting tool replacement is not reflecting the net in time.

As mentioned above, to complete work instruction manual is finished, what was shown in the illustration to the right column, posting a standard operation sheet.

表 8　〔 加 工 の 場 合 の 例 〕

（旧）の数字は解説の順序

㊀改 46年 12月 5日 作成

課長	工長	組長

作業指導書

品番	(1) 4320 1/2 — B-6022	必要数	(1) 446 台/日
品名	ステアリングナックル	分解番号	1/8

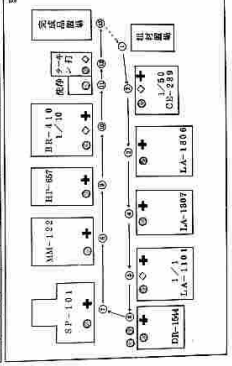
全　ページ中　ページ

所属　氏名　(3)

(4) No.	(5) 作業内容	(6) 品質 チェック	(6) 品質 ゲージ	(7) 急所（正否・安全・やり易く）	正味時間 (8) 分	秒
1	粗材取り出し			右手で		03"
2	CE－239 外 仕 送	1/50	目視	センターの残すぎは後工程のＬＡ，ＧＲ工程で危険		11"
3	LA－1306 〃			両センターに確実に取り付けること		11"
4	LA－1307 〃			〃　〃		10"
5	LA－1101 〃	1/1	C	22.5 +0.25 +0.20, 38.1 +0.25 +0.20, 切粉はデレッキで取ること		12"
6	DR－1544 〃		目視	貫通状態を直径から確認する		09"
7	SP－101 〃			M－22，P－1.5 取付面切粉掃除		09"
8	MM－122 〃					05"
9	HP－657 〃			プッシュは組みぞが円周に切ってある方を上にして入れる		12"
10	BR－410 〃	1/10		取付面掃除		
		1/10	PS	光開内80形以上		15"
		1/10	LP	+0.25 −0		
11	洗浄機 外 仕 送					
12	ニップル取り付け			インパクトで締付け		
13	テーキン打ち，外 付 送	1/1	目視	半欠け不可		17"
14	完成品台					
				(9) 時間計	1'	54"

サイクルタイム 1'53"　標準手持数 13ヶ　◎標準手持　◇品質チェック　正味時間 1'54"

加



−126−

表 9　〔 組 付 の 場 合 の 例 〕

㊀改 46年 12月 5日 作成

全　ページ中　ページ

課長	工長	組長

作業指導書

品番	45200 — ＊＊＊＊	必要数	600 台/日
品名	ステアリングポストアッシー	分解番号	2/3

所属　氏名

No.	作業内容	品質 チェック	品質 ゲージ	急所（正否・安全・やり易く）	正味時間 分	秒
1	ギヤーボックスを組付治具に取り付ける。			水平に押し込む。		03"
2	セクターシャフトにプレートシムをはめ込みギヤーボックスに入れる。			メーンシャフトをまわしながらセクターシャフトのローラーを中心にもって行く。		15"
3	セクタープレートを取り付ける。			ボルト締付けトルク　600～700kg/cm		33"
	スラストスクリューを取り付ける。					
4	スラストスクリューをセットする。			一杯に締めた後1/8～1/4もどしてロックする。		15"
5	マストジャケットを入れて，クランプボルトを締める。			ボルト締付けトルク　600～700kg/cm		12"
6	取り外し，ローラーコンベアに引っ掛ける。					04"
				時間計	1'	22"

サイクルタイム 1'24"　標準手持数 2ヶ　◎標準手持　◇安全注意　◇品質チェック　正味時間 1'22"

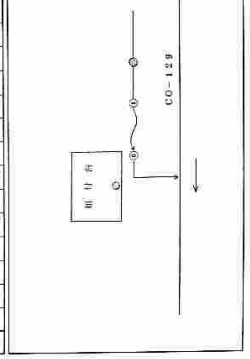


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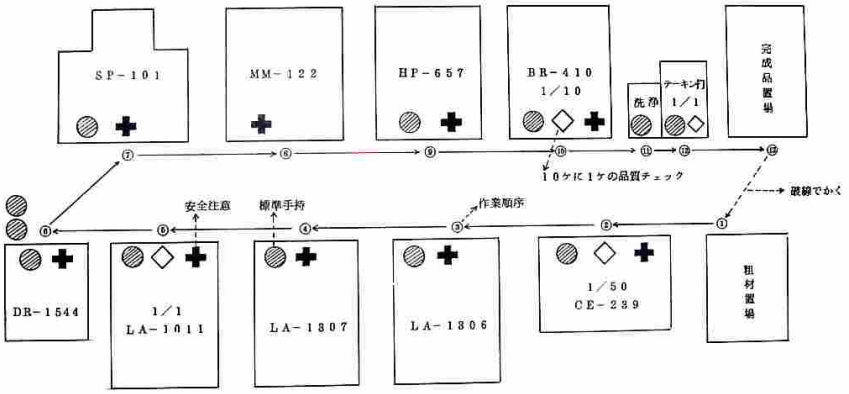
図 12

標　準　作　業　票

作業内容	粗材取り出し　から
	完成品　まで



品質チェック	安全注意	標準手持	標準手持数	サイクルタイム	分解番号	正味時間
◇	✚	◎	12ヶ	1'53"	1/3	1'54"

Section 5 Table critical quality checks <

Important quality check table, which is being incorporated in the work

instruction manual.

And, "▽ S] parts (an important security component safety parts) Pi of your own quality checks that we deem particularly important part in the field, what purpose, where, who, in any way Fill in is doing what.

Also, enter for cutting tool replacement parts in the table by the ability to post to the site as a standard work sheet.

The following describes the entry.

(1) the ability to fill different parts according to table No. Name.

(2) Fill in name of work process in accordance with instructions of channel numbers.

(3) Fill in any part or parts to check everywhere.

(4) What measurement instruments with anything (eg, gauge) to fill in or check using.

(5) at the beginning and work and work at the beginning when Setchingu Setchingu, who, to record the person or how to check.
(Example 2) with two check □ ... ... the leader continued.

(6) spot check sampling is how to write or conduct.
(Example) 1 △ / 10 ... ... 1 spot in 10 workers, to check.

(7) Replace the cutter blade replacement tool, anyone can fill in how often you conduct.
(Example) 50 / □ ... ... the leader once every 50, to conduct cutting tool replacement.

(8) to fill the quality goal can safely flow into back-end process aimed.

(9) clearly illustrates the point of quality checks not shown.

(10) or they need to do quality check why, to fill its purpose.

In some cases, such as reviewing best to fill this item.

表１０

（ ）内の数字は解説の順序

(1)	品番	43201-36021	重要品質チェック表		機番	HK-410			
	品名	ステアリングナックル			工程名	(2) プッシュ内径仕上削			
(3) どこを			(4) なにで	(5) セッチング時と作業始		(6) 抜取		(7) 刃具交換	(8) ねらい
				だれが	いつ	だれが	いつ	頻度／だれ	
S ①	キングピン孔		4P	□	逆 2	△	1／20	50／□	通し換算 25Ø +0.028 −0.007
S ⑤	当たり面（角度）		13P	□	逆 2	□	1／20	50／□	当たり面 光照射 80%以上
					連続してチェックする		20ヶに1ヶ抜取りチェックする		
(9)								△ 作業者	
								□ 班長	
(10) どうして		① キングピン焼付防止 ⑤ ハンドルの安定を計る							

Based on the advice of those working standard operation section 6

Supervisor is important to ensure compliance with standard operation workers.

In standard operation sheet no matter how worthy, but it must protect the stability of the process workers, who directed against accidents, and other measures will have to scramble to failure will lead to more waste in creating a.

In order to understand the work will be protected by a standard work, his supervisor enough Konashi first workers to understand, it is necessary to teach well. And fully explain why the work must adhere to standards, are taught specifically what happens 守Ranakattara, and desire to build a good product but their work and to have responsibility for the quality and emotional enlightenment must Okonawanakere.

Supervisors will check the implementation of standard operating results for the unusual shall take appropriate measures to thoroughly pursue the cause and reason.

To comply with the standard work, seeking the cause was not observed, in that the standard should be kept easily be changed by anyone.

The error occurs when they have been observed standard work, its cause must be pursued thoroughly.

The result turns out that the inadequacies of the standard operation itself, immediately fixed, fixes, it is important to ensure everyone a reason.

The coach is always based on facts, ideas and things, or say attitude is important. To do this, check the standard way of working, practical guidance should be made in the field. Supervisors, therefore, that working as a standard work worker, also, and that you fully grasp the importance of checks and patrol the site constantly grasp the actual conditions, all how to work on site, hands-on It is necessary to conduct instruction. When teaching, TWl teaching job (JI) to leverage, it is important to conduct effectively.

"The best is currently the only standard work. So there is no improvement," and what is not said that. Standard work is alive, always incomplete. So supervisors to observe whether there are inadequacies in the work where the standard should not miss even a tiny error.

The standard operation is the mother of improvement. Once you set a standard work, which is not that good anymore. The standard work, but is born as a result of the accumulation of improvements, a standard now is that I filled with waste, we must rise to the new standard work constantly improved.

The world has been constantly evolving. And after another is born, and new ways. Just follow that trend, it will maintaining the status quo has remained.

Therefore, the work that forever changed even after the standard work, very comfortable with the status quo as Shitsukushita improvement, if you think that work is no problem, it is relatively backward . Is performing a supervisor is always a positive improvement, the mission will be to oversee the site work to revise the standard.

Kanban System Chapter 4

Section 1 for Kanban

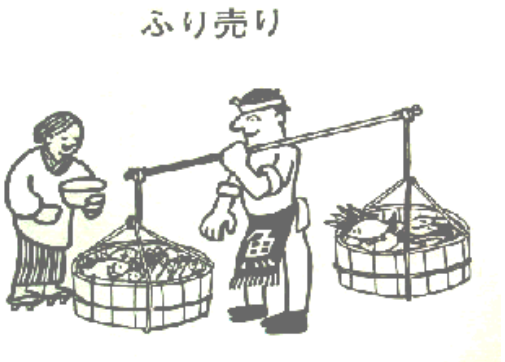
1-1 KANBAN Birth

Our "Kanban System" is a crystallization of the wisdom of the production floor, and something original, is one of the most representative of our proud possible.

Kanban system, the method is also called a supermarket, which is designed and inspired by the supermarket.
Operating system as a means of supermarkets, showing the necessary information on the other part in process "kanban" that was used as a tool, this production control system "Kanban System" came to be called.

The now officially used this method in 1963 (1963) in around August, but until then repeat what has been a part of the main plant improvements are gradually expanding the scope, all widely which was to be conducted at the factory.

In a supermarket, the goods required by the customer when necessary, the required amount, the market can get.
Customers like to be unwanted items without having to purchase the corner, while the market may become so when the customer what to buy, when you hold the idea that you have aligned the goods.



Supermarket system, the traditional Japanese "Toyama selling drugs," "taking orders", "pretended sale" rather than as commercial if its sell-side, and never carry anything or know when to sell, buy-side From the perspective of, would buy extras too easy to see that it might also eliminates waste that can be regarded as reasonable.

Production method is applied to this idea is our supermarket system.

Front-end market, after a process viewed as a customer, the customer is part post-processing is needed, when needed, amount needed to get on living a front-end market, demand for post-processing step before the would you say that you had the refills it.

To provide the way to the next process, you should consider that.
It is a process in the eyes of the customer's perspective after what you want your best quality as possible to request that the cheap.
Therefore, the manufacturing sector the previous process, good quality ones to answer the demands of customers, building supplies as cheaply as possible to be, it will lose the market.

Cost reduction activities 1-2 activities sponger extinction

So, to build as cheaply as possible is what I do?
To consider this, the value of the goods of automobile, consider whether any work being generated by.

And observe the work of those around us, or purchase parts and materials needed to build a car, or processing the material, transport or those who store, build a car complete each part people or vehicles designed to further facilitate the production planning people, many people in various fields, to share their work, said product produced by auto, and business activities being operated.

We are What we need from a product called 造Ridasane car I have a car out details to create a direct, again, that people who become directly involved in automobile manufacturing process.

So people who are not engaged in direct work would be necessary.
Materials and components purchased or even the people who designed the vehicle and, again, to produce a car is necessary.
However, people who work and building a car directly, there is a difference in the contents.
Some of these people, people who have him eat, or have strong potential freeloader.
The work of these people, could say a strong occupational risk freeloader.

If you think this way, lead to product worth only indirectly, management and what indirect departments find you consciously live rent, especially to have to work this extinction.

That is, if viewed in terms of cost reduction, in creating a product for the automobile expenses other than cost is freeloader, it is important to be wiped out.

So the people of division administrative overhead, all "We maybe would not freeload" "Let's work to be truly valuable for sale" by asking, "In no sponger" and confident say it is important to bear in mind the work.

We must be careful here, only one in the freeloader is never department administrative overhead is not always to live rent work includes working breadwinner in the value of goods and construction to direct that that is that.
To which there is a freeloader work all of the work, that there are many cases.

In addition it must be seen, the man is the only sponger, he said.

For example, a large warehouse of parts and materials are always the same, if the same amount has been placed, the parts and materials, and it warehouses and houses may not really be said that if There.
That can be considered freeloader.
The facility is good but, if there is not used to sleeping less than half a day, these facilities are freeloader.

A bloodsucker ever mentioned, it will become extinct, our aim is to reduce costs.
And importantly, there can be no hanger-on as a whole.

For example, above equipment to me, sponger, just because the equipment is half asleep, to ending the bloodsucker of equipment,

machinery and equipment to full operation, the unwanted parts of 造Ridashita rapidly, therefore effort and cost required to power, resulting in flood'll cost to live rent warehouse of materials and components.

Thus, a hanger-on and when I try to wipe out, and pulls out more and more of the other hanger-on is not the talk.

We have big wide eyes wide open, a freeloader so far mentioned, it is important that we all lose.
In this sense, "cost reduction activity is the activity freeloader extinction" can be said.

1-3 The first step in looking at extermination campaign management freeloader

That has been studied so far, a freeloader to extinction, was found to be the most effective way of reducing costs.
Then, cost reduction activities, will begin to find that the freeloader first begins.
So you probably want to find a good way to freeload.
Mlamli waste, however, this freeloader thing that is present in the form of three Mudarari That is, if normal, they hid in a warehouse part of the human materials and equipment, is easy to discern difficult.
Therefore, if the freeloader to figure remains the same, unless some experts, could be a story that's impossible.

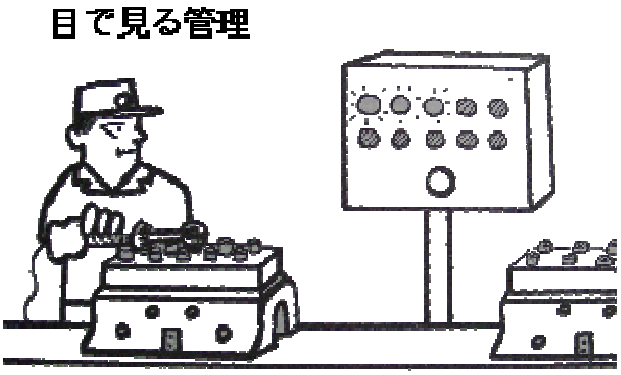
However, only got into the work of some expert cost reduction activities, the positive effect is not much to say.
This activity, but it should be done from the employee, the freeloader will become absolutely necessary to keep anyone be able to find easily.

So, to this situation, how can I do?
The first step is to determine clearly the standard work.
Clear that this is not decided, it is assumed that different methods work for the worker becomes very difficult to find a hanger-on is probably not convincing anyone.

The first step begins with the discovery of freeloader standard work decision.

The second step then is to always protect them standard work.
Even if a fixed standard work, it must protect workers is the same as undecided.
The standard work is protected for everyone, we can say is the first time that fixed.

Determine the standard operation, however, that enforcing this, it is quite difficult.
However, as mentioned in immediately, if not run out this can not easily find a freeloader who may not say.



So easy to keep everybody is working to make a meaningful standard to protect it whether anyone could see that.
(For details, see Chapter 3 standard operation)

One of the criteria of whether a good standard work, it is important that we seek here.

Working to make this a good standard by enforcing it, hiding in the waste material and equipment parts warehouse first man, uneven, and unreasonable, so we can find easily would be.

A lot, for example in the production of parts, that if U was set up at 100 by 200 finished goods inventory, keep a box of 50 pieces of finished products only.
And until the plant becomes 04 boxes boxful two more.
Oke decide if this way, compared to the way you build up one by one just finished, it helped them work much more standard.

Also, whether to protect, much easier to do by the coach to decide.
It one step further, once you decide to keep a rule that to where the first 3 boxes Kanban, looking up at all even know the time in process inventory.
Therefore, the standard work even easier to defend.
That way, the minimum stock of 100 or more then this may be necessary to consider whether the widget 200.
Even in work done at all times remain the case if one of two boxes in stock, one box worth of stock is considered part from freeload to eliminate this, a box of stock it should be cut down.

As shown in the example above, if carried out thoroughly to make this work good standard, has naturally become a serious problem, will openly live rent.
And clues to improve, we will be able to grasp easily.

That is, In order to successfully manage our workplace, the management system, such as eye can see, that "someone with management" is the most important.

An important tool for the management of 1-4 looking at "kanban"

We, as a way to manage the site features before, but looking at ways of managing, as has been strongly promoted unprecedented competition.
And, as an important tool for looking at management, and has appeared in KANBAN.
What is important to evaluate kanban is a tool that is used to manage the work site kanban is to be fully aware.

Kanban production, inventory and never part, only the instruments for carrying instructions, and should not be evaluated.
By using a kanban as a tool, site management circles, it works quite nicely to turn.
As a result, the effect of exercise that can give freeloader trying to extinct our aim should be to aim the focus of the evaluation.

If managers and supervisors in the field, it is important to turn the circle of good management are fully aware and everyone.

So, we can effectively operate Kanban, is also important that we recognize as well that is important..

Kanban spirit of Section 2

The previous description as a tool to manage the workplace and we are fully aware of the importance of kanban.

So important to be managed well then the kanban.

So I think it central to the Book, ie, it is necessary to understand fully the spirit of Kanban.

The premise of thorough field observations 2-1

Anything can and will improve, and to the standardization of work, first by observing the work site fully, to understand the current situation, is fundamental to understand.

However, it would not be protected surprisingly basic.

And investigate the problem of workplace, staff and supervisors that "are

staged in this way," You can always protected that say, "It's a problem here," that say, matter fact has not, that is often better but more different.

With this, the management circle, and it will not work by turning to her.

Why did they have something like this happening.

Directors and staff there, would not see the spot.

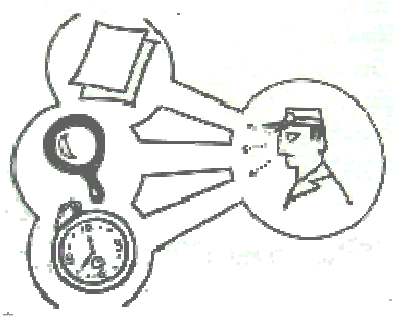
Of course, it will not.

The problem is that even if his intention is to observe, in that it was still insufficient,

This can be said to have problems with viewing.

First, there is a problem in the attitude of observation.

Man, come and experience, especially for things tend to have a so-called prejudice.



"I did this too far ahead, but this time," I have seen the problem is what they look like that.

So not just observation.

Always prejudice, attitude is important to observe is blank.

The second observation is that they tend to stay superficial.

As with the first human experience, a little observation, but often will feel like you found a problem with it, we must stop the observations.

The real problem is a little observation, was found behind the question seems, is always hiding.

Therefore, his and they found you with a problem, "Oh wait, the problem still would have been the shadows" more compassion and is important to continue to observe with a tenacity more.

Third, the "observation time is short" is that.

If you have problems in the field, "and stood about half a day observing Zip yourself up" is often said that, it was exactly correct, if observed over time, always embodied and problem resolution found what is coming plan.

"Busy, not put so much time" and it was like excuse at all, because many are busy with this problem, observed about half a day standing, and have to find the right solutions.

Must be observed in the position to discover the truth behind the facts.

Such a thorough observation is not easily done.

However, insufficient work as determined by standard observation is not impossible that arise 即Sanu shielded from the reality of the scene somewhere.

On the other hand, if good work site, are measures to improve the song constantly.

And since you are also constantly changing issues in the workplace is good, enough to observe the position of always blank, but they can make mistakes without understanding the problem.

The site has been constantly changing, always in a manner as described above, can take a good look, what is the basis for managing this site, from the attitude, the texture work was a good standard, ready through which you look at management systems.

And that will lay the foundation to operate effectively kanban.

Therefore, those who try to operate properly kanban, the major premise that attitude is most important to observe the scene thoroughly.

2-2 both rational pursuit of respect for people

Turning circle of well-site management, to continue to live rent-busting, as already noted, to understand just by looking, that is the first step to protect and ensure standardization.

So, to nip factors should be eliminated completely.

To do so, it is important first effort to simplify.

Working in the field, seemingly complicated, but something like solving Hogusenai very mean, like just giving up is disqualified.

To investigate the factors which caused the complex to break down complex tasks, and try to work simpler, it is important relentless determination.

Next, efforts should be made to eliminate the exception.

Many people fault the machine, like, or out is often defective, in order to cover these issues, and would allow the work has not been standardized, eventually causing difficult to adhere to a standard work.

Therefore, the exclusion order for the stable quality and quantity always exceptions, ie, it is important to efforts to combat problems.

This effort can change his words and eventually eliminate the attitude Mlamli waste, that is, it comes to pursuit of rationality.

By the way, as a result of the pursuit of rationality, the very monotony of such work will be simplified.
If measures have to think of it, after all, you might be lead to the problem of human alienation in the work place.
Moreover, in mass production industries such as automotive industry, it is a fact that it appears that this is a real problem.
However, respect for human rationality and the pursuit of balance and must, but try to balance that this is the spirit of the kanban system, the basic idea of our company.

This is because, once you are ready to look at the work site management, problems and improvements for everyone working there, that would have been easy to find a hanger-on that state.
Even monotonous work itself, can participate in improvement activities through the discovery of freeloader everyone, that is, rice could be a better awareness of workplace participation, too.
And what was that feeling of accomplishment can be obtained on their own improvement, humanity would not recover in the work place.
Therefore, the important thing is the environment to participate in such activities feel anyone is to always keep producing in the workplace.

Hanger-on to fight, everyone can participate create an environment, it keeps track of what balance the pursuit of rationality and respect for people, people to operate a Kanban is that we have to in particular.

2-3 unremitting efforts toward the improvement

So what will be the cornerstone of the spirit of what's kanban.
Needless to say it is the attitude of eradication freeloader.
Mentioned before, "observed thorough" and "rational pursuit" is also the basis for it was so to speak, we are clearly laid a firm foundation for this must build a castle worthy of improvement.

The basic improvement activities, it is said to be approaching a scientific

manner.

So this is what it explains how.

First, in order to discover the problem, the five white 1H, or "why" of development and could say the attitude of our scientific approach to repeated five times.

5W1H technique called general question, what where why when how who, that, as of a question to ask.

However, it is often just a cosmetic problem to stay discovery, the discovery of more fundamental issue is regarded as difficult.

For instance, if the machine stopped working.

"You stopped why" "because the switch did not work."

"You stuck why" "because the oil into the switch case."

"Why did you enter the oil," "but the switch case through the fuel pipe, because it leaks from the seams."

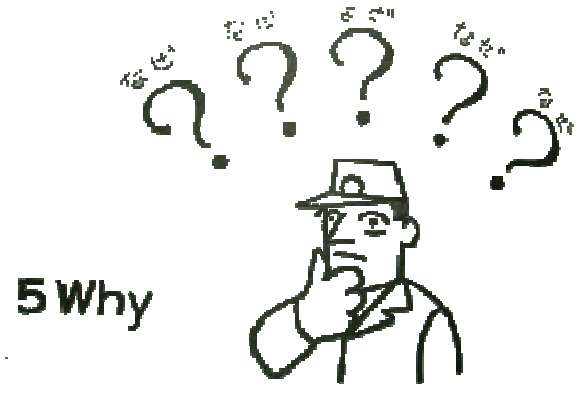
"Why do leak" ...

"What are the pipes through the case why" ...

And "why" it is important to repeat, and in this way can highlight the true cause of the problem first, and get to take measures to prevent recurrence of the root.

Even in this case, if the only white one, just switch to have different measures in the three white can also be wrapped with tape to the seams.

The five white, and so pass the case back to the pipe, from a mere cosmetic measure, indicating that measures will become more fundamental to prevent recurrence.



Five Why this attitude, I mentioned earlier "thorough observation that" it was said that the attitude of, to discover "the problem is to observe blank is prejudice," "behind the facts discover the truth, "therefore" stand around and observe half-day jitter

"attitude is required.
Given the different words, "do it in one Howaibuhowai" is also that of the lead.

The following important measures to improve planning, but considering the views of the entire relationship.
That is, standing in line thinking is not bound to ensure that the unit thinking.

For example, part subcontracting in the field that A and part B, which assembled the vehicle from the assembled parts, A and part B with a combination of parts and so annoying, I want to deliver from assembling in the subcontractor and the like I need speak to you.
In this case, it may reduce the effort in assembling more 組Mi付Keta subcontractor, on the contrary, such cases are increasing rather, outsourced assembling such a funny and everyone will feel.

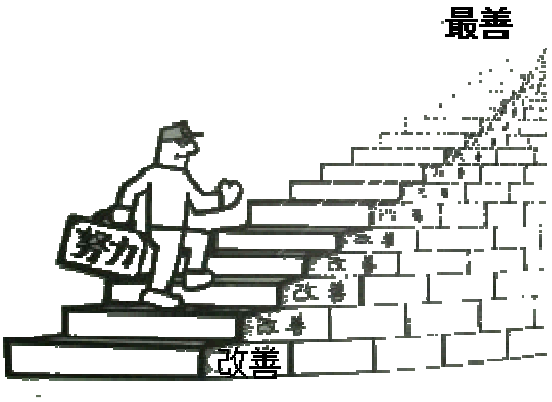
However, only looking to improve your site, as in the example above story is good every comes.
When considering ways to improve not only improve your site, including the related departments as a whole, it is important to think of ways to improve effectiveness.
Such as the automobile industry, in general industry, this approach is necessary in particular.
If you expand this further and eventually lead to the bill as a Toyota.

After planning for improvement, the implementation of the improvement plan is to tie up with the tenacity to run.
Suggestions for improvement can be hard to much trouble, unless this is done, to nothing.
Given this sense, is to compete in activities to improve the result only.

In reality, however, improvement activities is the most difficult part of this implementation.
This is because, in order to successfully implement the improvement plan, and ask that they understand and accept other people and it is and you have to do

it.

But the bill, the wonderful and the less innovative, but rather to accept the Notes, the relevant department who is often in a fight.



Buttsuke break all the walls have their own, combine to run what tenacity of action, to build a castle that improvement is most important.

In the above manner, improvement activities over and over again, and start to improve next one done to improve.

In other words, improvement activities is that every step up the endless stairs.

We must continue to strive for constant improvement.

Things do not work 2-4 as determined

Until now, the concept of Kanban, the study has been focused on improvement activities, and then from another angle, consider the kanban concept.

It is all decided as things that work.

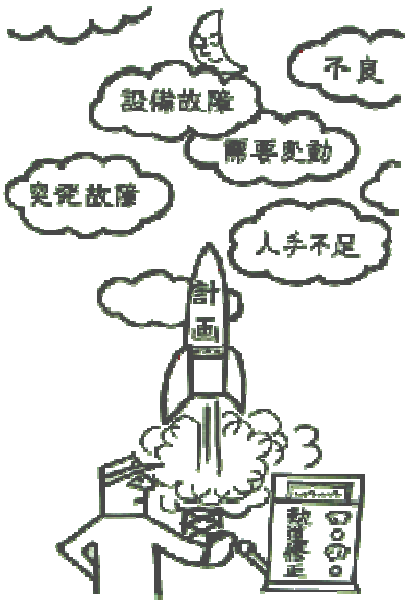
To carry out things well in what is the best plan seems to be suited to reality, according to the plan or decide the rules and standards, have been put into practice and ask directions or go.

However, even so decide how viable, and actually try to act is often decided not to run as.

That is on one level or another, and decided that it is slightly differently in some way.

This is how severe as planned, it should be allowed which would cause the error, another way to manage this error is that it must be corrected.

This is working-if things are really moving, and everyone knows it.



Kanban is the crystallization of wisdom of practitioners to be figured out without this error.

The idea no matter what move they decided to make things as, for example, the concept of planned economy controlled economy.

Do it this way, everything that they will work plans, most will move in a planned economy as such, the reality is that human activity may be unable to issue a compelling action of black people (In the scene, the black act like this issue is the inherent human nature) and by changes in environmental contingencies, Husband everything goes well (guess) what the actual situation in the field are different from failed speculation would return her.

According to plan, sticking to only could move at any cost, in terms of execution, better utilize the action of natural regulation, and as a whole, that successful weight off balance, more knowing that we all be.

As I explained, so to speak, that will bridge the gap between planning and execution, yet, the run it, that is, the problem is mainly the site, fill in the gap between planning and execution The idea will be one of the spiritual pillar of the kanban.

Section 3 and Kanban

3-1 KANBAN Features

Kanban is the work order information. The primary feature of this kanban.

In other words, "what, when, how much to produce in any way, or do you carry" system of automatic instruction information that is automatically issued.

Place where transport and transport equipment shelter to the time when the order or delivery Haul production, and container, and all know that if he sees a kanban.

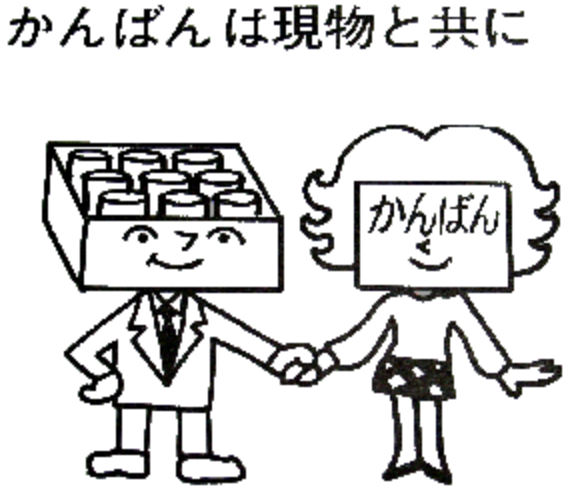
Companies in general, "what, when, how much information" and to change the schedule, work in progress, schedule, transportation, instruction produced, making the clerk widgets in the form of forms, such as ticket delivery instructions, not swept the field is, as already mentioned, this will surely be appearing live rent-strewn.

The "production methods" "destination transport, shelter location information" such as, but you keep a corner of the desk and write a standard work in the field, workers are not easily observed, producing a so-called working poor Both have been the cause.

Therefore, always be the standard work ①, automatically get directions suited to site conditions ②.

In charge of paper work and extra fees widgets ③ (no article) to prevent the spread of things like that, aiming at, was born in the kanban.
Kanban is used as long as the paper mentioned above wasteful (capital) charge is necessary we should become.

The second feature of kanban is to always move with the products.



"Kanban is a management tool for looking at" that is already mentioned that, in order to embody it, this second feature is important and primary function.
You Let him match always Kanban and cash, can not produce extra ①, know the preferred order of production ② (one rushing things trapped in kanban) can easily manage your cash ③, that such becomes possible.

Two functions as above, if the kanban operation, it is possible to look at and manage our purposes.
And management by supervisors to look at, to administer the site, but they can know that the next most needed.

The urgency of the work progress downstream ⑥ ⑤ downstream process at their own fitness staffing availability ④ ③ own process of understanding the process capability of their own compliance with standard operating ② ① (own process priority for further work .)

Varying degree, these two features, operators can work if he sees that standard, the administrator was able to see if things are best managed, and that I should speak all, we You can think of.

3-2 also bought "kanban"

I must say and speak normally, we made a plastic bag containing a

rectangular or delivery instructions that Kanban for external parts, but I think the plate made of Kanban processes commonly found among the in-house.

But the ones featured above show, and I think it is all you speak, a kind of shows that I should also speak the following.

(B) also kanban carts

The main factory, the receipt of such units and missions Ashy engine assembly lines in total, only a certain amount積Menai, but are also carried out using the truck settled, this dolly has acted as a kanban.

That is, the reference volume inventory of the total assembly line-side units (3 to 5 units on), the department has a unit attached to each vehicle (engine department has, for example), and a free trolley and, to a line assembling Iki, in exchange for empty trucks, which come loaded on trucks collect the necessary units.

In this case, the kanban is not about the truck, lay down the law to take back ①, and to regulate the carriage of ②, which give the same effect as using kanban.

For example, the unit's assembly line, there is no place of shelter units was completed without even made their free carriage than necessary, Hashi Kono stop line (full idea of the work), the general assembly line, trolley excess inventory than to have decided on the stock to prevent that.

In other words, the same as running a kanban, by its conduct to the truck thing, that the kanban and the role of the truck.

Also in the machine shop is being conducted may be transported without a kanban parts in-between process.

In this case as precedent, and then the truck instead of Kanban, the Kanban itself without, and is performed by the kanban production and transport, rather we can say.

(B) do you speak well of seats.

Our work in the field, carrying a weapon of the rational, running a lot of chain conveyors.
It hung or painted parts have been supplied to or assembled parts for line side.

Using a chain conveyor, if you carry a wide variety of parts, "when, what parts or how good fishing Sagetara" I do not doubt, I preferred the conveyor chain Keep hanging objects displayed on a suitable interval to specify the parts, so if you see some parts Tsuranai only (which it seats), and with the spin of seats conveyor components necessary smooth pick up and can supply.

This seats, it was kind of Kanban above features, the use of these kanban, we can take advantage of you speak to me very effective.

3-3 also bought "kanban" is used

In the preceding paragraph, the thing is without kanban learned that there are many ways in KANBAN.
This section is followed by "kanban can also be used to manage things like" give an example to explain that.

The propeller shaft is attached to the balance weight.
There is five different weight balance, the uneven degree of rotation of the propeller shaft, which are the select and install what you need from it, of course, one may also取Ri付Kenakutsu without irregularities, in some cases The individual also must be fitted with anything.
See if any usage plan as part of normal production, so that there is no such thing in.

Therefore, these components are not well managed and compelling products that express it out while on the other hand, on the other hand would rapidly accumulate unwanted inventories.
Often be forced to change plans and transportation plans in process, so eventually all the processes used in the production → transportation → balance weight and paper hanger-on (capital) that are produced one after another fall into the Saddle charge be.

In fact, in this process, until the introduction of kanban, which ran a variety of hard and eventually did not work "If this part is unavoidable," which was given up.

In order to successfully manage this entire process, first by ICT, the five parts in stock at each step, that you always know exactly, then, will always reflect the reality of this stock it is necessary to make sure there is a work in process and transport and express and excess inventory.
And in order to achieve a goal like this, I must speak to the introduction of this process.

As a result, the past problems had been corrected, the extra death (capital) without charge, work in process inventory was transported by obstacles smoothly.
In other words, by installing I must speak to the kind ①, can now see exactly usual spot, by spin around between processes that kanban ②, in the required sequence was always able to transport and work in process Consequently ③, now maintain a constant inventory of five more, after all, is able to significantly reduce inventory levels.

This example is valuable, and often, "Kanban is used only to manage the stable parts used every day," because some people think.
I have to speak in certain rules, "average production stabilized" but has become a major condition that does not mean "not a stable component of custody, can not be used kanban" that were found.

That is, the kanban is a common parts stable usage means not an instrument of control parts only generic instability of usage, and I must speak first glance to manage the exclusive parts specialty seems to not manage a very effective tool out to be a "spirit of kanban" would understand if you can understand properly.
Also, try what used to manage these components, which would be true I know the kanban.

From the three examples above, we have the wisdom働Kasere, kanban is

a variety of applications, can be used in various forms, indicating that exert a great influence on the level of field management.

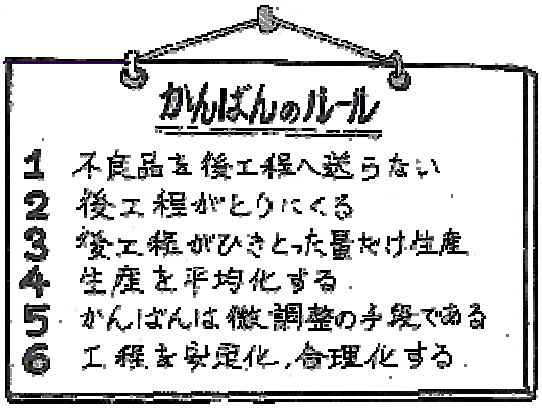
Its high level in the field, you can see the extent of the use of Kanban, why is called.

Given this context, kanban is the crystallization of wisdom of the field, why, what specifically it must Ikanakere land-evolving, and as with kanban same forever, the scene of the efforts Perhaps not enough of a say.

Section 4 Rules of Kanban

All of those tools, the less alive Using a good tool, it

The weapon will be effective for achieving the goal, which if used wrongly, which inhibit the achievement goal into a weapon instead.



Kanban is also a tool to effectively manage the work site, we can say the same.

This section is a prerequisite to operate if I speak, that is, explaining the rules of kanban.

4-1 The first rule: to send the defective back-end processes

Building a defective product, to be sold is that the effort to introduce material facilities.

This is a hanger-manufacturing activity are Saitaru is the biggest thing against business objectives and reduce costs.

We are a defective product, to prevent the production twice when it is discovered, one that must be Utanakere preventive measures in preference to all.

This poor eradication activities, in order to thoroughly implement "send

to next process failure" is so important that the first rule.

The reason is that if the rules are the first

(B) The process of manufacturing a defective product, defective units can be found immediately.
(B) and left untreated intact, or back-end process is stopped, and automatic pool or a defective process, so that the process just close the problem, prevent recurrence of managers and supervisors to match measures would have to be from.

In order to ensure implementation of this rule brings up defective machines automatically, or could be that you have to stop working. 働化 emerge in their own way of thinking here.

To operate effectively kanban must first abide by the rules.
In order to guarantee that no post-processing is never sent defective 働化 against this self must exert every effort to exorcise.

4-2 second rule: You get to take the next process

The second rule, the time required amount needed is that the process comes after Hikitori.

Demonai when necessary, making things more than necessary, to provide the back-end processes, it will produce a loss in many ways.
That loss would also let workers extra to work overtime loss to cause a variety of extra bed inventory, even though there is surplus equipment, adding to losses that would not know it, on the other hand, facilities have become an obstacle, to clear idea about the loss becomes too late measures, and as the largest loss, but not required to build, that can result in the need 造Renai be.

To eliminate these losses, the second rule is very important.
To be protected to ensure that this rule, and then explain what to do.

Be a problem here "is defective in post-processing shed," the first rule that we protect, defects can occur in self-discovery process.

Therefore, there is no need to get information from others, which can provide the required quality.

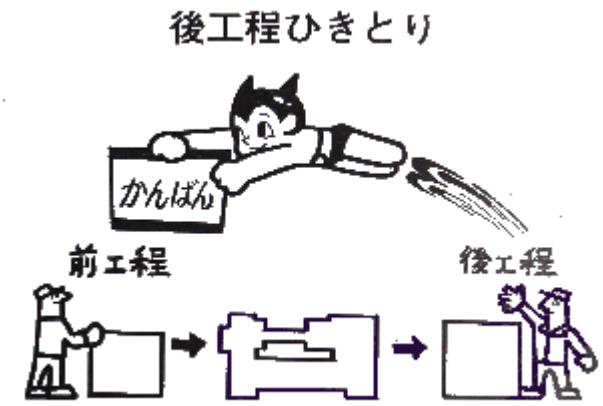
In contrast, the amount of time required to process and post the original, my process is that it can not grasp.

That is, given such information from others is that they know the first thing.

Therefore, you will need to provide this information for each process, so-called widget clerk appeared, was designed to include this information in process planning called, will be distributed.

Widgets plan as a matter of course, various factors such as defect rates or utilization of equipment, that is freshly made and one assumes that this premise work as a real production site, is already explained.

However, the cons of such expectations and reality, detailed plan to change the widget is not yet supported in a timely manner.



So that the production or delivery instructions could do well, and production sites where the problem.

And the abundance of useless information that will be the purr becomes that appear on the scene hanger-on.

Here, "to supply back-end process" Then you would drop the idea, the time required amount needed to come take a step before the next process, simply put, "Hikitori process after" do not you that Will.

From the vehicle assembly process is the final step of the process until

all the material the first material, always, whenever needed, that if you pick up the necessary amount, the process which is supplied to the next process the timing and amount of information must, they no longer need to get from nothing else.

"Supply" the idea, "Hikitori" by reversing the idea is you can not find out how to solve difficult problems at once.
From here "come to take the step after" The second rule that stuck. We never like to take care of the peel left on their own back-end process, we need to embody the rule.
"You come to no kanban should not take."
"The number of kanban Hikitotsu than do not."
"In the spot, I put it always speak."
If you operate a fundamental principle of such a kanban is a necessary step to protect the doubt after this second rule.

The third rule 4-3: Production processes Hikitotta amount after

Appear as an extension of the second rule, "after the production process is Hikitotta amount" of the importance of the third rule is that I can understand through the study of the preceding paragraph.

Of course, the stock is subject to their own processes to minimize. To do so, "produces more than the number of kanban must not", "produce order out of the Kanban", protect the principles of operation of this rule Third, do it for the first time of the.

More importantly, this second, the third to comply with the rules, all of our production process, as if the same effect associated with a single conveyor. In other words, means that synchronization is established.

The introduction of conveyor lines, work on standardization and cost down, when you consider how you show great power can fully understand the enormous implications this has for synchronization.

Rule 4-4 of 4: average production

The third rule is to protect, all processes that require time, only the amount necessary to allow the production will need to retain people and facilities.

If so, then if the process is time and quantity, if Hikitore Baratsuita form, is no longer front-end process and equipment for people without capacity, the capacity will be needed before the process so that if .

But needless to say, the spread of these freeloader, not never admit.

So what say, before the process is not much capacity, if you try to support back-end process, it is necessary to the production capacity ahead of time.

However, a third violation of these rules shall be eliminated.

How can you eliminate such a freeloader would need to do.

The answer is simple.

That is, should I Keep The Lights On variations in production.

Here the "average production" The fourth rule that is to build as cheaply as possible, appear as absolutely necessary.

Post-process variations, large variations have been expanded to front-end, when you consider that we Hanekaetsu, averaging responsibility for post production process is great.

Rules - particularly the second through third, if the production process has been thoroughly synchronized, the average production of the final assembly process is imperative.

Currently, we are using in computer, wherever possible, taking into account various factors, develop a plan that also lost your average production from every angle, because this reason.

The future through expanded Furuchoisu, as you proceed diversification of complete vehicles, will need to achieve the average would be higher.

It should be noted here that the more you progress in diversification,

averaging is that they become difficult.
Therefore, the average Tsuranuku diversity while addressing the most important task for future production sites.

For this reason, an important measure of the surface facilities is of special equipment, considering the versatility.
For instance, if the entire Corolla production planning, production plans, to be definitive on a monthly basis by dividing the moving day, which can be averaged daily production volume.
However, when divided into the sedan and coupe, from a compelling production in response to specific customer orders, the number per day, per season would be impossible to avoid change.
Similar to the engine (1,200 cc, 1,400 cc, high-speed) also could say.
In this case, if the divided line and dedicated line coupe sedan only if the final assembly line, standardization of production is extremely difficult.

However, if the line is also possible to assemble a sedan Coupe even if this line will allow averaging.

If you think this way, private facilities for mass production costs down is the biggest weapon, of course, must be carried out thoroughly, instead of simply promoting it, in effect, mass effect work to interfere with the wisdom (ie, slip in the jig by the minimum equipment), as in the example above, with special efforts to make production versatility is more important.

Such considerations, by adding all processes, we can take to harmonize with the averaging and diversification, customer orders, which can support more timely.
Consider the expansion of market diversification in the future, we must promote this idea more than ever.

The fourth rule of average production, it is necessary to understand terms, including consideration of such a facility.

Rule 4-5 of 5: kanban is a means of fine-tuning

Kanban concrete contents, which already mentioned in Section 3, as an expression of one of the "pointing device is automatic, and work order information for workers," he explained.

Therefore, if adopted Kanban is separate from information such as schedule, transportation schedule, work in process is not provided, and information for directions and transport produce only Kanban, workers work relying only Kanban to be a.

So is the average production is particularly important.
If you have not done that average production, would cause any problem.
For example, some stamped parts, type setup from the start, before the next process is supplied to the press part, and shall take two days.
Then, press parts in stock when it falls below 2.5 days, entry (set-up type) begin case, as it'll prompt, and set the kanban.

However, when production is doubled downstream and 2.5 minutes the day stock would have been 1.25 Hikitora process days later, the process can not part from the press,
Sun-Sun 0.75 -1.25 2 0.75 days this will be a complete shortage condition.
Nevertheless, and so can respond to this case, at the stock days after five times, when the normal output from the will have extra time to stock unnecessary, something like this is not allowed.
You say so? "Do not you Hikitotsu lot of back-end process," and worried about the front-end and "this time, please work early," and then you being sent a special information other than the kanban, the scene confused.
If you operate a Kanban "production averaged" about how important that is, through a study like this, we can further deepen their understanding.

As seen in the example above, we can not only Kanban is fine-tuning the production kanban is what you use as a means of fine tuning, but they can demonstrate for the first time the Almighty.

The second section already, "things do not work as decided.
Therefore, the error occurs, we have to manage in a different way.
I must speak to the idea that led here, "explained that.
This can also be a means of kanban tweak, I think we understand.
In other words, "average production" to judge, and the errors that occurred as it freezes, it does not help tweaking kanban management, thus the fourth, fifth and understand the rules linking is necessary.

However, if absolutely unavoidable fluctuations in demand, variations in production, we must be prepared.
That is, with the average effort of production, Kanban can be considered a way to deal with fluctuations in production die.
But also addresses the variability of production, Kanban as a means of fine tuning, to keep alive important thing is to forget the maintenance of the kanban.
As well as kanban, standardized work for all sites is what made the assumption that production, that changes in the level of production must be revised accordingly.
Thus, in the field, through the program, and the moon program for the year, Haraiso interest movements of the production constantly, add the inspection contents and number of kanban in response to changes that can be supplied to downstream processes and production inventory minimum so, it is important we set the kanban.

Rule 4-6 of 6: to streamline the regulation process

The fourth rule, while we guarantee to supply back-end process, to achieve the goal of building as cheaply as possible, "the average production of" The learned rules that must not be forgotten here is that is the sixth rule that streamlines the process of stabilization.

"To send the defective back-end process," through study of the first rules that we "own 働化" but understood the importance of not only bad part of this failure simply means "working poor" in Given the extended rules easier to understand further the sixth.
In other words, poor work is not done enough to streamline standards

work and wasted time can cause Mlamli the way you work and work, which in turn is leading to the production of defective parts.
Must eliminate these defects, while guaranteeing the supply of back-end process, not to build as cheaply as possible.
Through efforts to streamline the process of stabilization, it is necessary that we 働化 been trying to realize their own "average production" can be fully demonstrated its value as evidence only after this.

Six rules mentioned above, both to protect it will require hard work.
However, adhering to these rules, introduced as kanban, then I should never speak without effect, can promote cost reduction activities.
Site management as a tool to promote cost reduction, as acknowledged the efficacy of kanban is to overcome any difficulties, we should be the rules.

So far, the basic idea of Kanban, and what has been described as.
We will have to run as Kanban, which can not really understand their nature.

Kanban is created by the efforts of those who are truly moving scene, "crystal of wisdom" is.
"Improvement is infinite and eternal" called.
Even beyond the use of kanban status quo, but with further development of creativity and effort, will challenge people to move kanban.
And the wisdom and ingenuity, it is important that everyone 作Ridasu power of such great work coming Wakide mania exists.

Change the way you work Administrivia

Section 1 of the placement machine

Technological innovation is constantly advancing. In our manufacturing technology is no exception. Machine placement and combination, such as how to work a machine shop and press shop, the figure was not present as the start.

"Rome was not built in a day" like a proverb, and were able to reach our current situation is not in a day. As of now, the parts on hand very little, began to flow to final assembly is made placement machine by processes other parts also ensures idea of kanban system, stacking improved improved as a combination of work What results is.

For example, looking back to the original form of the machine shop,

(B) are arranged independently of each machine, each individual machine, which was always just one by one worker. Cosmetic case, even if there were just two workers.

(B) workers, all the while cutting machine, standing in front of the "monitoring" was.

(C) parts placed on the floor and then placed inside a box or, if a shelter far away from the machine, the more difficult cases that take place away.

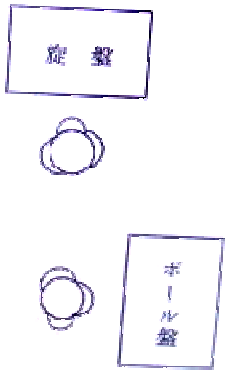
(D) also Rorakonbea, only part is used as a shelter, it was on a pile of parts.

(E) the height of the working surface of the machine, a machine is high, the other machine was less mixed.

(F) the finished product is inspected by the engineering inspection, finished product warehouse once housed, had been transported from there to the assembled line.

(Cart) for a small amount of finished goods on hand, believed that the worker rather lazy, and had been a lot better.

The above situation is also seen in other plants not only in a machine shop. Or how has it improved as the heart motion machine alignment, changing the course of the work described.



1-1 place single <with one person>

In the simplest arrangement, each one of each machine was equipped with workers one by one. And his work, and put the feed component mounting machine, cutting machine while, but I just watched, or brush with oil or paint, and had paid chips .

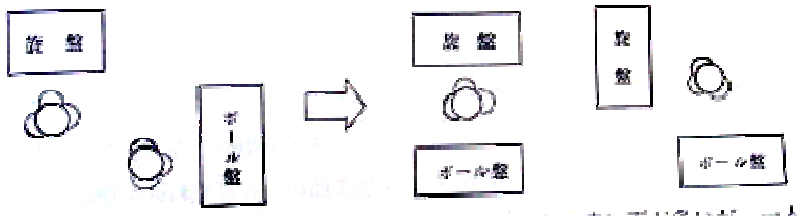
This is a waste of waiting hands. That is, while cutting machine, in

which the machines are working, and that is the work of the workers say.

At that time, the time seemed to have a machine is measured that included reference time of parts, while cutting machine, and time looking blankly, but not included in the time of machining parts, as a matter of course is the Teita.

Another place 1-2 models <with one to two>

In a single place, such as, the result is wasted waiting to get really, a very large waste. So little to eliminate waste, while cutting a single machine, install the other parts of one machine, or can not be removed, but that has been considered. That way the machine "-shaped double" or "L"-shaped was to be placed. Is changed to have a machine in one and two. (Circa 1946 - 22)



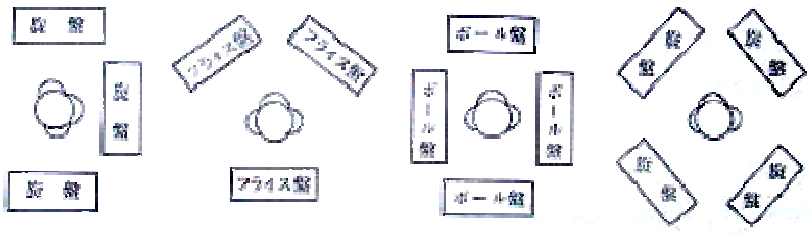
This way than to have one person, there are many aspects much better, and working on with two one, workers or are processed far the other machine always, they care and have to be no less likely to concentrate the mind on one task can not proceed to the next task with confidence.

So while cutting machine, the next task to the worker at ease, how we could do was improved as follows.

After cutting to the point where we need, or no way to feed off the auto-install the limit, which was to stop the machine automatically.

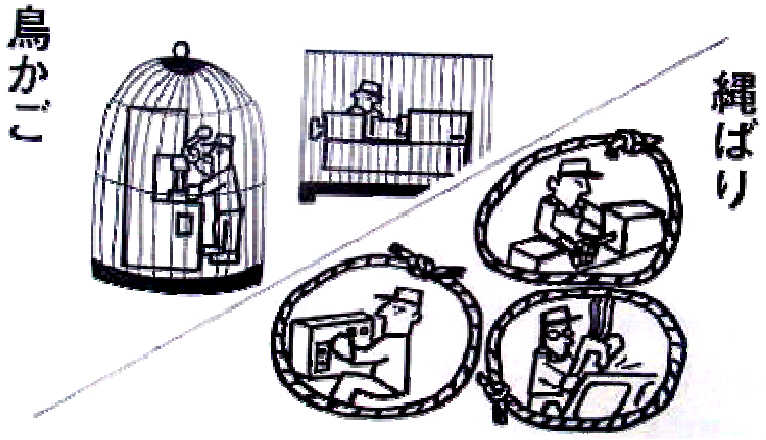
You can also pay by Derekki the chips, for cutting oil is made like no so you are do not need a hand of each of the worker, the standardization of cutlery (to grind and shape of the cutter and bytes) is also under consideration, which was able to work safely and has been employed workers.

In this way, and have been in with two person task, if there's room for more, the three machines, "U-shaped" or "triangular" or place, or the four machines type "square" and type "ling" to place, which was to have as one of the workers.



Thus, you can have so many similar machines, the production per capita rises, the worker, the other hand, tends to build is too half-finished products. For instance, such as lathes, machining is finished drilling semi-finished products, will be piled at each process, and not the flow components, a problem that takes a long time to finished product arose.

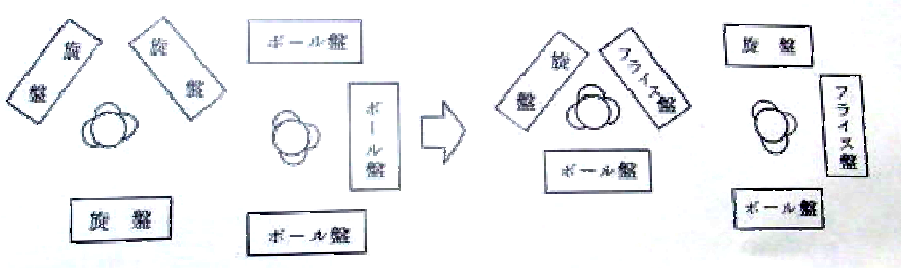
We made a study of this issue, which was improved by alignment process described below.



Order placement process 1-3

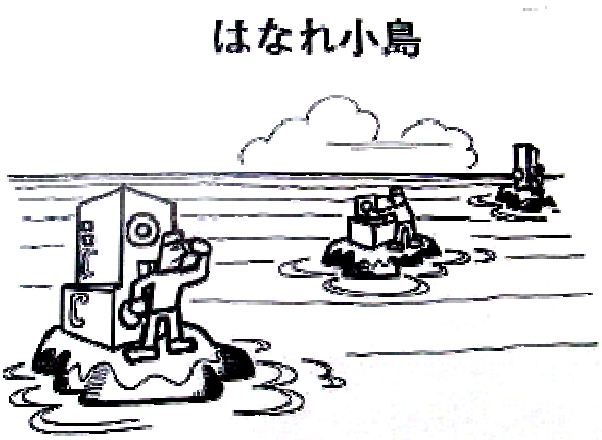
Another place the model, after all, too much building of semi-finished products (waste inventory) and to increase the transport of parts (waste transport) becomes especially because the disadvantage of very low efficiency, this arrangement It was found that more than desirable.

So, too Hold the building of such semi-finished products, the components can only carry so you can get the product on the spot early on, and they have gradually improved as follows. That is, that part of the machinery needed to be processed, then the order will be processed as Naraberu components turning milling and boring machine, for example, is changing gradually went from place to place another order process model .



Order placement process, the shortest walking distance of work from one of the first one has yet even to operate the machine alone several more were convinced that the good work. However, when viewed as a whole line, "Kojima Hanare" and can become difficult to take the entire balance.

As a result, during each step, but it can accumulate over the process, not corresponding to the placement of personnel changes in production volume.



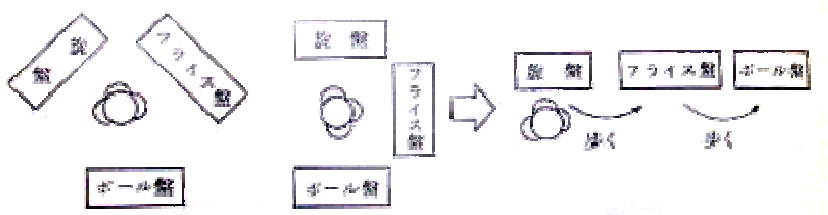
This time, they are flourishing motion analysis has been done, a worker in one place one step Kazu Ayumi, but to work with minimal operation is the best way.

Walking is a rather bad, because the machine had been placed on the idea. This is a productive, efficient work done considering only the individual worker, the entire line from the viewpoint of efficiency and synchronization, and results were not considered efficient way.

The rise of current production methods 1-4

Therefore, the flow of things well, raised productivity, workers will understand that in order to walk out and work, work that is surrounded by a machine operator until now, the machine arranged in a straight, well you can walk to work, moreover, which was also arranged to have one can do anything.

In a straight alignment machine, and separate line when the production volume in relation to staffing, 0. Would be odd in that many people.



0. Many of staffing as it is not to be left alone because they are rounded up, the trend of the past become the building means.

Therefore, by combining some lines, 0. One minute to absorb that many jobs. And placement of personnel for the change in production volume, we first combination of work, commensurate with production only need to be made by obstacles.

These clinical deterioration, mechanical alignment of our efforts by the accumulation of many people, now is the present.