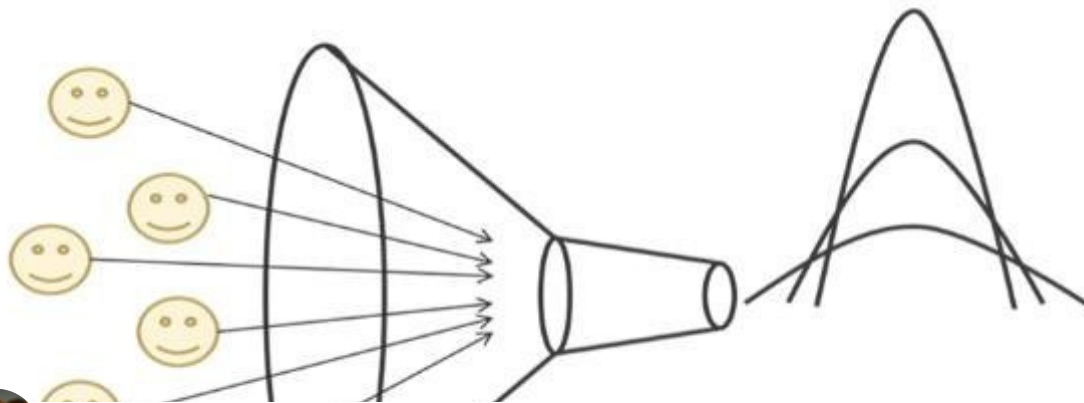




Mark Warren

Experienced Manufacturing Professional "Discovering Solutions with People"

Walkabout - Developing Awareness - #2

July 16, 2017 • 14 Likes • 2 Comments

Part 2 of 3 in a series.

Option 2 - Focus on Production

The *"Focus on Production"* has a defined path of discovery (fact finding), weigh and decide (choosing the segments that will make the most impact), convergence on how people do the tasks; their *'one best way'* (Job Instruction - JI), then improving the process (Job Methods - JM) and training to the new *'best way'*.

Ohno's Objective was to Create Flow



From a system with
disruptions and obstacles

...to a system that
flowed smoothly



Our purpose is to develop a clear understanding that the primary objective in creating an adaptive production system is for creating *flow*.

We start by developing awareness of the problems encountered along the process flow. You may already track the safety, quality or productivity issues; we want to heighten your awareness to some of the hidden barriers. Often, the hidden barriers have only some *symptoms* visible. Ohno created a way to more easily identify symptoms that are hidden barriers - he started with the 3 M's.

Ohno's 3-M's

Muda

not useful

Mura

uneven

Muri

unreasonable

THE SEVEN WASTES

Waste Symptom	Observed
Overproduction – early or extra production of materials, and producing unordered goods.	<i>TWO WEEKS WORTH OF CASTINGS HAVE ARRIVED FROM THE SUPPLIER INSTEAD OF TWO DAYS OF INVENTORY. CASTING SUPPLIER DOES PRODUCTION RUNS MORE THAN A MONTH AHEAD OF DELIVERY DATES</i>
Waiting – idle time waiting on machine, materials or people.	<i>THE PUMP ASSEMBLY OPERATOR SPENDS ABOUT 2 HOURS A DAY WAITING ON HOUSING FROM THE MACHINING DEPARTMENT</i>
Transportation – handling more than once, delays in moving materials, unnecessary moving or handling.	<i>THE CASTINGS ARE DELIVERED TO THE DOCK, THEN MOVED TO BE CHECKED BY ACCOUNTING, THEN MOVED TO INSPECTION BEFORE DELIVERY TO THE MACHINING DEPARTMENT</i>
Inventory - unnecessary raw materials in stores, work in process (WIP), and finished stocks.	<i>MACHINING DOES NOT MOVE THE FINISHED CASTING TO ASSEMBLY AT REGULAR INTERVALS. IT CAN BE FROM 4 TO 6 HOURS OF PRODUCTION (MAY BE CAUSING THE WAIT TIMES IN ASSEMBLY)</i>
Motion – extra unnecessary movement of equipment or people.	
Over-processing – unnecessary processing or procedures.	
Defects – producing and reworking, or scrap.	<i>MACHINING IS HAVING ABOUT 10% SCRAP BECAUSE THEY ARE NOT MOUNTING THE RAW CASTING PROPERLY</i>

Step 1. Discover Waste Symptom

Step 2. Understand Why it is there (5 Whys + FOG)

Step 3. Improve Flow (solve and implement countermeasures)

Muda or the 7-Wastes are the best known of the 3-M's. Here is an example of the 7-Wastes from that has been filled in.

We can start by walking your process flow and having people identify examples.

Once the disruptions to flow are well understood, we will walk the process sequence again and list the activities. This is a starting point to build a basic process map.

Once the process map is outlines, we can begin to link each of the problems to the activity.

JOB METHODS ACTIVITY SHEET		CHECKLIST	
Job:		An ACTIVITY is	
		Every single thing that is done:	
		Operation	
		Inspection	
		Transport	
		Storage	
		Delay	
		It helps to find activities if you think in terms of:	
		Getting or Placing temporarily	GET READY activities
		Working on or Checking	KEY activities
		Placing temporarily Placing finally	PUT AWAY activities
		Snags and Difficulties	
		- Key Points - 'positives' you must remember	
		- Snags and Difficulties - 'negatives' you work to remove.	
		Examples are:	
		Effects of delays	
		Awkward movements	
		Distances to walk	
		Reaching (over shoulder level, lifting below knees)	
		Dangers	
		Unpleasant tasks	
		Quality affected (one only some people can master)	
		Waste, etc.	
		"KEY activity"	
		- One that produces a significant change in the material being worked on	
		- KEY activities are to be tackled first	
		- Weak activity in system	
		- Bottleneck activity, limits capacity of system	

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DISCOVERING PROBLEMS

1. GO TO THE WORKPLACE REGULARLY

Avoid Surprises
Do not work from memory.

2. OBSERVE

Be patient, use all of your senses to observe, not

just your eyes. (More than one sample.)

Check for scrap, breakages, damages, stock write offs, stock holdings, rejects, rework, production targets, holdups, bottlenecks, morale, lack of communication, customer complaints, product returns.

3. QUESTION

Talk to people concerned, get opinions, develop understanding, never blame.

Discover possible impacts – Safety, Quality, Quantity, Cost

Look for patterns, abnormalities.

4. RECORD THE FACTS

Validation process using F.O.G.

Experiment to validate guesses.

Capture all details revealed.

Is the fact relevant to the problem?

5. CLASSIFY AND STATE PROBLEMS

People – skills, attitude,

Method – process, machine, materials, layout flow, suppliers.

List out all the problems you see with evidence.

Arrange in easily understandable way.

Avoid too much of information.

NO PROBLEM, IS A PROBLEM

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Before you make a decision about a problem or symptom discovered, there is a fact finding phase.

First, we make sure we actually see the problem. Better - have an example of a '*good*' and '*bad*' part for more accurate data gathering.

Second, observe with all your senses.

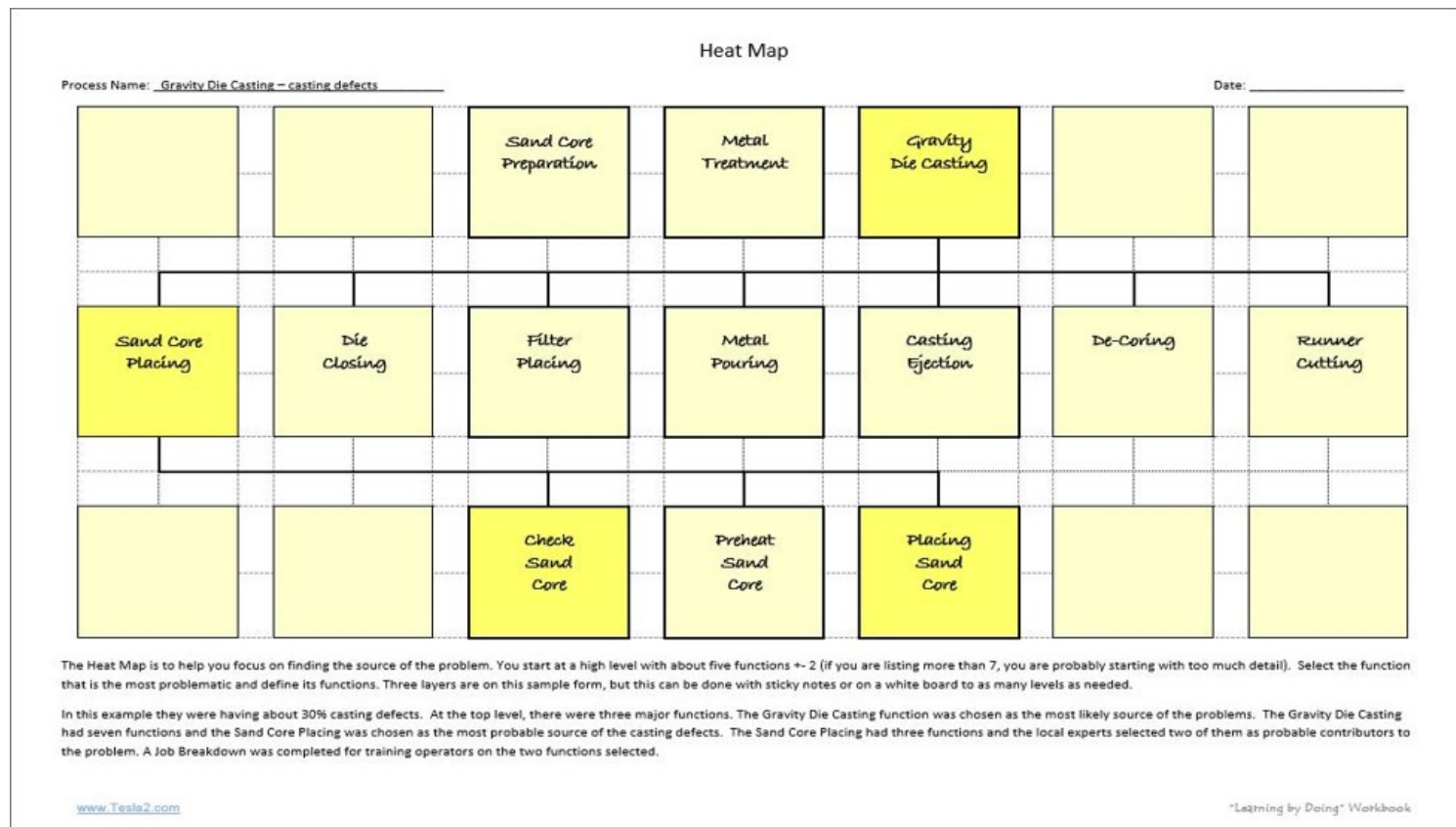
Third, question for *fact finding*, not finding out *who to blame*. (We have a series of example questions that can be asked to draw out information.)

Fourth, the objective is getting facts so you can make accurate decisions. We use the 5-Whys + FOG (Fact-Opinion-Guess) to get to the root cause(s).

Fifth, classifying the problem is a 'weigh and decide' step. Do we have a '*people*' problem where there is no consistent method used by all? The first step will be getting a standardized way of doing the task. Do we have a '*process*' problem that needs improvement? If so, then we select the activity that needs to be improved and apply the '*challenge*' questions to help develop ideas.

Optional - Heat Map

Creating a Heat Map is an optional way to select which problem area needs the most attention - will make the most difference to the process if resolved.



Example: The Heat Map above was used to search for possible root cause(s) for about 30% scrap and re-work on an air compressor intake manifold; primarily porosity, but also internal defects.

- Why #1 – What do you think is the contributor for the casting porosity?
- “We think that it is related to the Sand Core placing.” (This guess will require validation – an experiment.)
- Why #2 – What are the Important Steps in the sand core placing?
- “It has three Important Steps and two of these are equal possible contributors. The possible contributors are defective sand cores that are not identified before using and the other is the damage that can be done to the sand core while placing it in the steel die.”
- Why #3 – Do you have a process (JBS - Job Breakdown Sheet)
- “No.” (The next steps will be to create a job breakdown sheet with subject matter experts and then train all the operators to the new process as defined in the JBS.)

Name of Job:		Gravity Die Casting			
Materials Required:					
Tools, Supplies, Info:					
Common Key Point:		Porosity defects 30%			
WHAT	<u>Important Steps:</u> Logical sequence of steps which advance the work	HOW	<u>Key Points:</u> Make or break the job, make the job easier, can injure the worker	WHY	<u>Reasons:</u> Explains the key points
Check Sand Core		Uniform coating		Affects finish of casting	
		Parting line cleaning – smooth		Affects finish of casting	
		Damage profile check		The blemishes may cause part to be rejected or require rework	
		Hollow of core		Break during casting	
Preheat Sand Core		To a minimum of 110° C.		Drive off any remaining moisture	
		15-20 minutes		Ensure no moisture in core – moisture contributes to porosity	
Placing Sand Core		Core print are seating position (pins in location)		To ensure that the core is properly located	
		Blowing air		To remove loose sand from mold area	
		Check core for cracks		Core can break while placing in die. Crack will leave a parting line and casting will be rejected.	

An experiment will be used to track the defect rate after training to see if this reduces the number of defects.

The training was successful and did reduce the number of defects, but the 'Whys' should not stop there. Both Important Steps are using the operator to check for the quality of earlier steps. The 'Whys' need to continue to eliminate as many of the causes in the earlier steps as possible.

- Why #4 – Why do you need to check the sand core for defects? What defects are you looking for?
- “Sometimes they are cracked, or have mold lines, or uneven coating on the sand core that affects the

finish.”

- Why #5 – Do you have processes (JBS) for making the sand core?
- “No.” Next step would be to create JBS for each of the steps for the making of the sand core and training all the operators to the new standards.
- Why #6 – Why do you need to be careful in placing the sand core in the steel die?
- “*You can break or crack the core while trying to seat the alignment pins of the core.*”
- Why #7 – Why do you need to be so careful, is the sand core that brittle?
- “*No, most of the time we crack or break the sand core because of the poor fit of the alignment pins in the mold. The operator has a file to shape them to fit, instead of forcing it.*” (Any sort of rework or sorting operation is a '**red flag**' indicating a problem.)
- Why #8 – Why is this fit not checked during the finishing of the sand core? (*This process should have a fixture to test fit the sand core before sending them to the casting department.*)

The problem solving process migrates upstream to the production of the sand cores. When you do the Problem Discovery in this process, it is normal to uncover problems originating further upstream in the process flow.

Root Cause / Impact Analysis

Symptoms		
Reference:		
Investigator(s)		Date:

5 Why's to understand	Find root cause
Check for <i>Fact</i> – <i>Opinion</i> – <i>Guess</i> Also define your area of control	
Why – 1	
Why – 2	
Why – 3	
Why – 4	
Why – 5	

Major root cause	
Major impact if neglected	

The 5-Whys starts with the discovery of a symptom. Be careful you do not define a solution or what you

think is the cause in the beginning. This is a discovery process.

To improve the effectiveness of the 5-Whys process, validate each response. Assume that the first answer is a guess. By seeking to validate it as a quantifiable fact may slow you down a bit, but it will also lead to better next questions and improve the likelihood that you will discover a root cause that you can resolve.

Notice the last section of the form - "Major impact if neglected". This is a practice exercise to consider the effects that the problem has on downstream events. This can also drive a sense of urgency to implement a containment or solution.

Ranking - weigh and decide - If you improved one activity, which one would make the most difference in morale, safety, quality, productivity or cost? The fact finding discovery process or the 'Heat map' helps you focus first on solving problems that will make an immediate difference.

Building the Job Breakdown is best done by a team of three where the job is done. One person is the team leader or supervisor, the other two should be the most skilled employees that do the job. You can use a paper form, or a blank piece of paper, or a small whiteboard (I prefer the whiteboard so all participants can see the one working 'document' and quickly make changes).

Start with listing the Important Steps. When you have agreement between the three people, then go back and start listing the Key Points for each Important Step (if there are any - it is possible that there will be none). Defining the Key Points is where you are drawing out the unconscious knowledge that the skilled employee has. This is also the place where you are most likely to have disagreements. A Key Point is a detail that must be done to ensure *safety* or *quality*, or a technique to make the job easier (*productivity*). Once the team agrees on the Key Points, start detailing the Reason Why for each of the Key Points. This draws out information to validate the necessity of the Key Point. (*Having a reason why for each Key Point also shortens the learning curve as well as improving the probability that the learner will understand and follow the instructions.*)

[illegible]

The next step is trying out the Job Breakdown by the team. One acts as the trainer, one as the learner, and

one as the observer. Everyone takes their turn as a trainer, learner and observer. The trying out practice brings out missing details, helps them define the materials required to teach the job, and helps them break up the job breakdown into proper coaching units. Most job instructions start with trying to teach too much at one time. By the time they have the job breakdown refined, you have three people with experience training this job segment.

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Tools, Supplies, Info:					
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Check Sand Core		Uniform coating		Affects finish of casting	
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Placing Sand Core		Core print are seating position (pins in location)		To ensure that the core is properly located	
		Blowing air		To remove loose sand from mold area	
		Check core for cracks		Core can break while placing in die. Crack will leave a parting line and casting will be rejected.	

Experts decided that this was two critical skills that needed separate coaching

Once you have the job breakdown sheet validated, it is time to define who needs to be trained.

It is normal to discover more problems that need to be addressed when you are building the job break-

down sheet. Some of these are problems that can be solved only by improving the process. The 'Green Card' (Job Methods) is a structured process that helps you quickly focus on the problem and has a question sequence to help you consider a full range of ideas.



EXPERIMENT RECORD

Investigator:	Process:
Team:	Date:
Problem (symptoms):	
(Idea) If we do...	
Then we expect...	
Experimental Design: (Site, duration, variables, procedure, resources needed)	
What:	
When:	
How many trials:	
Resources used:	
Results (success or failure)	Impact on process:
	Impact on system: (downstream processes and/or customer)
Approved by:	Reviewed by:

Once you have some ideas, then you start an evaluation process to weigh and decide which ideas have the most promise of improving the process. Once you select one or more ideas that have promise, you design an experiment to test (validate) the idea before implementation. Often the testing will generate different results than what you expected (which means you can learn something). Are the results good enough, or did you learn something that suggests that the idea could be improved, or did the results invalidate the idea as a solution?

The '*Experiment Record*' can be used for more than just to validate a proposed new method. It can also be used to validate a guess when you are doing a 5-Whys investigation. Or to validate whether the Job Instruction training has a measurable impact - Safety, Quality, Productivity, Cost, Morale.

Work on improving one activity of a job at a time; don't try to reorganize the whole shop at the same time. Changing one activity at a time allows you to document the effect of each change.

JOB METHODS CHALLENGE SHEET

Key Activity:

Date:

	UNDERSTAND - DEFINE	QUESTION	Ideas for a BETTER way:
Purpose:	WHAT is achieved?	WHY is it necessary?	WHAT also COULD be done?
Place:	WHERE is it done?	WHY there?	WHERE else COULD it be done?
Sequence:	WHEN is it done?	WHY then?	WHEN else COULD it be done?
Person:	WHO should do it?	WHY that person?	WHO else COULD do it?
Means:	HOW is it done?	WHY that way?	HOW else COULD it be done?

HINTS FOR IMPROVING METHODS:

Don't reinvent the wheel

Is/Is Not

Layout

Product Design

Design Is there an internal solution for this problem? Is there a similar internal process that does not have this snag? Is there an existing external solution for this problem?	Process Is there a minimum of back tracking? Are the number of handlings and distances traveled at a minimum? Are aisles wide enough and placed to optimize flow? Is space being used to advantage? Is everything in the convenient work area?	Product Design Would slight change of design or specification of product or equipment improve quality, save materials or time? Is the quality standard correct for this job? (correct tolerances and finish)
Safety Is this method the safest as well as the easiest? Does it conform to safety rules? Has proper safety equipment been provided to the operator? Does the operator understand all safety rules and precautions?	Workplace Is everything in the proper work area? Can gravity feed hoppers or drop delivery chutes be used? Are both hands doing useful work? Has all hand holding of material been eliminated? (clamps or fixtures)	Equipment and Tools Are suitable equipment and tools available? Have they been supplied to the operators? How about gauges, jigs and fixtures? Can holding devices be used? Can gravity aids help? Have equipment, tools and fixtures been properly positioned to permit effective work? Is other equipment available within the organization?
Materials Can better, less expensive, or less scarce materials be used? * Can scrap or waste be reduced, or used for another job? * Have defects and scrap been reduced to a minimum? Are the material specifications entirely clear and definite?	Housekeeping Are working and storage areas are clean and orderly? Is junk taking up space that could be used for productive work? Do away with anything that is unnecessary. Are necessary things in proper place? See that good housekeeping reduces delays, waste and accidents.	Paper Work Could duplications of work be reduced? Can sorting, summarizing, recording, copying, checking, be reduced or simplified? Can the design of the form be improved? Standardization to reduce work?
Machines Is bottleneck machine operating at maximum capacity? Is machine in good operating condition? Are they serviced regularly? Is this the best machine for the operation? Is the set up time optimized?	Flow Can you put processes in better sequence? Can you synchronize processes better? Can you balance work content better? Can you balance the demand pace better?	* Material utilization – for example, with sheet stock, using trimming pieces for another part.

Coaching Action Sheet - a Kanban system for continuous improvement

This form was developed to assist the team leader and supervisor keep track of the problems that they are working on - their continuous improvement log. The team leader or supervisor updates the form daily, documenting activity on the floor. The supervisor and manager use it as part of their weekly '*gemba walk*' coaching exercise. The manager is learning about the progress on each problem while observing if the supervisor followed the problem solving pattern. The manager is responsible for coaching the supervisor where they have weak follow through in the problem solving pattern (*kata*).

COACHING ACTION SHEET	
Yellow Card – Problem Discovery Process Describe 5 problems that need to be addressed.	
1.	☐ Observe ☐ Blue Card ☐ Question ☐ Validate ☐ Green Card ☐ Classify next step
2.	☐ Observe ☐ Blue Card ☐ Question ☐ Validate ☐ Green Card ☐ Classify next step
3.	☐ Observe ☐ Blue Card ☐ Question ☐ Validate ☐ Green Card ☐ Classify next step
4.	☐ Observe ☐ Blue Card ☐ Question ☐ Validate ☐ Green Card ☐ Classify next step
5.	☐ Observe ☐ Blue Card ☐ Question ☐ Validate ☐ Green Card ☐ Classify next step

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Blue Card – Job Breakdown	
1.	
2.	
Blue Card – Training	
	What – Coaching Unit
	Who – to be trained
1.	
2.	
3.	
Green Card – Challenge and Idea Development	
1.	
2.	
Green Card – Experiments	
1.	

Did you accomplish your objectives?

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"LEARNING BY DOING" WORKBOOK

We are now doing experiments where the form is posted in each work area as a poster and the team leader or supervisor uses this as an outline for the short daily meetings. They have a whiteboard on the left where any employee can add a problem or symptom observed, as well as any details. The employees vote on the ranging of the problems, with the highest once going to the first open slots. To the right of the Action Sheet posters, they have a poster board for the completed projects - their success stories.

Below are examples of a filled in Action Sheet:

Yellow Card – Problem Discovery Process

Describe 5 problems that need to be addressed.

1. Spillage issue in die casting department –
between furnace and machine (3 tons/month)

☒ Observe
☒ Blue Card

☒ Question

☒ Validate
☐ Green Card

☒ Classify next step

2. Over 30% rejection of intake manifold for
porosity

☒ Observe
☐ Blue Card

☒ Question

☒ Validate
☐ Green Card

☐ Classify next step

3. Two high volume parts have bottlenecks in the
removal of casting flanges

☒ Observe
☐ Blue Card

☒ Question

☐ Validate
☐ Green Card

☐ Classify next step

4. Operators not filling in their production
figures hourly, waiting to end of day

☒ Observe
☐ Blue Card

☒ Question

☐ Validate
☐ Green Card

☐ Classify next step

5.

☐ Observe
☐ Blue Card

☐ Question

☐ Validate
☐ Green Card

☐ Classify next step

In this example, the #1 problem discovery has been completed and the Blue Card (Job Instruction) is chosen as the next step.

Problem #2 has completed the validation step - they have the facts about the problem, now they move to

choosing the next step.

Problem #3 and #4 are still in the discovery mode - getting facts before deciding on the next steps needed.

Blue Card – Job Breakdown	
1.	check Sand Core
2.	Placing Sand Core
Blue Card – Training	
What – Coaching Unit	Who – to be trained
1.	check Sand Core
	Hari and John
2.	Placing Sand Core
	Hari and John
3.	

Two Job breakdowns have been defined as needed.

Once the Job Breakdowns are ready, the people to be trained have been identified.

Green Card – Challenge and Idea Development

1. Sand Core making and finishing process
2. Manual removal of flashing from die castings

Green Card – Experiments

1. Test pouring funnel shapes at back of manual machine (try patterns like those use with the robots)
Test 'slides' between furnace and machine to capture any spills.

Two activities have been defined as needing *challenge* and *idea development*. The need for this was discovered when they were creating the JBS.

The Experiments to be done were defined during the cycles of applying the Blue Card (Job Instruction) to reduce defects. Each iteration of JBS improved the results, but also uncovered new weaknesses. The Yellow Card (fact finding - discovery) process uncovered that other similar operations had applied some solutions. This is a test to validate whether these same solutions would have a positive impact.

Want to find out what you can learn and accomplish through coaching in a few days?

Interested enough to apply? Contact Mark Warren (mark.tesla2@gmail.com)

Written by



Mark Warren

Experienced Manufacturing Professional "Discovering Solutions with People"

2 comments

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Jason Wei

Business Development Director - Sinopharm Healthcare

... 2mo

Hello, Mark. It is Jason. How are you? Miss you and your mother much.

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