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TPS Manual - Chapter 1, Section 2

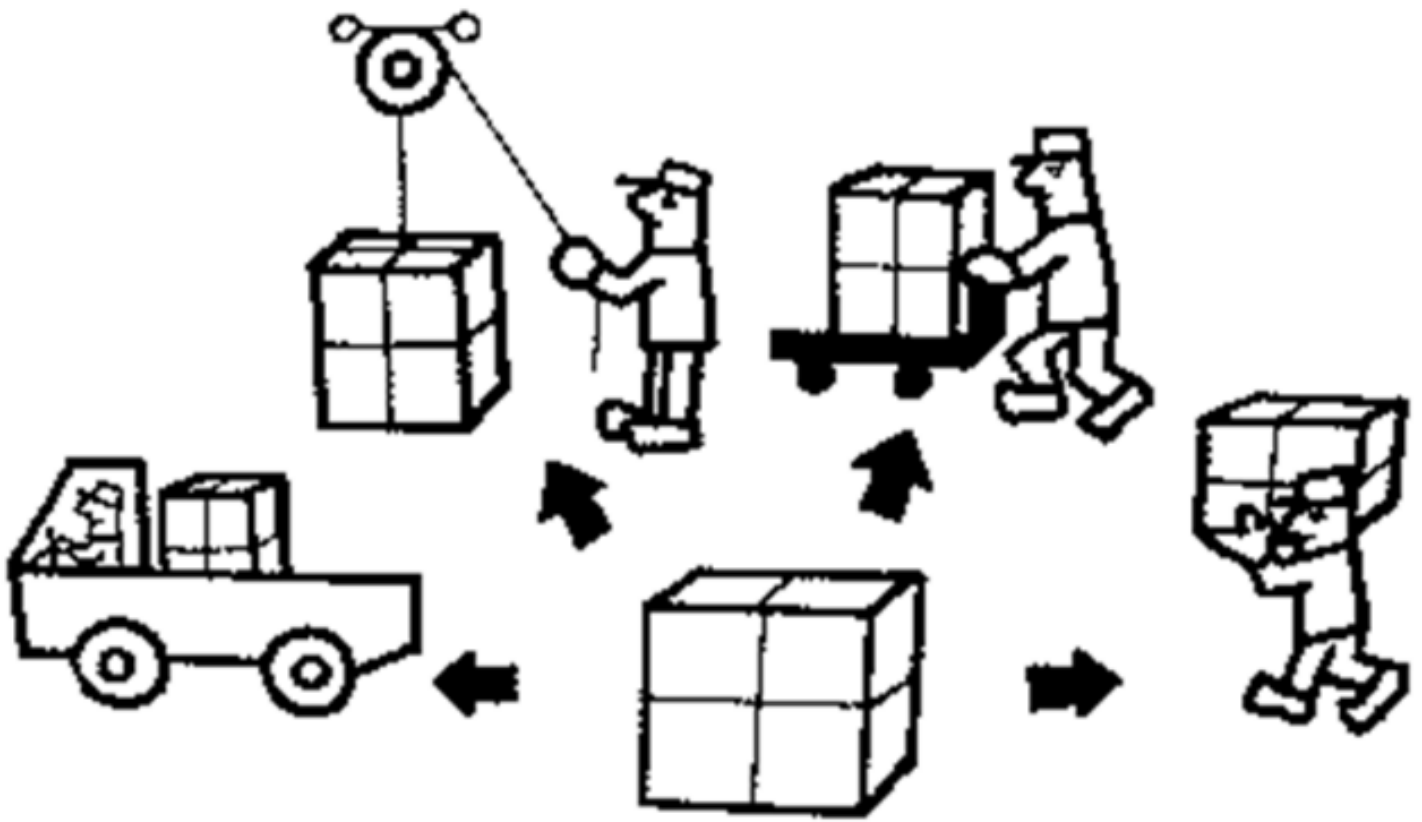
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This is the second part of the TPS Manual. The translations are from the 1973 version.

Section 2 - Labor Reduction and Cost

The objective of labor reduction is cost reduction.

In this section, we will talk about the relationship between labor reduction and cost reduction, while focusing on the concept of economic efficiency, which is the "basic idea" of Section 1.



There are many ways to meet an objective

Toyota's labor reduction effort is a company-wide activity concerned with the workplace, whose purpose is cost reduction. To sum it up, all the various concepts and improvement policies, must ultimately lead to cost reductions. All evaluation criteria are decided based on whether they can achieve cost reductions.

Problem of deciding which is more beneficial; A or B - Consider the case of deciding where, if we pick option **A**, we can't pick option **B** (or possibly the other way around). In this case, we decide based on whether **A** or **B** is more beneficial for everyone in Toyota.

There might be one objective, but there are many means. For example, when we consider which is more effective: maintaining the current method of production, or doing it with one less person.

Problem of selecting from numerous choices - For "reducing people", there should be many approaches available. We must investigate which one among these is the most beneficial. Sometimes multiple choices occur independently; and the evaluations may occur separately, after testing the improvements, consider them relative to each other.

Sometimes there is improvement where **B** is not sufficient. If the investigation of **B** is not sufficient, this generally leads to an unreasonable improvement plan (one that costs more money.) Even though, such a plan is still valid relative to **A** and thus seemingly advantageous as a

whole; it may cause rather bad results.

For example: Let's say there was a plan to reduce the number of people by one, when we installed an electric controller that costs ¥100,000. If we carry out this plan, since we could reduce the number of people by one for the cost of ¥100,000, and claim that it was a big profit for Toyota.

However, after you consider the other options carefully, you may find out that one person could be reduced by changing the work procedure without investing any money. Then the plan to improve by spending ¥100,000 is not a success, but a failure from rushed decision making.

Therefore, we don't do just anything because it's profitable. Instead we must go for the plan that we believed to be the most profitable among all the other profitable options.

We have pay close attention, since this is a mistake one is easily prone to make when introducing automation.

Unnecessary Activity Increases Cost

The basic concept of the TPS is to improve the productivity by eliminating unnecessary activity. We believe it is not necessary to explain how this helps in reducing costs at this point, but when it comes to how much it helps, interpretation varies according to each person. With that in mind, we shall explain how we believe unnecessary activity affects production cost.

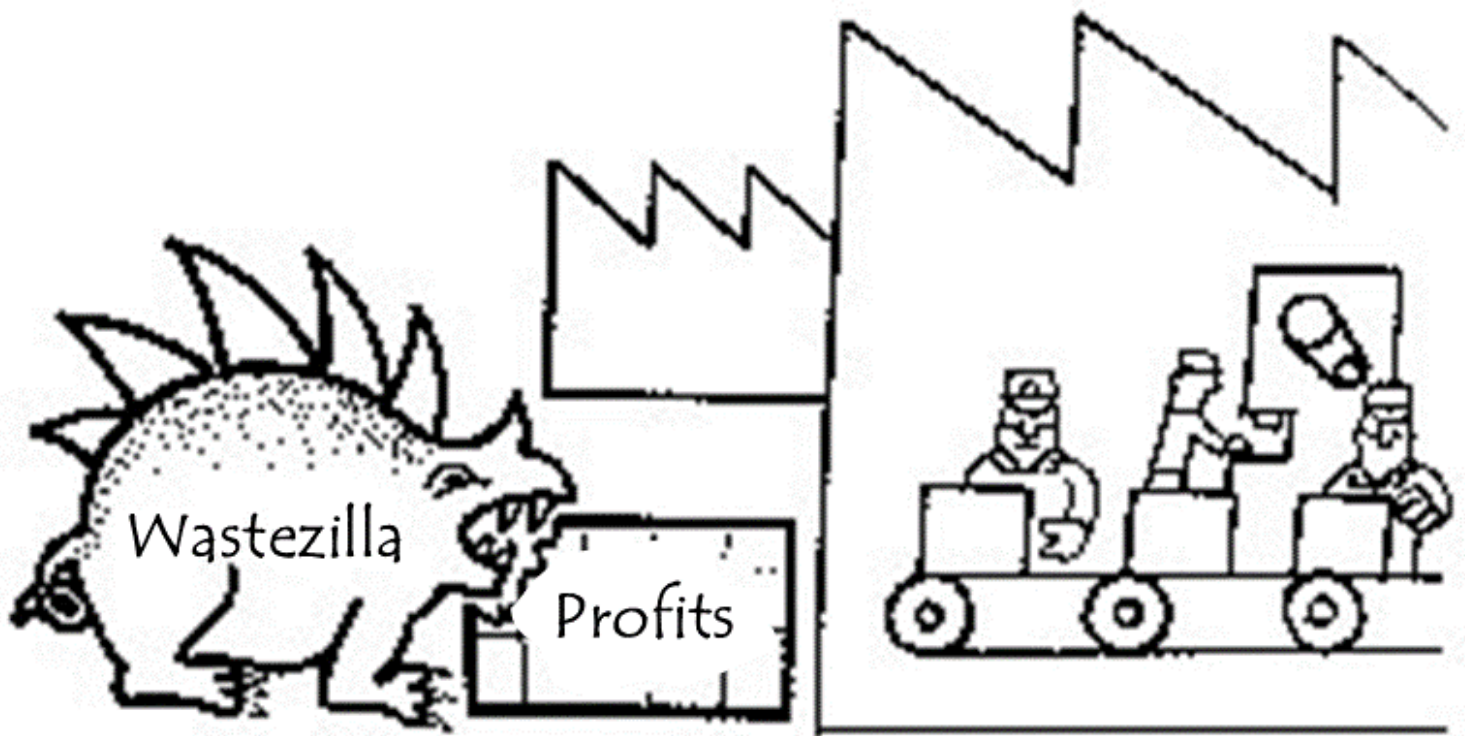
If we are to borrow a phrase, the definition of "unnecessary activity in the production workplace" would be the factors which "only increase cost." For example, too many people, excessive equipment, too much inventory, and the like. Anything that exists more than needed, be it people, equipment, raw materials, or products, would only be increasing the cost. In addition, this unnecessary activity causes further unnecessary secondary activities.

For example, if there are too many people, you may create some work for them to do. The power and materials consumed for this labor can be considered as secondary unnecessary activity.

The largest unnecessary activity is caused by overstocked inventory. Let's take a closer look on this example. Suppose we have more inventory than needed. If all of it can't go in the factory alone, then there will be a need to build a warehouse, we will have to employ people to transport it to the warehouse, and we will have to buy a forklift (or truck) for each of these people. We would also need to allocate some people to the warehouses to manage the inventory and protect it. And even after doing all that, scratches, rust, or other damage are still likely to occur. Then you need more people for repair work.

Knowing what you have and how many is time consuming. This drives the need for considerable labor in the management department. When manual tracking reaches its limits, someone will come up with the idea of installing computers to manage the inventory.

If you know what you have and how many, then you will have shortage of products. And then, we will start thinking that our production capabilities must be insufficient because a stock-out occurred even though we produce it daily. So, expansion plans are placed in the capital investment for next fiscal year. And once the new equipment is introduced, we will have even more inventory to manage.



All the additional people, forklifts, pallets, manufacturing plants, computers, and equipment we mentioned here would be unnecessary. These are secondary things that were added all because of unnecessary inventory. This is all unnecessary if there were no such excess inventory.

Such an example is an assumption of the worst-case-scenario. Occurrences like this can happen anywhere at different scales. It can easily happen right away if we get a little careless. It is difficult to determine what is necessary and what is unnecessary; some details are hard to notice. Nevertheless, considering the magnitude of the impact, it is important to give close attention daily.

As shown in the earlier example, mistaking the order of priorities, ending up with a stock-

out, and assuming it to be a lack of capacities, ultimately lead to investing in unnecessary equipment. A mistake that is difficult to undo.

The primary and secondary unnecessary activity described above, all will be included in the direct labor costs, depreciation costs, general and administrative expenses, thus increasing the entire production cost.

When we think this way, we cannot ignore the parts where unnecessary activity causes an increase in cost. Not to mention, a mistake like this could cause unnecessary activity to eat away the profit we make, which could compromise management itself.

This way of perceiving cost underlies the objective of TPS regarding cost reduction. We emphasize elimination of unnecessary activity, because we believe that by reducing inventory and people, clarifying the surplus capacity of the equipment, and by removing the secondary unnecessary activity, this will lead to cost reductions.

Concept of Economic Advantage

In Section One, we explained the basic idea of how we think and practice. That all the decisions are based on the question, "Is this going to reduce costs or not?"

In the following section, let's look at the concept of the TPS from the "economic engineering" point of view and discuss what is economically advantageous.

With and Without Reserve Capacity - Economic advantage varies from situation to situation, if there is a surplus in production capacity or not. To put it simply, in times of surplus, we use people who have nothing productive to do, and idle machines, so there is no additional cost.

(A) The problem of in-house production or outsourcing - There are many cases where we compare the costs of producing an article in-house or outsourcing it. If there is spare capacity of in-house production, the actual additional cost is only the variable costs such as materials and consumables. Accordingly, in-house production would be beneficial without even needing to compare.

The same can be said about the following example: If a transport operator is waiting beside the line until the pallet is full, assigning them some line work or preparatory work will not create additional costs. This is obvious without making investigation into the profit and loss. It is a mistake to think that this labor improvement will raise your labor efficiency.

(B) The problem of making smaller lots - If there is a surplus in general-purpose machinery such as presses, putting the problem of shortening the setup time aside, it is best to

keep lots as small as possible when producing something.

If you still cannot reach the scheduled time, you use the time to the practice changeover improvements, which is more profitable than doing nothing. The reason for this is the same as (A).

If there is surplus capacity, there is no need to investigate cost, since profitability is clear as it can be. What matters here, is to always make it obvious when we have surplus capacity. If the surplus capacity is not obvious, this can lead to misjudgment and increase the cost.

In TPS, we take this one step further, and put effort into improvements that squeeze out the surplus. If there is surplus capacity, it may be considered as 'free', as explained in the example above.

Sunk Costs - Costs and expense that have already been paid are irrelevant to plans or measures in the future. When you think about improvements, it is a mistake to think that this is the constraint condition.

Looking at it from the other side, we can't evaluate the effectiveness of the special-use equipment, devices, and pallets, which have been economized by the improvement activities. It is only too clear that they were once unnecessary activities.

We should take advantage of using this as learning lesson for planning future investments.

Is it really a loss to not make expensive equipment operate fully? - In principle, once a piece of equipment is installed in the workplace, regardless of whether it is cheap or expensive, the price is irrelevant to the use of the equipment.

When you must choose between using expensive equipment **A**, or simple equipment **B**, you should choose the one whose overall operating cost is less. (Usually the expenses for **A** should be cheaper as the machine is more expensive...) However, more expensive, higher performing machinery usually has a different problem to consider; that you must put in more effort to technically master using the machine. It is noteworthy here that it is unreasonable to think that "it is a loss to frequently change setups, because it is expensive equipment"; there are many other conditions you should consider.

Reducing People Reduces Costs - Index the takt time from the required number, and establishing processes where the people can work with 100% capacity, a single person could operate multiple machines (or large variety of machines).

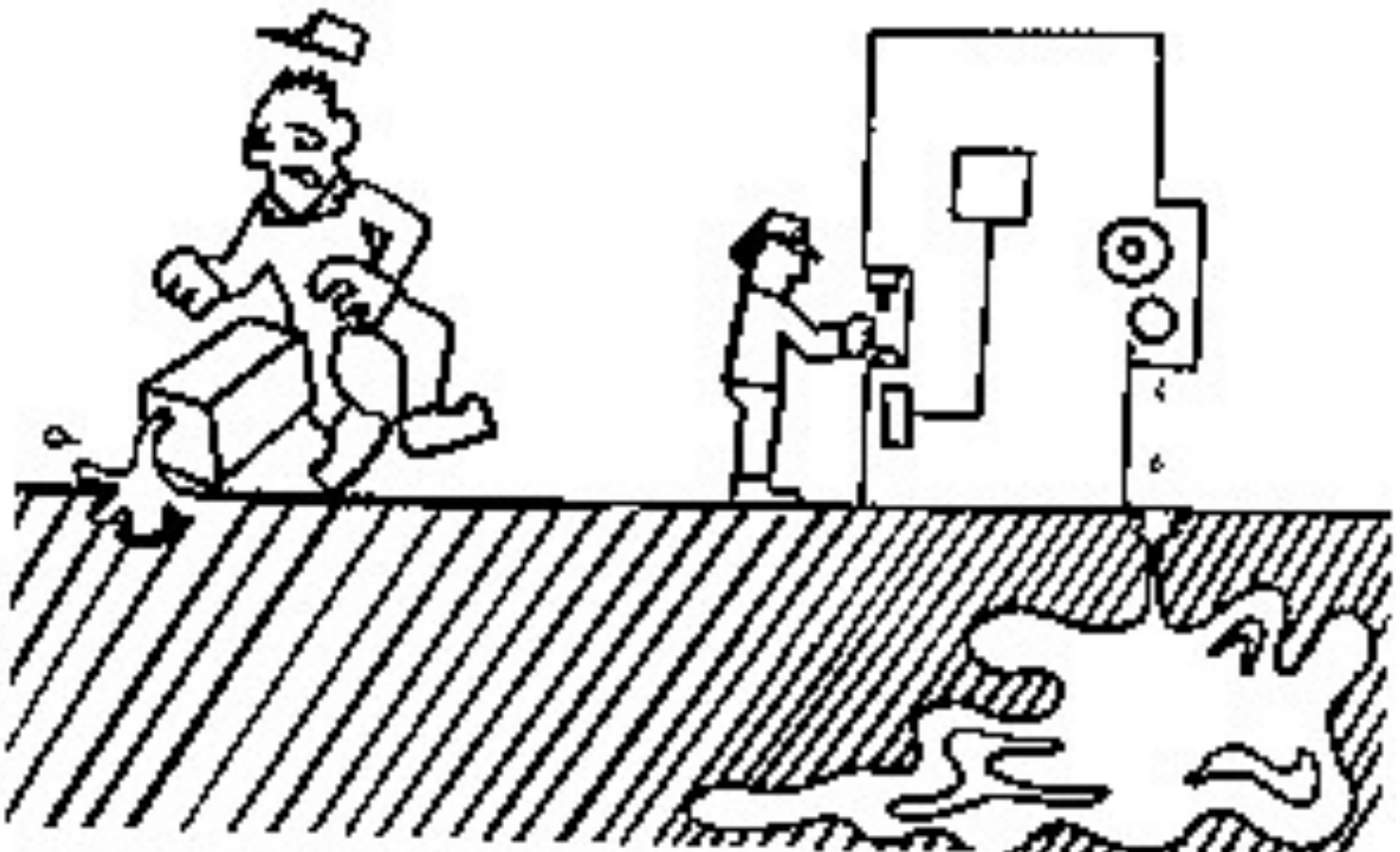
If there is the capacity to make more than necessary, it is wrong to think of leaving a machine

idle as a loss. It is economically advantageous to set up a standard operating procedure that is centered on the work done by people, while the machine work is considered secondary.

Results of Improvement and Planning - It's not unusual to hear that after implementing improvements, a lot of fork lifts or storage racks and pallets are not used, or space has become vacant. However, this cannot be valued as an improvement, because no matter how many of them you have managed to spare, it wouldn't create any profit.

In such cases, it's important to think about just how many unnecessary things looked as if they were necessary depending on the current production method. Give feedback to the planning department so the same type of mistake is not repeated in the next project. A plan is something that is created based on the current situation.

When there are a lot of unnecessary activities in the way things are currently done, the same methods end up being incorporated into the next plan. Furthermore, once the investments are made, they can't be undone, even if improvements are made. This is important. Such a relationship should be fully recognized. You should make efforts to eliminate the unnecessary activity from sites daily, and at the same time, and you should not neglect to report unnecessary activity to management once they are brought to light by the improvement process.



Continuous Costs and Temporary Costs - Costs incurred daily seem to be reasonable when you look at them individually, this makes them easy to overlook. On the contrary, tem-

porary expenses tend to be noticed because they often have high costs, so they tend to be viewed as a loss. But if you convert the total cost of the continuous daily costs over a year into a temporary cost, it is often surprisingly expensive. In many cases you feel the costs for the improvement are too expensive (apart from the problem of finding a cheaper way) and the continuous cost is unchecked, leading to loss.

Do not decide things just by feelings, get the facts and always do the necessary calculations. A frequently discussed issue about the installation of signal lights, and cost of setting up sign boards, or, when the improvement increased overtime.

How to use Ratios - Concept such as "**X** ratio is improved" or "this approach more advantageous since **X** rate is higher" may lead different judgment according to its purpose. There are many cases when scales such as the profit ratio of a product or an investment should not be used when choosing the beneficial product or investment. (The reason is complicated, so it has been omitted).

We would like to discuss the utilization rate in terms of cost. People often think that a decline of the utilization rate is equal to a loss. But, the most profitable way with least amount of unnecessary activity is to produce only necessary amount of what you need, when you need them. What would happen if we got obsessed over the utilization ratio and have all our machinery working at 100% capacity?

Finished products, as well as intermediate products will be piled up like a mountain, and the number of people required could be doubled or even tripled. We'll also have to purchase several times the current amount of raw materials and parts than we currently purchase. Looking at this in terms of expenditure and income, expenditure could be three or four times higher, but the income will not change at all. It is far more than just a loss.

It is best to regard the utilization rate as something to be determined by the required number of products. It is important to have the machinery available for use whenever it is needed. If not, this may cause an opportunity loss and overtime which may result in a loss. TPS considers these rates separately. (See the section of Chapter 2, utilization rate and the movable rate)

Summary

In this chapter, we have discussed how cost is considered and how a decision of economic efficiency is made within TPS.

Before closing this discussion, it must be noted that the economic efficiency varies in many ways according to external conditions. To put it in an extreme way, what was profitable yesterday, might be a loss today, if any new factors are introduced.

For example, when wage agreement contracts change from time-based to production-based, the problem of profit and loss emerges in a different form.

We believe that there are many other examples, as well as many challenges concerning the necessity of improvement, which have not been discussed in this section.

To sum things up, we have discussed how we should always find out the most economic option while keeping many conditions in mind.

Make this the standard of thinking for implementing improvements.

To be continued..

Section 3 - Labor Reduction and Quality

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