A3 Process
with
8-Step Problem Solving

Training for JTEKT Suppliers

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A3
Process

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Definition of A3

What is an A3?

- A data driven, consensus based process solving form that incorporates a problem solving tool (normally 8 Step Problem Solving).

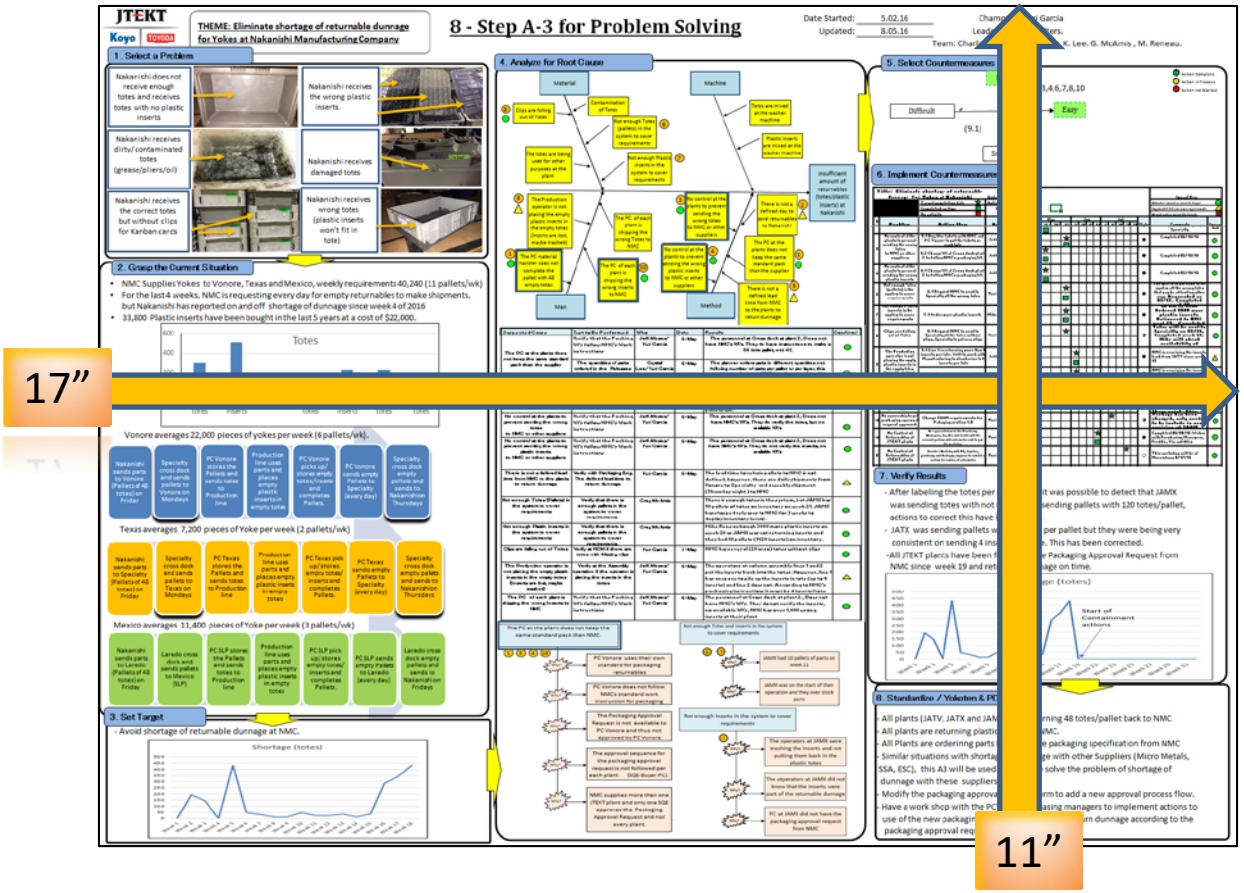
What does it do?

- It identifies an owner or leader of the problem.
- It takes a multidisciplinary approach.
- It helps to visually define, analyze and solve the problem in one single piece of paper.
- Sets targets and it helps to identify the root cause of the problem.
- Identifies the best countermeasures and the responsibility for the implementation of the countermeasures.
- Provides evidence that the issue has been addressed and the problem has been solved.
- It helps to solve “any” type of problem (not only Quality problems).

Definition of A3

Why is it called an A3?

An A3 is the international size of a paper, the size of the paper is 297 mm.(11.7”) X 420 mm.(16.5”), we normally call this size of paper 11”X17”.



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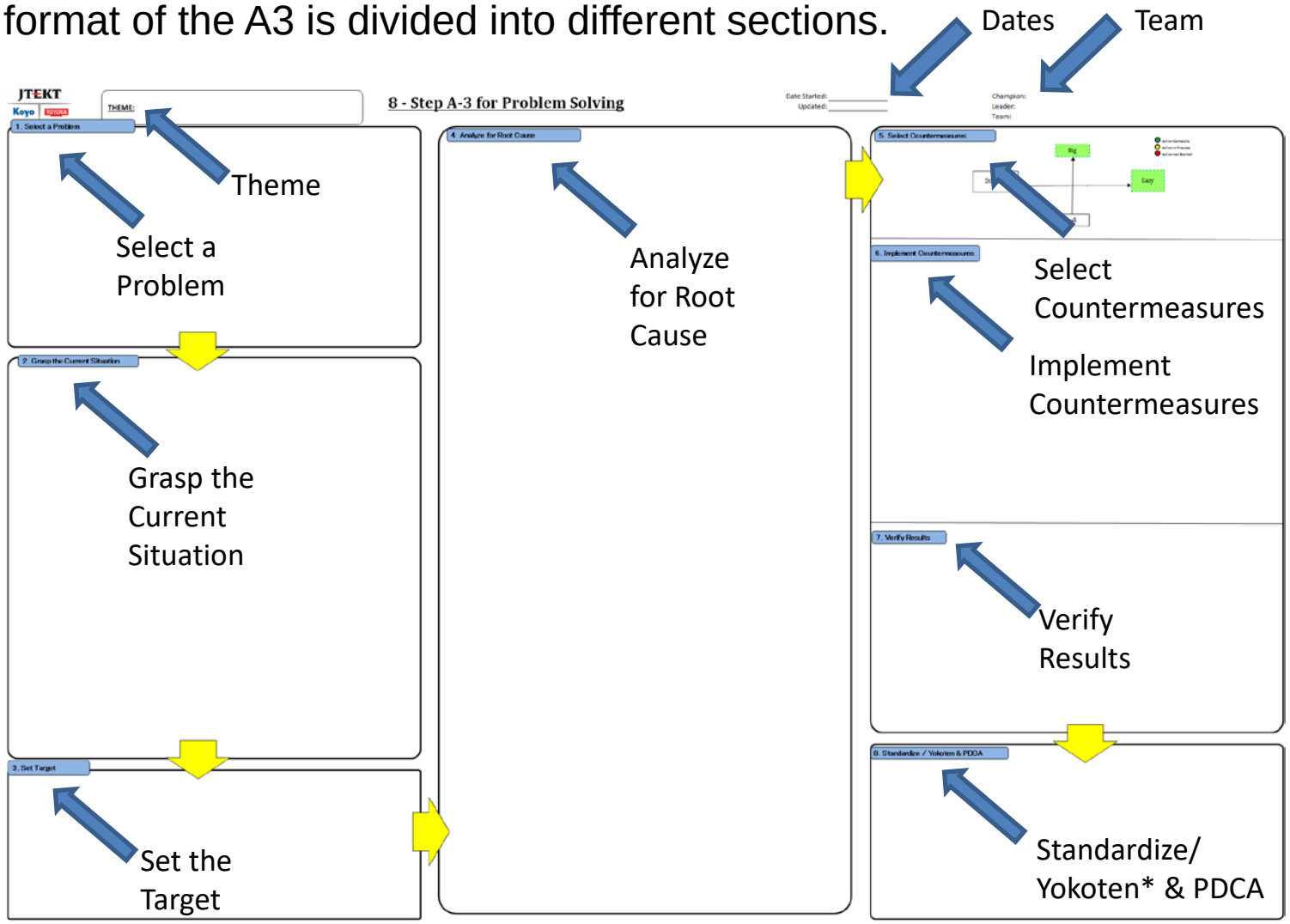
Format of an A3

The format of the A3 is divided into different sections.



Yokoten* Implement the corrective action at other similar lines or processes

Format of an A3

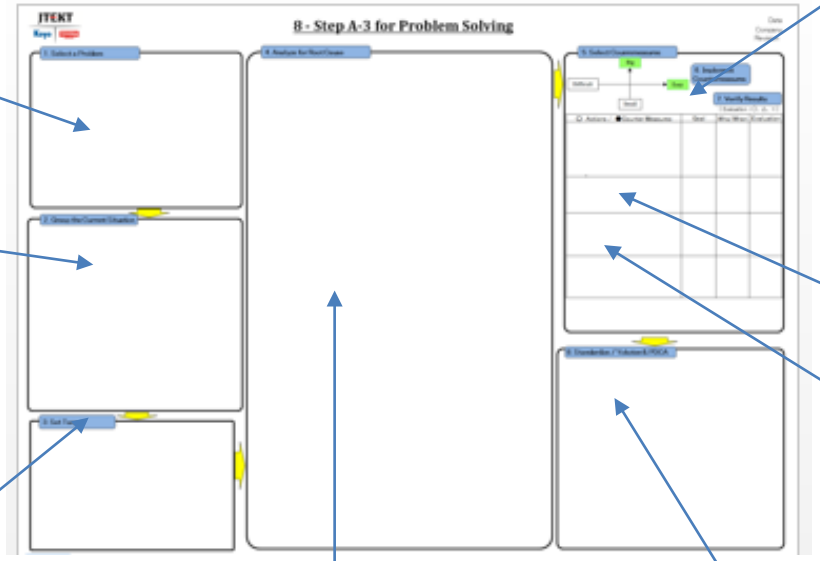
Each section of the A3 is one of the 8-Steps to Problem Solving.

1. PROBLEM STATEMENT
Background information regarding the theme of the problem. Can you see a current PDCA cycle

2. CURRENT SITUATION
Basic information regarding the problem area.
Examples: Line Load, Line Performance, Volumes, Staffing…
Looking for "GAPS" we may need to dive deeper into later

3. TARGET
Initially "General" is ok, as Step#4 becomes more clear our target should get very specific

8 Steps to Problem Solving



4. ANALYSIS
Ishikawa Diagram, Factor Trees Analysis, 5 Why? 1 How?
Should be able to clarify (3) Target in more detail.
Root Cause Statement is clearly defined

5. ACTIONS
ACTIONS may be put in place for getting more detail for "Root Causes", but we are looking for COUNTER MEASURES that address the Root Causes, Prioritized by "Big" or "Small", and "Easy" or "Difficult"

6. DO COUNTER MEASURES

7. RESULTS
Completed by the customer, (O) Good impact, (Δ) Little, or no change, (X) Worse condition.

8. MAINTAIN
Establish a PDCA to maintain improvement, don't forget Yokoten opportunities

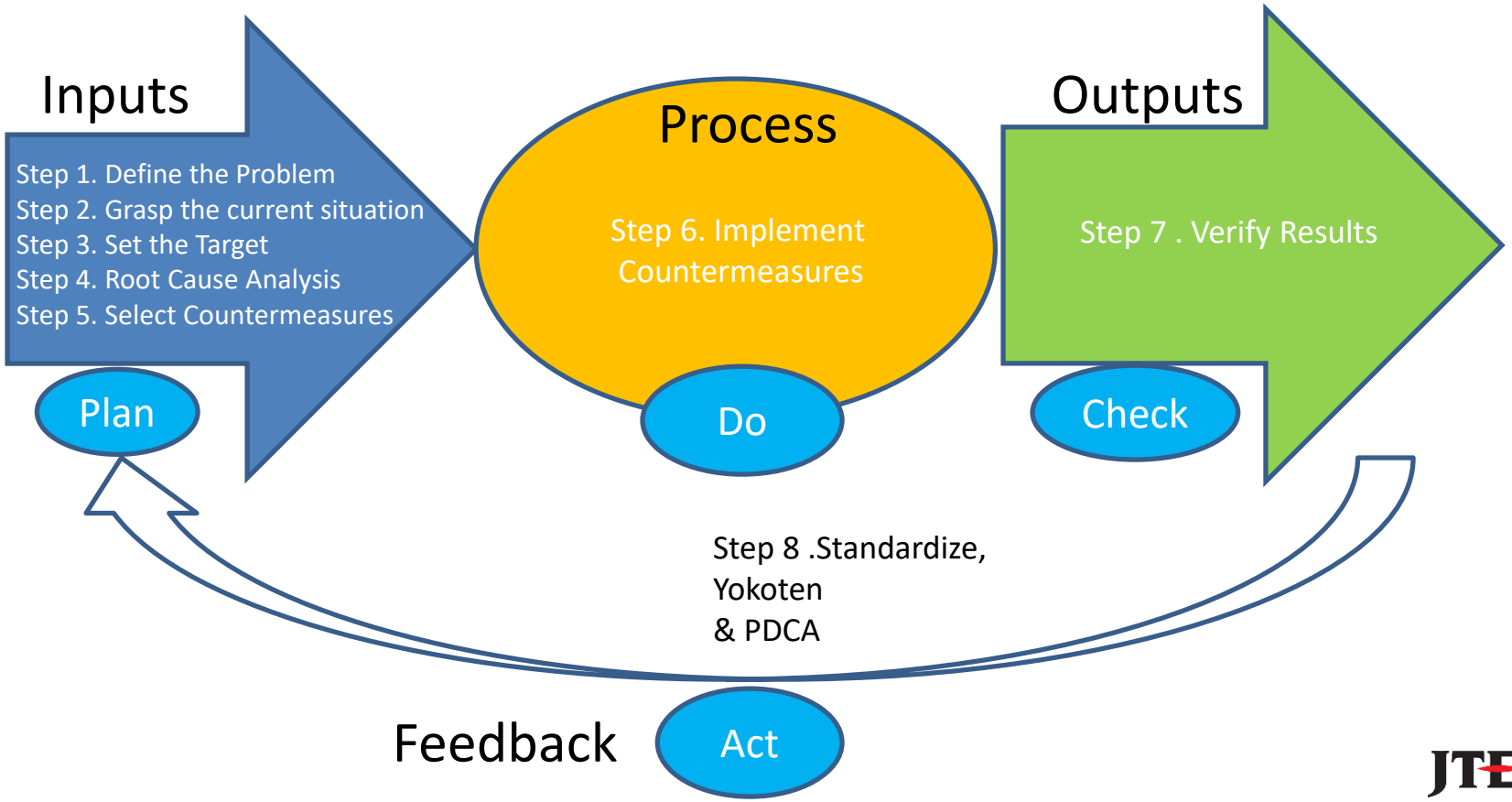
Advantages of an A3

What are the advantages of an A3?

- It is a living document and it will change as activity unfolds.
- All the data and analysis is in ***one*** sheet of paper. Normally an excel file is used for an A3 and allows the team to use other tabs to keep forms, pictures, data analysis or any documentation that helps the 8-step problem solving process.
- Easy to pass along and make revisions.
- Because A3 is a “Visual tool” (the story is told in data and pictures), it is easily understood by anyone in the organization.
- It follows the Plan, Do, Check, Act cycle. This cycle repeats until the problem is solved.
- Is widely used at all the JTEKT plants as a tool to manage problem solving.

A3 Process Approach

Like many other processes, the A3 process approach defines and provides the inputs, runs the process, evaluates the outputs of the process and provides feedback to the process.



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Problem Definition

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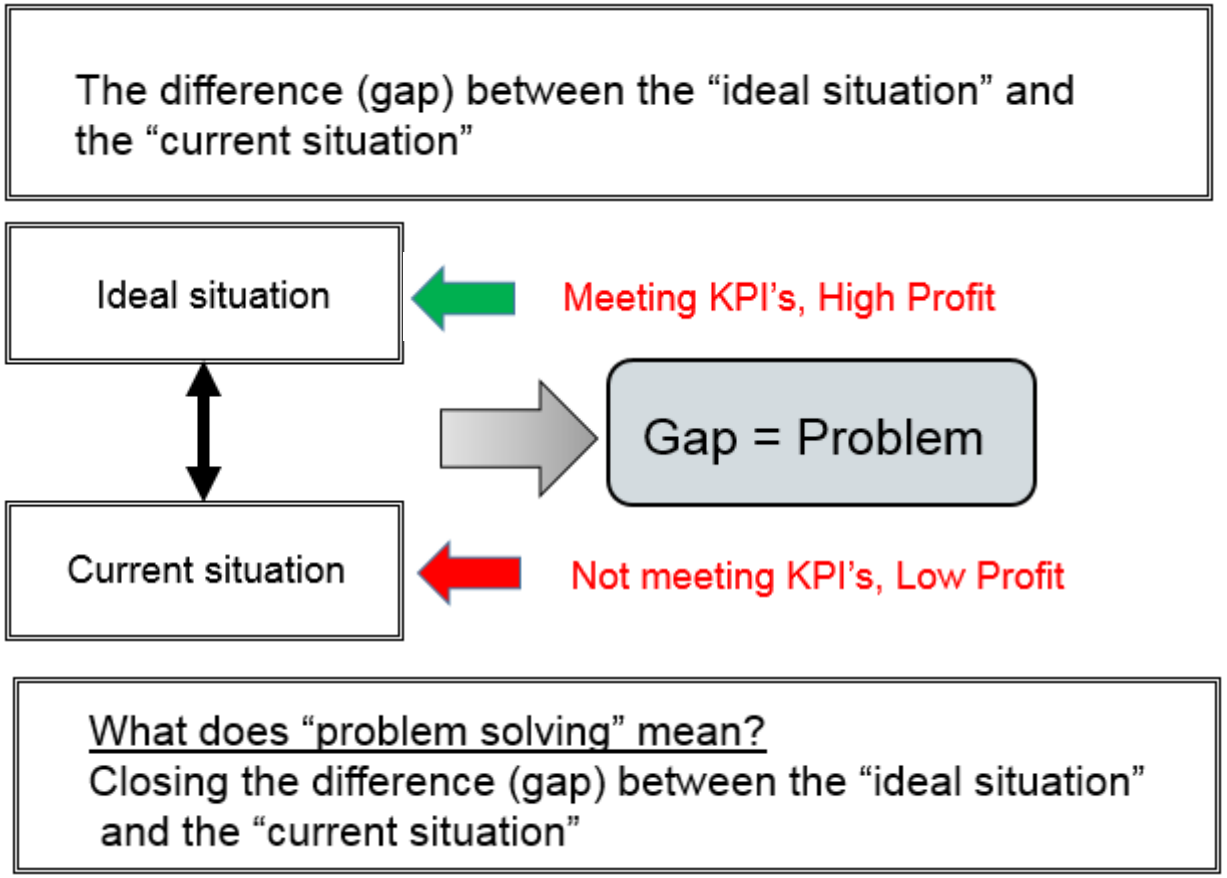
Problem definition

Before we try to solve a problem using the A3 process, we need to understand what is a problem.

A problem is:



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Problem Solving

What is Problem Solving?

- Closing the gap between the current situation and the ideal situation.
- Is the most essential skill and tool used within JTEKT (and any work place).
- Is a methodology used for all aspects of business planning, production and development.
- Is a good way of “organized” thinking and analysis that leads to create effective solutions to problems within the organization.
- Is a methodology that can be applied to any work environment and used by any team member.

The team members of the A3 need to be good problem solvers.

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Problem Solving

What makes a good problem solver?

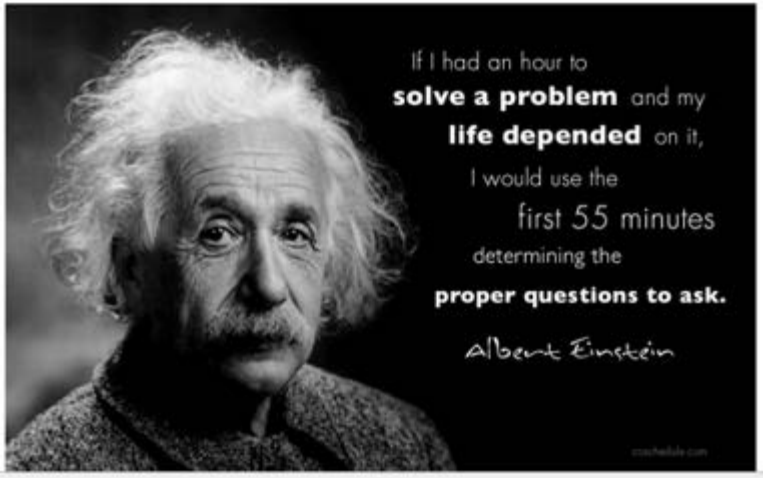
Problem Solving = Organized Common Sense.

- Use of an organized approach (use of A3 and 8 Step problem solving process).
- Excellent listening skills (understand before wanting to be understood)
- Objectivity (it is what it is…..).
- Curiosity (Why do things work the way they do?).
- Creativity (Very important for current condition and root cause analysis).
- Determination to complete the 8 Steps.
- Teamwork, be able to work with the team and provide input to the team.

Problem Solving

To solve problems the organization needs to implement a Non-Blaming Culture where:

- Problems are recognized as opportunities.
- It is OK to make legitimate mistakes.
- Problems are exposed because of increased trust.
- People are not problems, they are problem solvers.
- Emphasis is placed on finding solutions instead of “who did it”.
- Allow all types of questions to understand and solve the problem.



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Problem Solving

Not all problems are equal. There are three classifications you need to know about:

1) Level 1—your team can collect all the data, analyze it and implement the corrective action without any help.

2) Level 2—your team can collect the data, analyze it, but someone else needs to implement the countermeasure.

3) Level 3—your team can collect the data, do some of the analysis but countermeasures must be done by someone outside your facility (customer, corporate or supplier/new vendor).

"A problem well defined is a problem half solved."
Henry Ford

Example of different levels on Quality circles at JTEKT

	LEVEL 1	LEVEL 2	LEVEL 3
1. QC Circle chooses the problem based on SQDC	Yes	Yes	Yes
2. QC Circle can collect all of the data	Yes	Yes	Yes
3. QC Circle can implement the Counter Measures	Yes	Maybe	No
4. QC Circle can track the results of the C/Ms	Yes	Maybe	No
5. QC Circle can standardize the results	Yes	Maybe	Maybe

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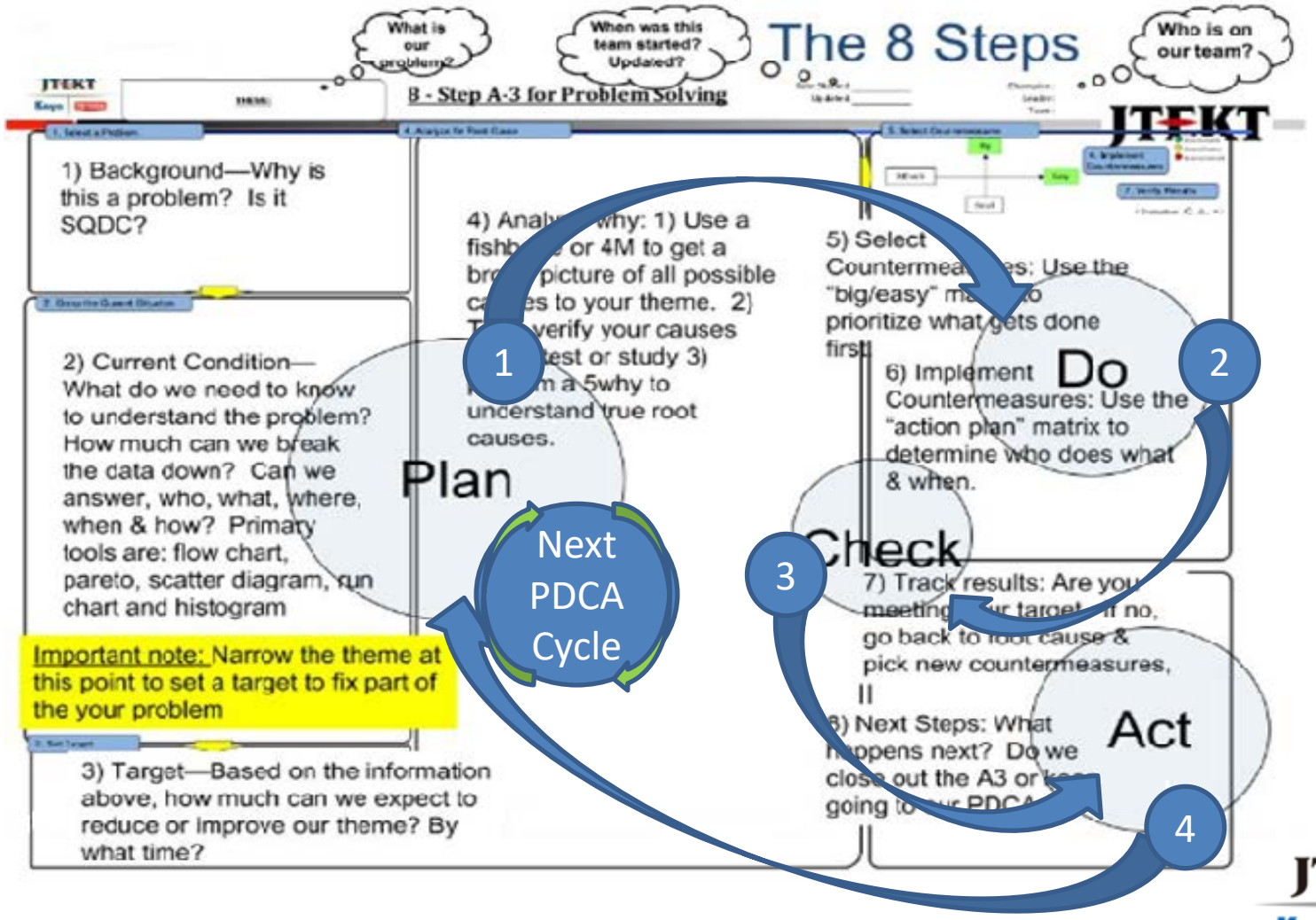
8-Step Problem Solving Methodology

8-Step Problem Solving

The 8-Step Problem Solving Methodology uses the PDCA approach.



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8-Step Problem Solving

Each step of the Problem solving fits the PDCA process, below are suggested tools to document each step.

	Step	Description	Suggested Tools
P	1	Clarify the GAP - Can you see / explain the PDCA Cycle? - What is supposed to be happening? - What is happening?	- Trend Charts - Hour x Hour Charts - Standardized Work Charts - Any Visual Management indicator
	2	Breakdown the GAP - Explain, in detail, the problems creating a GAP - Ask What, Where, When, & Who to drive your thinking.	- Non-Bekido; Non-Chokko breakdown - Tachinbo Studies - Spaghetti Charts; MIF / VSM; Logistics - *Create your own*
	3	Set Target - Ensure your target is *SMART (Specific, Measurable, Attainable, Relevent, and Time Bounded)* and includes the Point of Occurrence	- Use Current State analysis to ensure SMART clarity.
	4	Root Cause Analysis - Brainstorm possible causes relative to problem at point of occurrence. - Determine root cause by elimination at the GEMBA	- Cause and Effect Diagram - Fishbone Diagram - Factor Tree Analysis - Brainstorm on a White-Board
	5	Develop Countermeasures - Brainstorm Possible Countermeasures - Develop detailed action plan: What, Who, When, Benefit	- Ensure clear and concise expectations: 1. What will you do? 2. Who will do it? 3. When will it be done? 4. What is the benefit?
D	6	See Countermeasures Through - Provide status update - Think and Act persistently; Never give up	- Try and verify your activity before making permanent. - Take before and after pictures
C	7	Monitor Process and Results - Determine if Target was achieved. - Measure as close to the countermeasure as possible.	- Measure as close to the countermeasure as possible: a. Learn Quickly b. Avoid other noises
A	8	Standardize and Share Best Practice - PDCA to ensure short term success - Standardize the Best Practice - Yoketen, Share Best Practice	- What is the management cycle to ensure sustainment? (Shinsen, TPM, Pokeyoke) - If problem is resolved, return to Step 2 to work on second problem.

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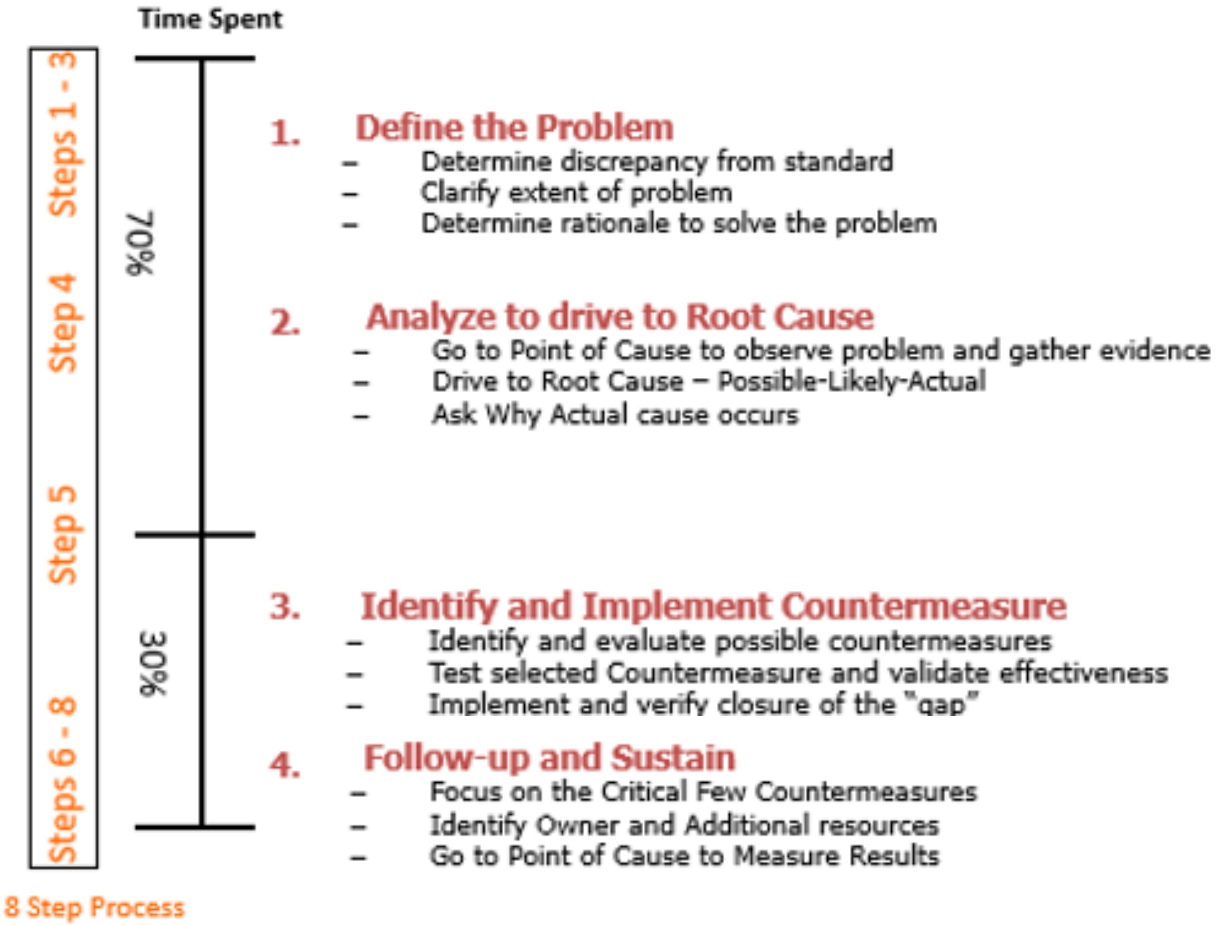
8-Step Problem Solving

Implementing a countermeasure when the problem has not been understood and the root cause has not been clearly identified is a waste of time.
70% of the time invested in an A3 needs to be spent in steps 1 to 5.



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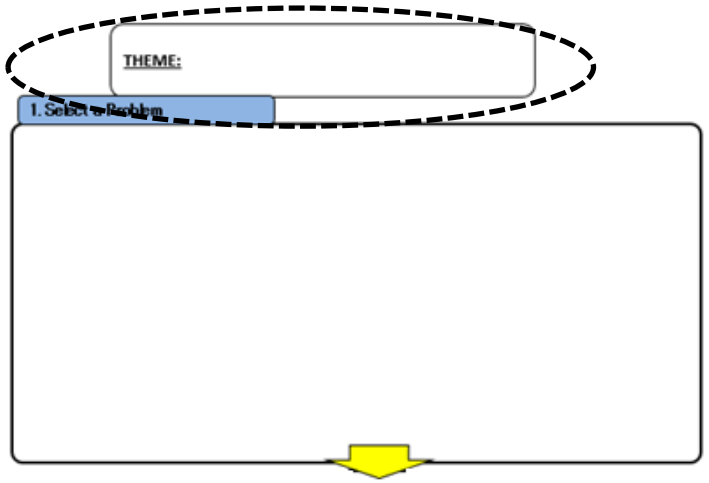
Define the Theme of your problem

Before starting to solve a problem, the team needs to define a Theme. The Theme is the purpose of the A3 and needs to answer this question: What are you trying to accomplish?

The theme should always begin with an “action” word: Eliminate, Reduce, Increase, Improve, etc.

You should periodically go back to the Theme during the A3 Process to confirm that you are on track and have not strayed from your objective.



The Theme also should have a date of when the problem has to be solved.

For Example:
Theme: Improve productivity of machining line number 2 from 60% to 85 % by December of 2019.

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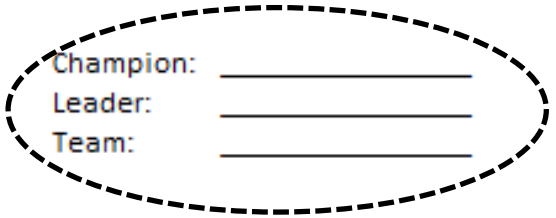
Define the Team

Every A3 has to have a team, the members are:

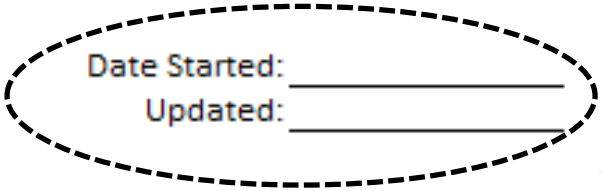
Champion: This is the person with more experience with the process or with the use of the A3 or other problem solving tools.



Leader: This is the person in charge of the A3, has the responsibility to gather the team and verify that every step in the A3 has been documented and completed.

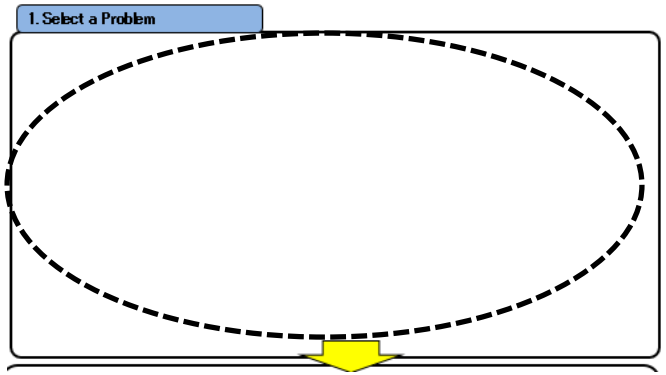
Team members: The members of the team will vary depending on the type of problem to be solved. There could be members that need to be in the team all the time and members that only need to be involved for an specific step of the A3.

Dates: It is important to document the date when the A3 has started and document the date when A3 has been updated. This will help the team to visualize how much time it has been spent in the A3 or when was the last time the A3 was updated.



Step 1: Select/Clarify the problem

Step 1. Select the Problem.
This section of the A3 should show **Why** this is a problem for your facility. When you are done with this box, anyone should easily understand why are you working on this problem.
It should show your trend to your target (run chart). It can also include photos and/or a Pareto diagram that show the problem. It should show the "gap" between your goal and actual performance.



The space allocated is small and usually 2-3 charts will be enough to show why your team needs to work on this.

Selecting the problem is a key step of the A3 process; however, the problem could change during the progress of the A3. There may be cases where the Problem and the Theme could be very similar, except on Quality problems.

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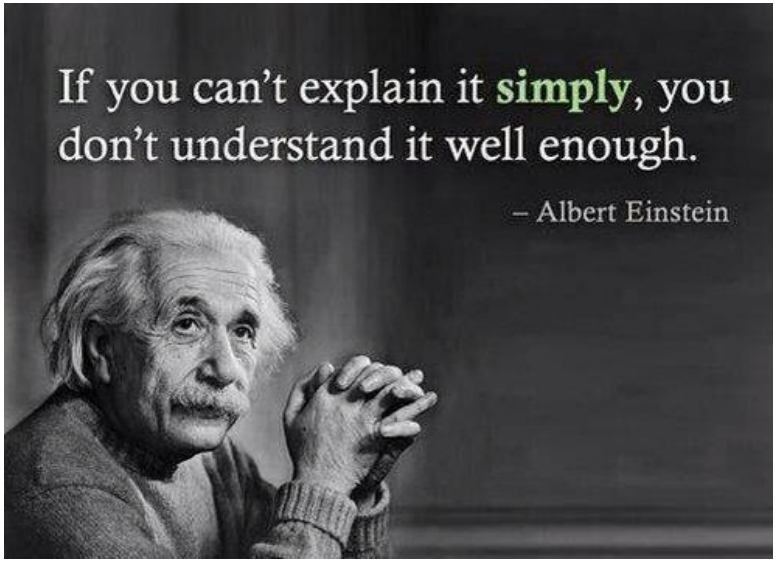
Step 1: Select/Clarify the problem

Every member of the A3 team should be able to understand the problem, explain it and show "**Why**" the team is working on the problem.
The team does not need to be worried about **Why** this problem is happening, this question will be answered in step 4.



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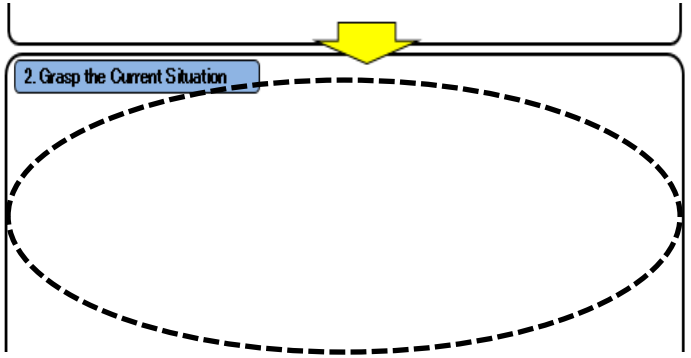
Step 2: Grasp the current situation

Step 2. Understand the Current Situation.
Step 2 shows **What** is currently happening. Your task is to analyze this to understand how much your team can impact the problem.



Process flow, Pareto, Scatter diagram, histograms are all important.
"Go and See" & talking to operators & people involved in the problem are very good tools too.
At the end of this step, the team should understand and be able to answer the questions below to be able to grasp the current situation of the problem:
Who, **What**, **Where**, **When**, and **How**.

At the end of Step 2, the team should be able to narrow the Theme and set a measurable Target. The amount of change in our Target should be based on the data gathered in step 1 and 2.

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Step 2: Grasp the current situation

Grasping the current situation will help you to know:

- **Where** is the problem happening?
- **How** often is the problem happening?
- **How** does the problem happen?
- **Who** is involved with the problem?: Operators, engineers, etc.
- **How** is the problem detected?: At the plant or maybe the customer
- **How** is the problem affecting the company?: $, Scrap, customer complaint, Bekido (productivity), Chokko (quality)
- **What** is the direct impact to the company?
- **How** is the process defined and how is it working?

If your problem is production process related, you may want to check:

- If your company uses 4M Change point, you may be able to get most of this information from your 4M change point logs.
- If your company uses Process FMEA, this would be a good starting point to understand more about the problem, Severity, Occurrence, Detection and RPN.

Step 2: Grasp the current situation

In order to understand the current situation, the team needs to do **Gemba** (Gemba means go and spend time where the problem is happening), leave the desk, go talk with the people involved with the problem, evaluate the current conditions where the problem is happening.

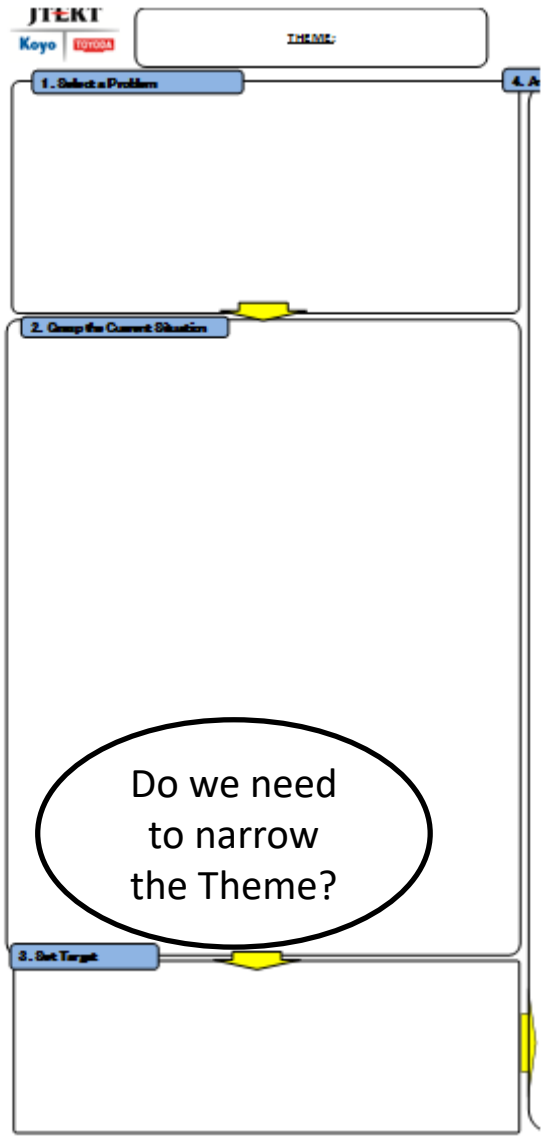
Not all the problems are happening at the production process; however, if the problem is happening at the production process then:

Go and See

1. Interview associates: Ask about that day. Ask about the defect in general.
2. Look at the equipment: Inspect the fixturing, look for worn surfaces, check the sensors and programming logic, etc.

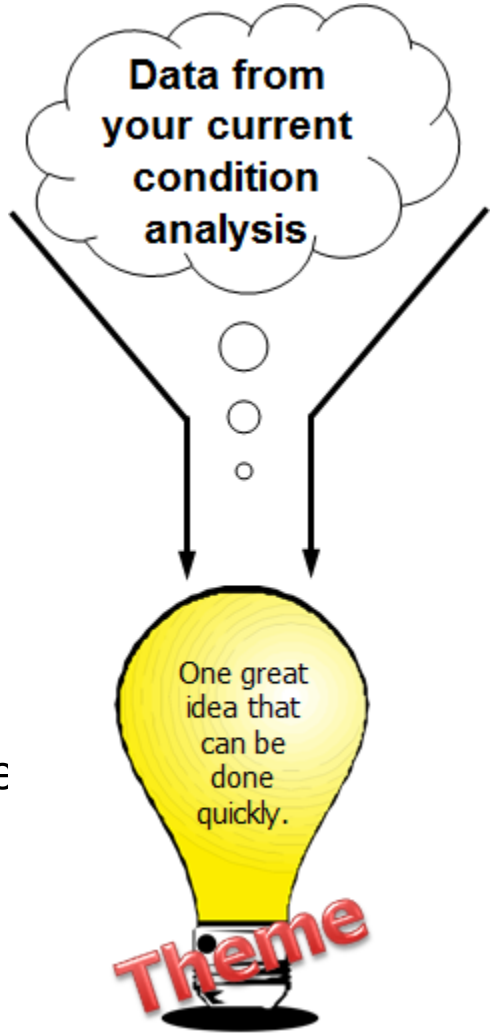
The more the team learns about the problem, the easier it will be to understand the problem and solve the problem (close the Gap).

Step 2: Grasp the current situation



Is it important after the second step to review if the Theme is too big.
Many teams have TOO big of a problem to solve in the time allowed. This leads to frustration, declining meetings & eventually abandonment of the project.

For example, If you have 26 machines with problems, improve your worst one & fix the other ones in your next A3.
Use the “Target” step to funnel your data into a manageable level 1 solution.



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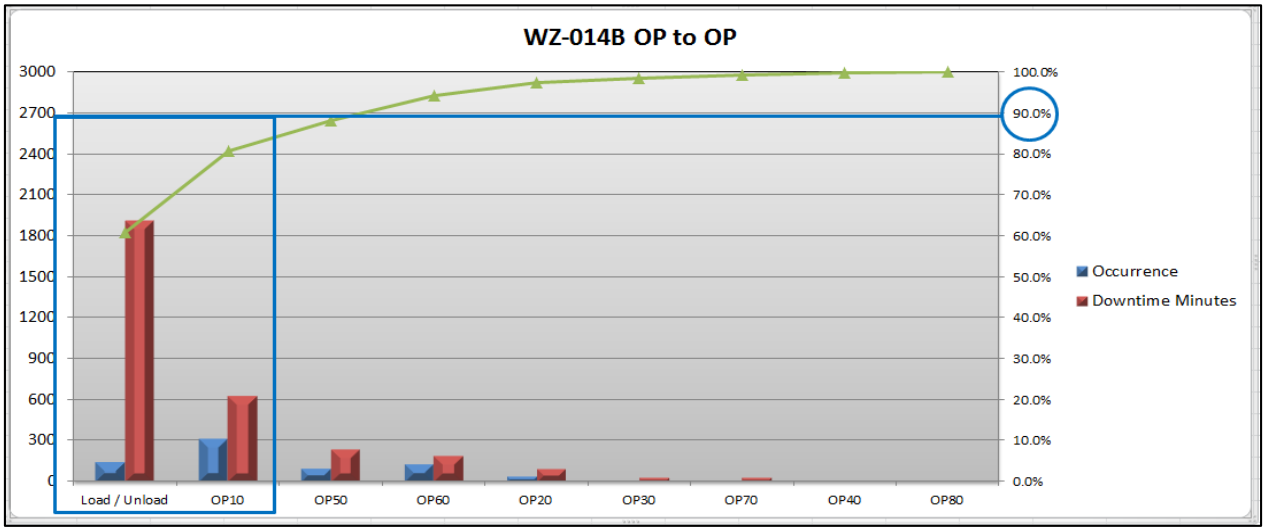
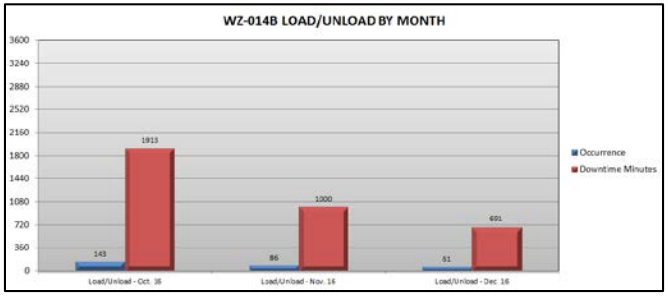
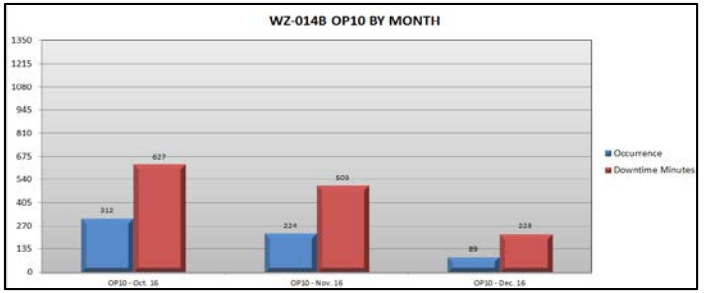
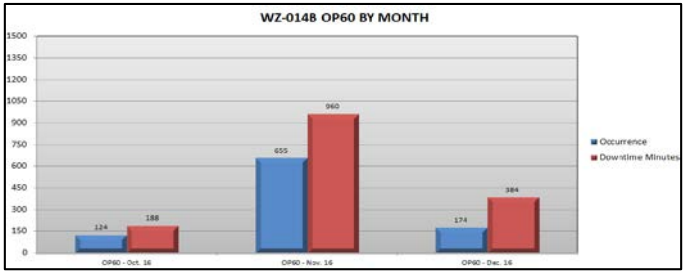
Step 2: Grasp the current situation

Examples of charts that could help the team to visualize the current situation.









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Step 2: Grasp the current situation

If the problem is a ***Quality*** problem, the containment implemented to certify that only good parts are sent to the customer should be documented as part of Step 2.

This will provide very important data about the defect:

- **How** may bad parts are found during containment?
- **How** big is the problem?
- **How** often are bad parts being found?
- **When** is the defect detected?
- **When** is the defect created?
- **How** is the defect made?

The containment SHALL be maintained until the countermeasures have been implemented and validated as effective to eliminate the root cause (Step 7).

Step 2: Grasp the current situation

STOP.

Before you continue to Step 3, remember that the team needs to understand the problem, grasp the current situation and evaluate if all of this is according to the Theme.

Evaluate if it is time to change the Theme, the Problem definition or get more data to grasp the current situation.

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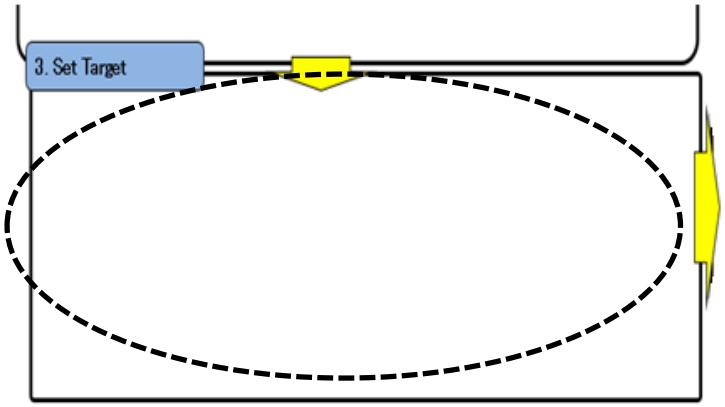
Step 3: Set targets

Step 3. When setting the target, the team needs to consider that the same goal or indicator (Scrap, Bekido, Chokko, etc.) that the team is going to start tracking, is the same goal or indicator that will be tracked to evaluate the effectiveness of the corrective action.

Use a chart to track the target the team has defined.

The chart should be tracked from the time step 3 has started until the time the team has implemented and validated the countermeasures (steps 6 and 7).



A common mistake is to start tracking one indicator and once the root cause of the problem has been determined, start tracking a different indicator or add another indicator to step 7.

If the team wants to add another indicator, the team needs to add a new target but this may be very confusing to some members of the team and slow the A3.

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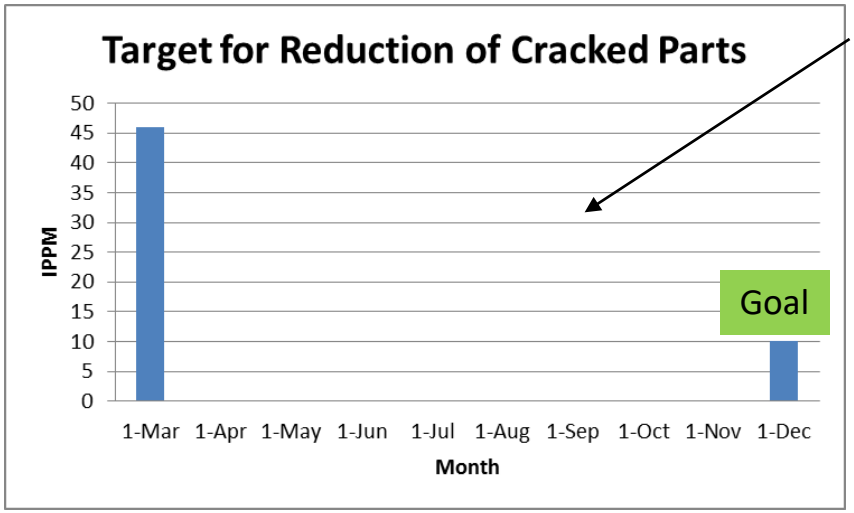
Step 3: Set targets

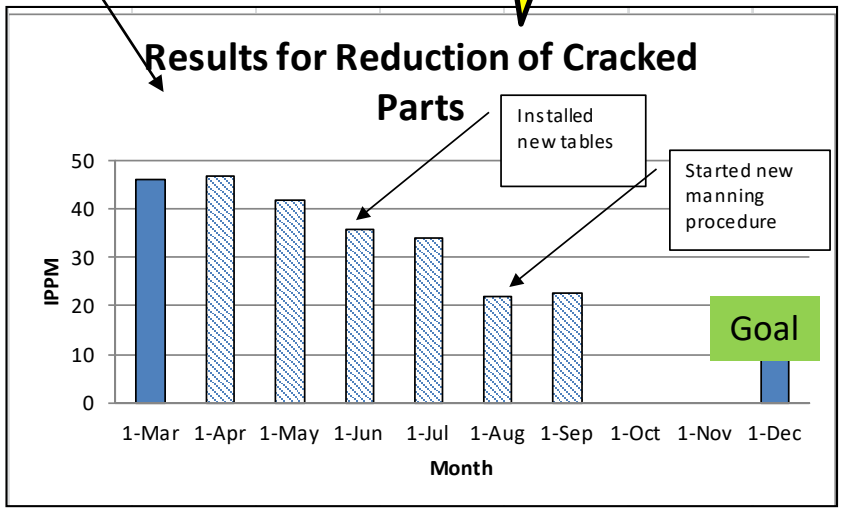
When you set a target, you are also creating the chart to track your results for steps 3 and 7.



Set Target (step 3)

Verify Results (step 7)

The target should always be a Run Chart



Charts should be the same

CAUTION

Be sure the target is not a counter-measure.

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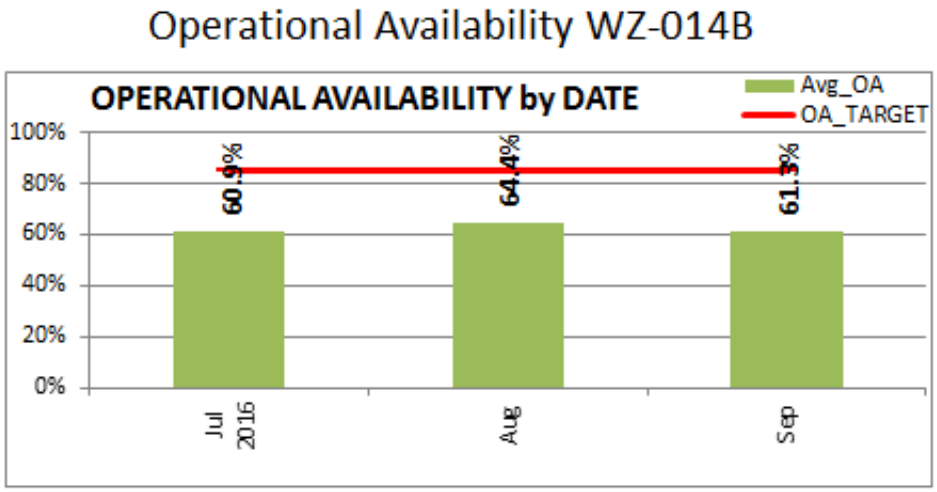
Step 3: Set targets

Example of a simple chart to track productivity or operational availability.

Keep your chart simple and always define a target on the chart.



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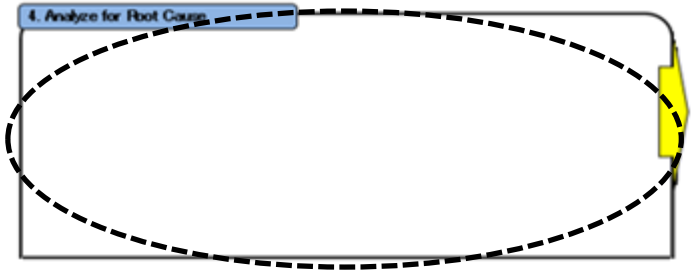
Step 4: Analyze for root cause

If you have a good foundation for the Theme, the problem, grasp the situation and set the target, then you may be able to determine a root cause to know how the problem happen and be able to turn the problem on and off.

Step 1. Do a fishbone analysis of the problem.

Step 2. Confirm the suspected causes of the problem.

Step 3. For the confirmed causes of the problem, do a 5 Why for each one of the causes.



Remember, you are still on the planning part of the PDCA process, it is recommended to spend 70% of the 8-Step Problem Solving time on the plan section (Steps 1 to 5).

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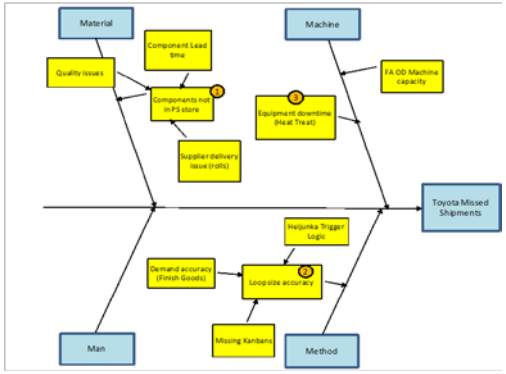
Step 4: Analyze for root cause

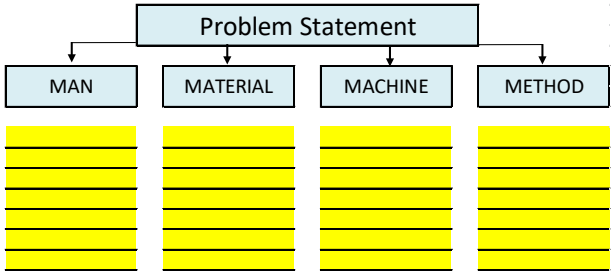
Step 4.1

Root Cause is given the most space in the A3. This is because it is a 3 step process that requires a gradual analysis. First start with a very broad fishbone diagram and end up with very specific reasons for your problem.

The target in this section is to capture as many possible root causes as you can. This allows you to look at the problem from different directions & makes sure that your team is not only looking at the things they already *think* are the problem.

Fishbone Diagram/4M list ALL possible reasons why the problem can occur.





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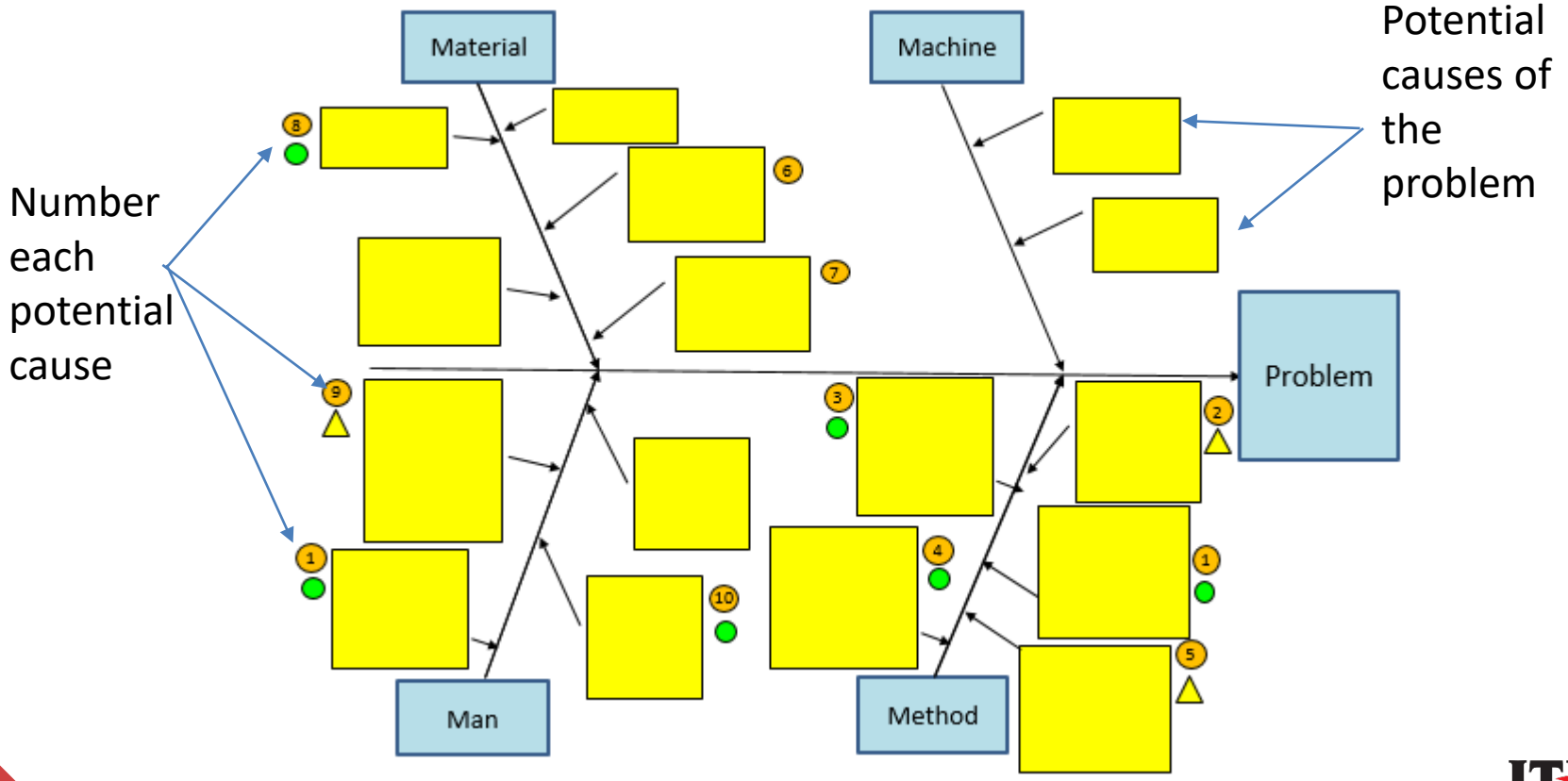
Step 4: Analyze for root cause

A good analysis of the fishbone diagram should consider the 4M's: Material, Machine, Man and Method.
One technique is to number every one of the potential causes, this will be helpful during the confirmation of the causes and 5Why analysis.

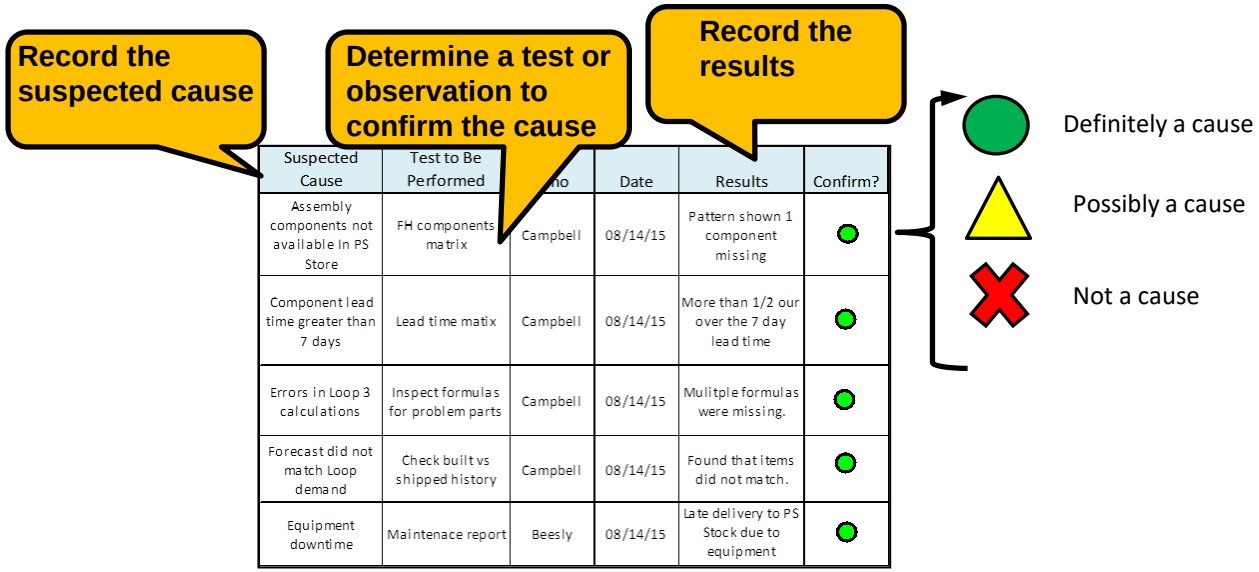


Step 4: Analyze for root cause

Step 4.2

After you have completed the Fishbone/4M, your team has a long list of possible causes to investigate. You may not have time to fully investigate everything.
Use post it notes, group discussion or some type of consensus tool to identify which items the team should investigate. This decision should be based on the data you collected in Step 2.

Verification allows your team to understand if the suspected cause really affects the problem.



Suspected Cause	Test to Be Performed	Who	Date	Results	Confirm?
Assembly components not available In PS Store	FH components matrix	Campbell	08/14/15	Pattern shown 1 component missing	
Component lead time greater than 7 days	Lead time matix	Campbell	08/14/15	More than 1/2 our over the 7 day lead time	
Errors in Loop 3 calculations	Inspect formulas for problem parts	Campbell	08/14/15	Mulitple formulas were missing.	
Forecast did not match Loop demand	Check built vs shipped history	Campbell	08/14/15	Found that items did not match.	
Equipment downtime	Maintenace report	Beesly	08/14/15	Late delivery to PS Stock due to equipment	

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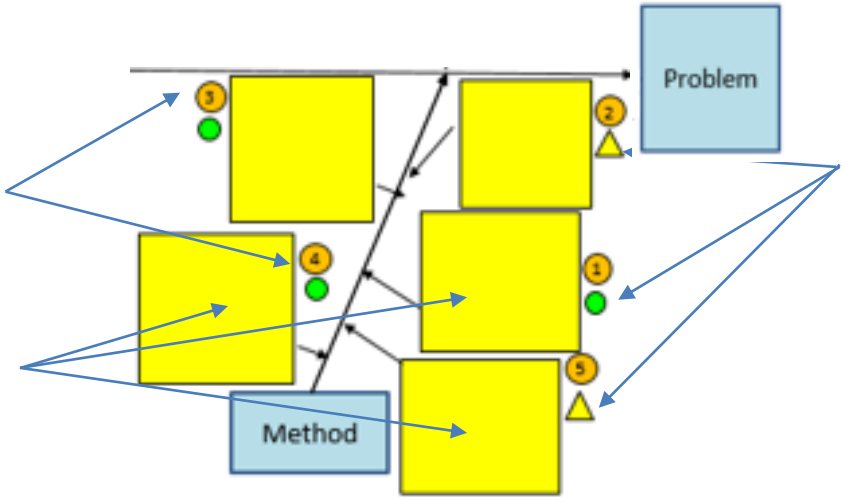
Step 4: Analyze for root cause

The team should evaluate potential causes and do a confirmation of the suspected causes. The use of the number for each cause will help the team to identify the cause in the fishbone diagram.
The team should also identify if the cause has a confirmed effect, no effect or minimum effect and identify this in the fishbone diagram.

Number each cause

Potential cause of the problem



Confirm the effect of each cause

Now it is time to take your most likely causes and do Step 4.3 - 5 Whys.

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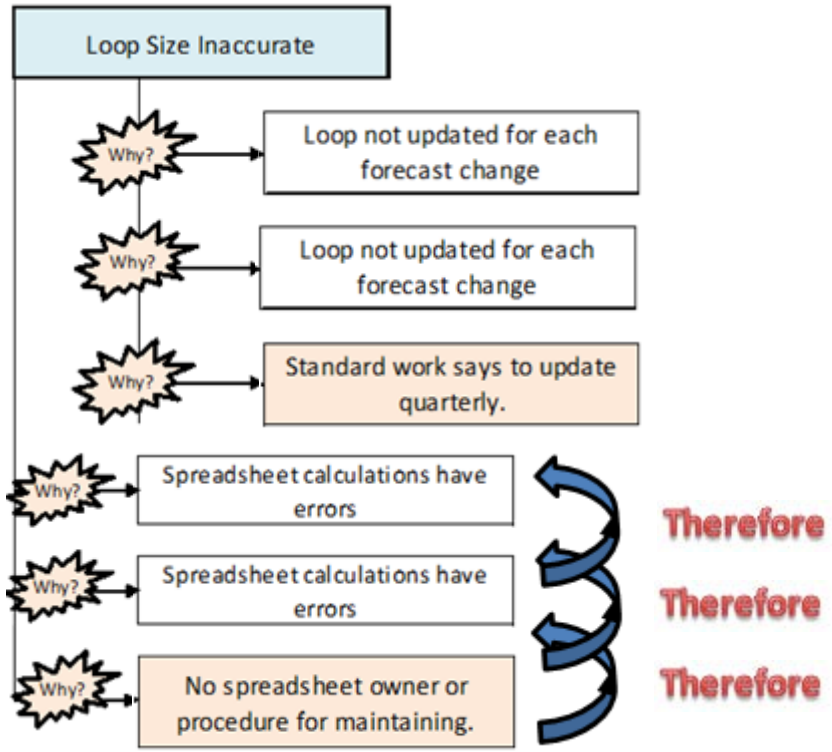
Step 4: Analyze for root cause

Step 4.3



5 Why- Drill down and ask "why" as many times as needed to get to true root cause.

After completing the 5 why, start at the bottom and state, "therefore" & read the preceding why. If the logic does not make sense, you have missed something. Go back and recheck your 5 why.

The items at the bottom of your 5 why can be re-worded into countermeasures to eliminate the root cause. You need to define countermeasures for each root cause.

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Step 4: Analyze for root cause

Before you go any further with the A3, make sure that you have Steps 1 to 5 aligned with the Theme of the A3 and these steps have been done correctly.

Make sure that you have listed ALL the countermeasures to eliminate the root causes.

You don’t want to implement countermeasures that are not going to solve the problem you have defined.

JTEKT has a very detailed 5Why technique called Why-Why, please see Appendix A

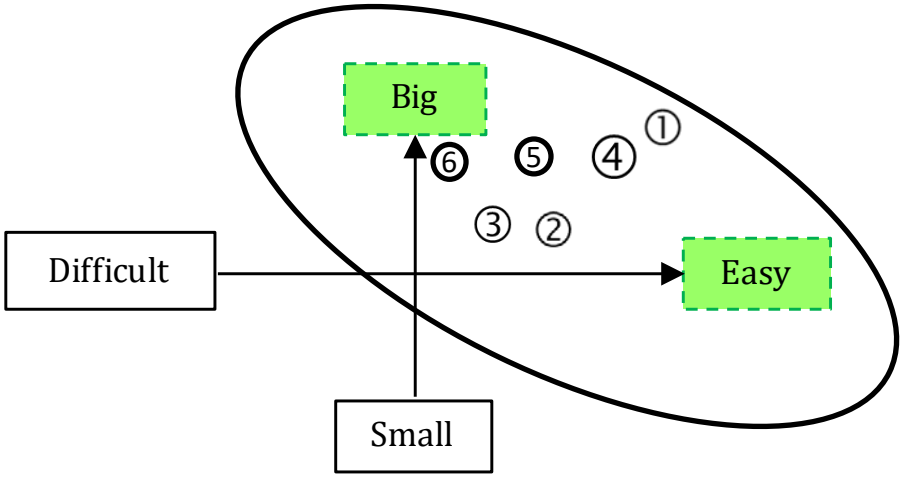
Step 5: Select Countermeasures

After you select the countermeasures, you must evaluate them.

For each countermeasure, ask, “What is the expected results & how easy (cheap, fast) or how hard (expensive, slow) will it be to adopt?”

Then ask, “Will the expected results have a big impact on our problem or a small impact?”

Place a number for each countermeasure in the matrix. Prioritizing now becomes much easier.



Do all your “big/ easy’” countermeasures first.
Your target should be to get all the items in the circle first.

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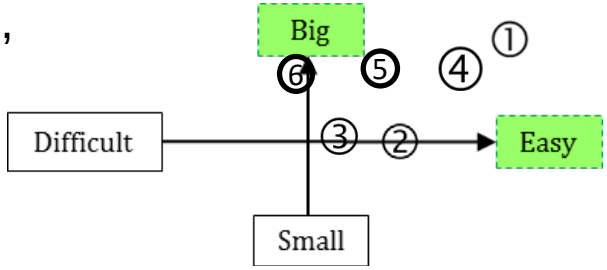
Step 6: Implement Countermeasures

Once you select the big and easy countermeasures, you can use an action plan to track the countermeasures, assign a responsible person and define target dates for implementation.



Title: Updated:

Target completion date	★	Activity ongoing	
Completed, on time		Date Started:	
No activity			

Impact Key	
Effective--moved us closer to target	●
Implemented but only minor improvement.	△
Did not positively impact the target.	✖

#	Problem	Action Item	Owner	month	May				Jun				Jul					Status	Comments	Impact
				week	6	13	20	27	3	10	17	24	1	8	15	22	29			
1				Plan	★													○		✖
				Actual	■															
2				Plan		★												◔		△
				Actual		■														
3				Plan				★										◑		●
				Actual				■												
4				Plan		★												●		●
				Actual		■														

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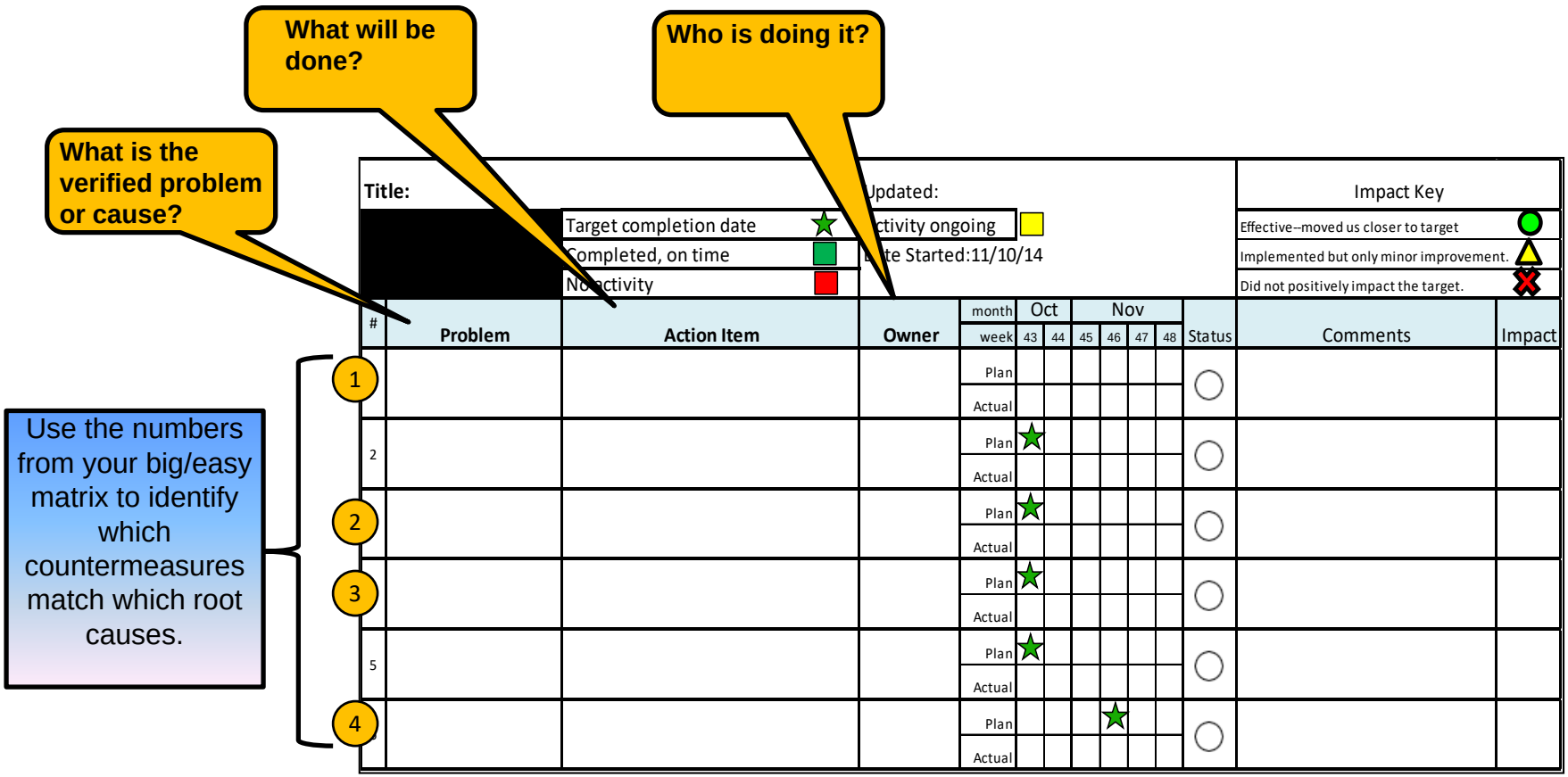
Step 6: Implement Countermeasures

After you prioritize your countermeasures, you have to prepare an action item list. This is located on the tab with the same name as your blank A3.
The action plan helps the team to identify Who will do What and by When.



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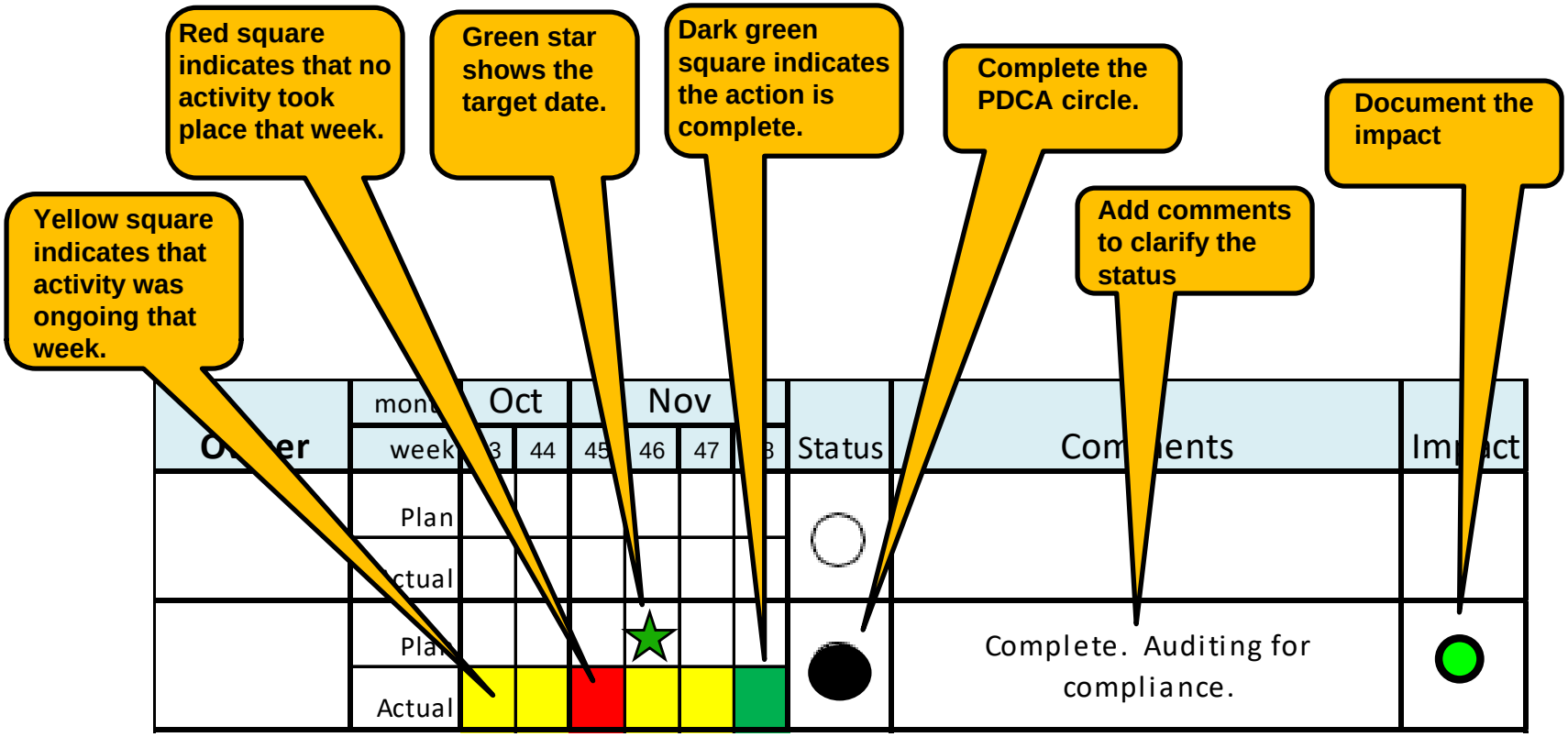
Step 6: Implement Countermeasures

Use these guidelines for updating & completing the action item tracker.



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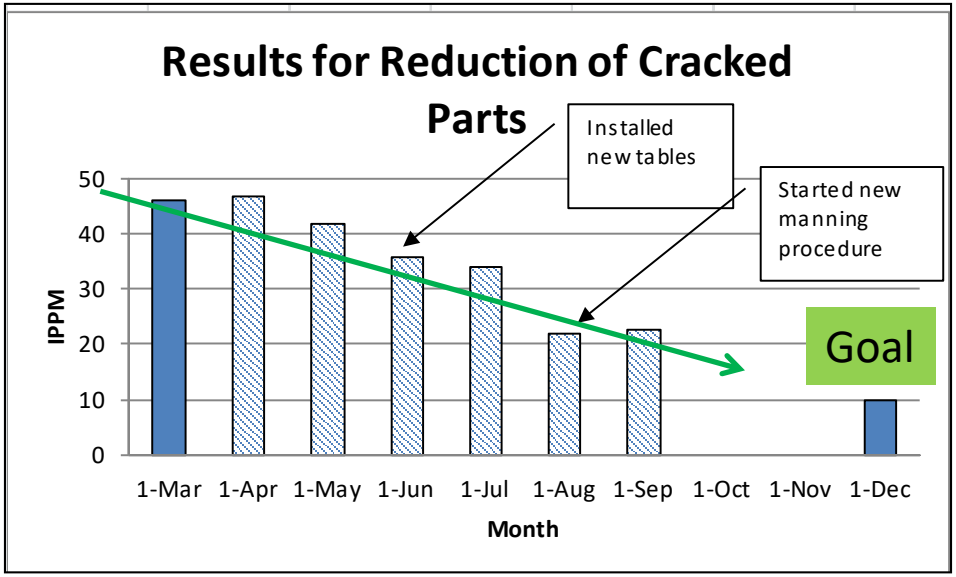
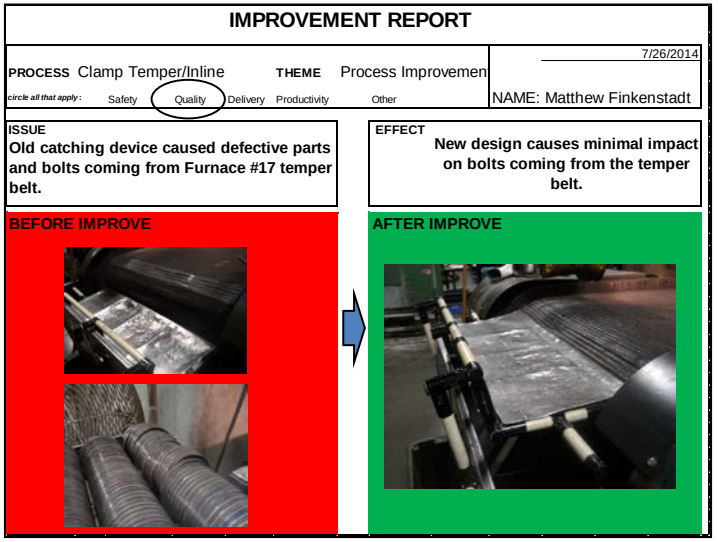
Step 7: Verify Results

This step is to verify that the results of your countermeasures are being effective. Use the same run chart from Step 3 (Target) to record your results.



Record your countermeasures during the week/time they were completed. This is how you can "see" if they are effective.



Add other documentation: before & after, layout changes, work element sheets to show your results

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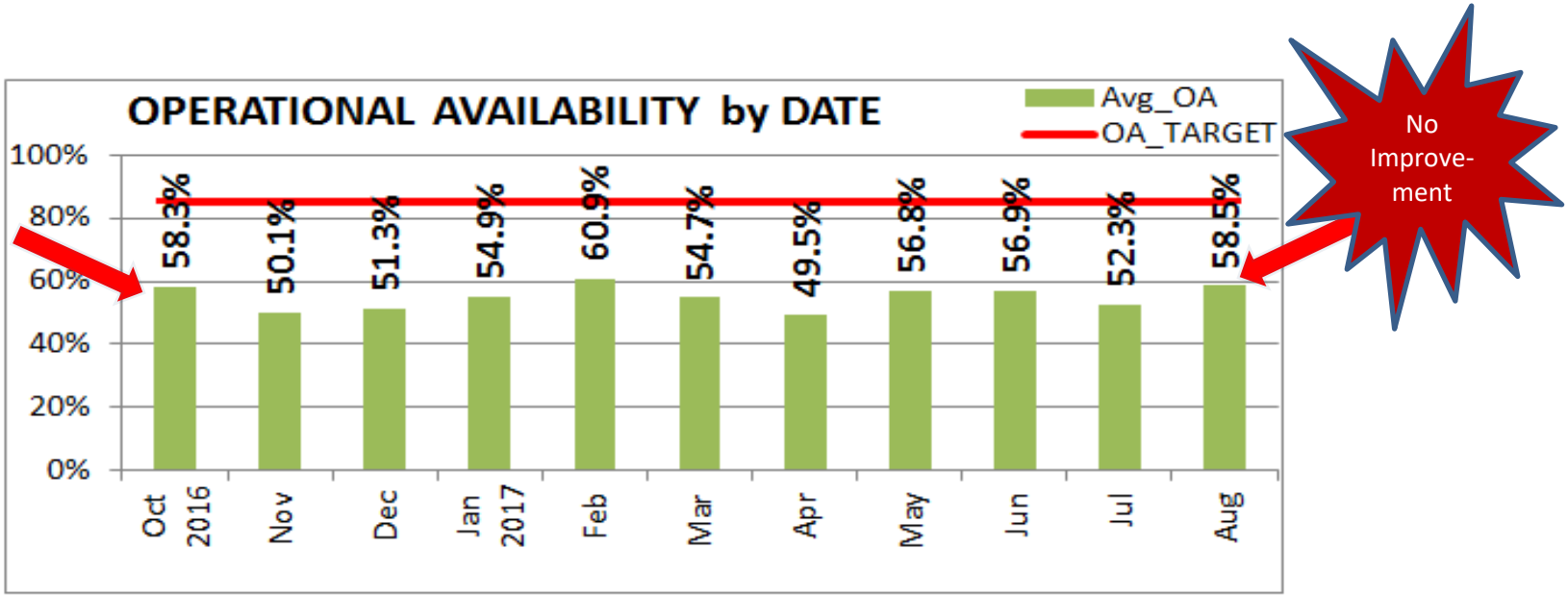
Step 7: Verify Results

Sometimes when the team starts the verification of the results, the team may not see any improvement in the results (after a defined period of time).

If this is the case, most likely the root cause was not identified correctly (Step 4) therefore the countermeasures are not being effective (step 6). There may be other factors that affect the problem and were not considered during steps 2 through 6.

If that is the case, the team needs to do the first PDCA cycle and evaluate again all the steps of the A3 in order to solve the problem.



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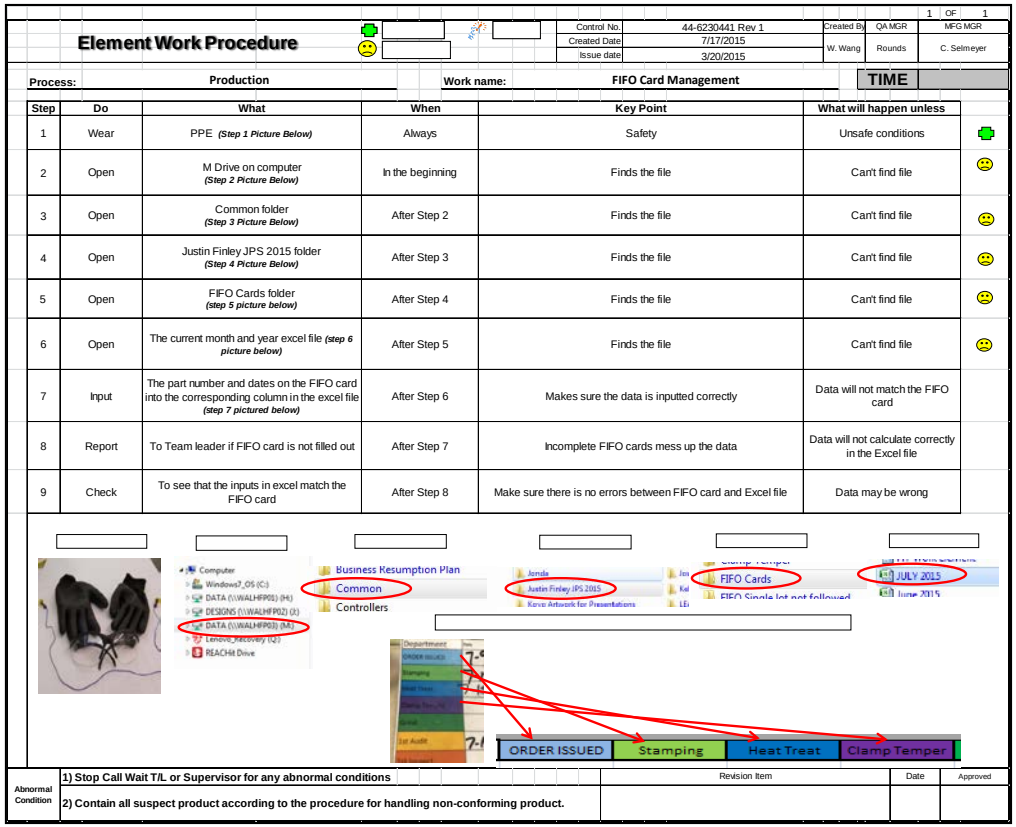
Step 8: Standardize

Once the countermeasures are proven to be effective, your successful countermeasures will need to be standardized to guarantee the success is not lost. Examples of standardization include: Standardized Inspection instructions, Work Element Sheet, Process Check Sheet, Preventative Maintenance Activity, etc.



Element Work Procedure

Control No.	44-6230441 Rev 1	Created By	QA MGR / MFG MGR
Created Date	7/17/2015	W. Wang	Rounds / C. Selmeyer
Issue date	3/20/2015		

1 OF 1

Process: Production Work name: FIFO Card Management TIME

Step	Do	What	When	Key Point	What will happen unless
1	Wear	PPE *(Step 1 Picture Below)*	Always	Safety	Unsafe conditions
2	Open	M Drive on computer *(Step 2 Picture Below)*	In the beginning	Finds the file	Can't find file
3	Open	Common folder *(Step 3 Picture Below)*	After Step 2	Finds the file	Can't find file
4	Open	Justin Finley JPS 2015 folder *(Step 4 Picture Below)*	After Step 3	Finds the file	Can't find file
5	Open	FIFO Cards folder *(step 5 picture below)*	After Step 4	Finds the file	Can't find file
6	Open	The current month and year excel file *(step 6 picture below)*	After Step 5	Finds the file	Can't find file
7	Input	The part number and dates on the FIFO card into the corresponding column in the excel file *(step 7 pictured below)*	After Step 6	Makes sure the data is inputted correctly	Data will not match the FIFO card
8	Report	To Team leader if FIFO card is not filled out	After Step 7	Incomplete FIFO cards mess up the data	Data will not calculate correctly in the Excel file
9	Check	To see that the inputs in excel match the FIFO card	After Step 8	Make sure there is no errors between FIFO card and Excel file	Data may be wrong

Abnormal Condition		Revision Item	Date	Approved
	1) Stop Call Wait T/L or Supervisor for any abnormal conditions			
	2) Contain all suspect product according to the procedure for handling non-conforming product.			

Inspection Instruction

Daily Check sheet

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Step 8: Standardize

Yokoten (or Read across)

Is an activity where the lessons learned from and A3 are implemented to other similar processes to prevent potential problems.

However this is the most difficult part of the A3, because finally, the problem has been solved and the members of the A3 team are back to their daily activities.

The Champion of the A3 and upper management play a very important roll on this step of the A3.

The champion needs to evaluate if there is a potential risk of having the same problems at other similar processes, needs to work with the Leader of the A3 and some of the members of the team to decide if the same countermeasures could be implemented at other similar processes or if a new A3 needs to be created.

Read Across Next Steps				
Item #	Action to be Taken	Who	When	PDCA
1	One Piece Flow in Tumble	BM, HP, KC, MC	W51	◔
2	Continue analyze & reduce top 10 highest lead time parts.	CS, KS, JM,	Wk 36	◑
3	Create standard work matrix for < min or overflow condition.	CC, MO	W37	◕
4	Complete HT into totes	JR	W50	◑
5	Update lead times in Loop 3	RD	W50	◑

Next Steps Matrix—Who does What, and by When?

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A3 and 8-Step Quick Reference Guide

- What is an A3?, What are the advantages of an A3? and What does it do?.
- What is the A3 Process Approach?.
- Problem definition and Problem solving
- 8-Step Problem Solving (understand PDCA cycle)
- Define the Theme, Define the Team, Track the dates of the A3
- Step 1. Select/Clarify the problem
- Step 2. Grasp the current situation
- Step 3. Set targets
- Step 4. Analyze for root cause
  - Why –Why Analysis
  - The 3 legs of a Why-Why
- Step 5. Select Countermeasures
- Step 6. Implement Countermeasures
- Step 7. Verify Results
- Step 8. Standardize

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Access to training material

This training will be posted to the JTEKT Supplier portal under the Help section.

Also an Excel file with the A3 form will be posted in the supplier portal. The excel file has tabs with some of the forms used for the A3.

Any questions please contact your SAE.

Thank you

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Appendix A

Why-Why Analysis

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Why-Why Analysis

JTEKT uses 5 Why technique to determine the root cause, JTEKT encourages our suppliers use the 5 Why technique explained in the next slides.

The following is a detailed explanation of the use of the Why-Why technique for problems with a **manufacturing process**.

Contents

Introduction to Why-Why

I. What is Why-Why analysis?

II. Why is Why-Why analysis necessary?

III. Preparation of Why-Why analysis

III-1 Steps of Preparation

III-2 Decide on a starting point for analysis

IV. Operation of Why-Why analysis

V. Summary of Why-Why analysis

VI. The 3 Legs of Why-Why Analysis

VII. Look across / Yokoten

VIII. Practical Examples

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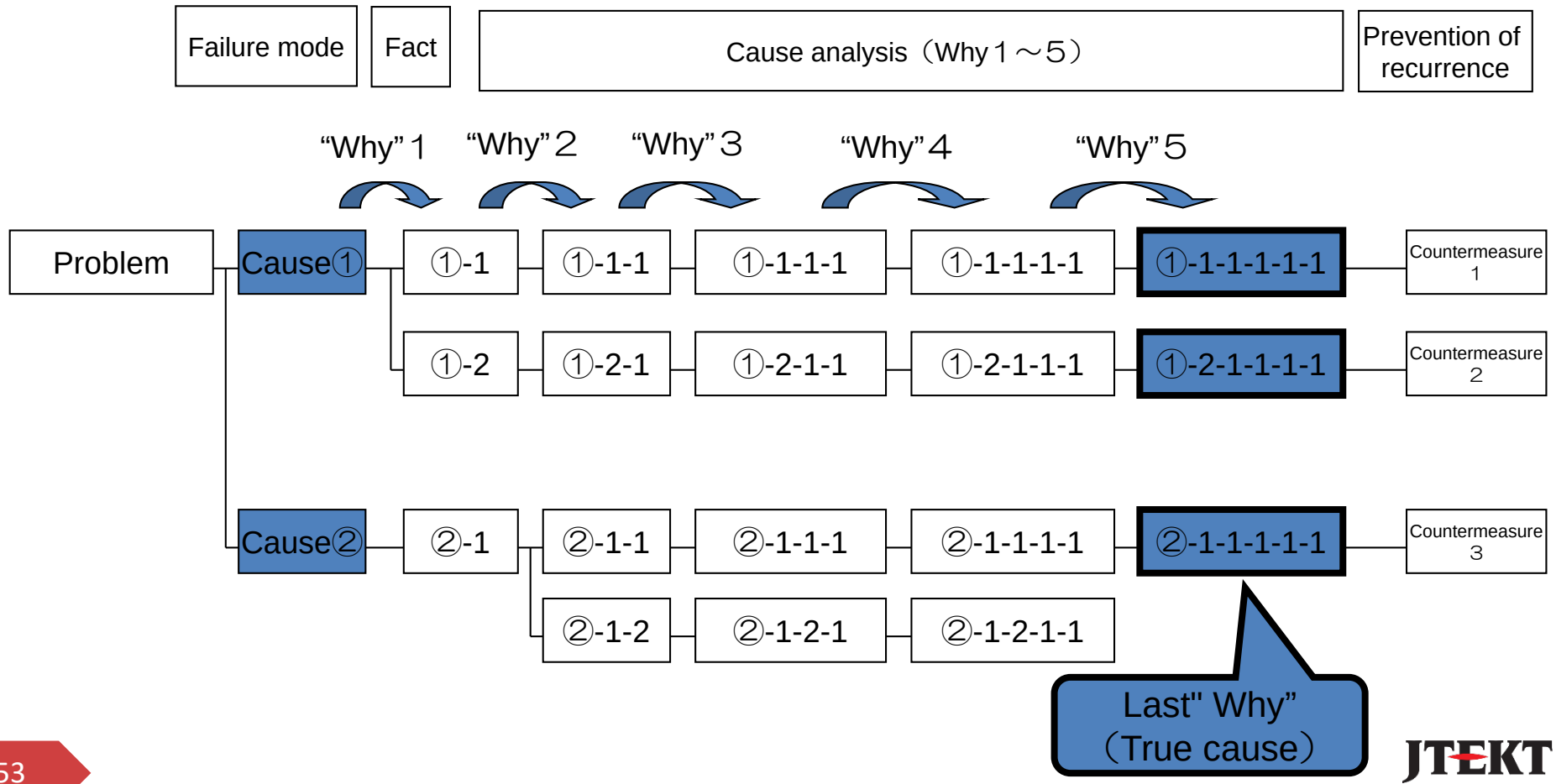
Why-Why Analysis

Ⅰ. What is “Why-Why” analysis?

“Why- Why“ analysis is a technique to investigate the true cause that is hidden in the root of the problem by repeating a question “Why" for a cause (fact) in order to prevent recurrence of the problem.



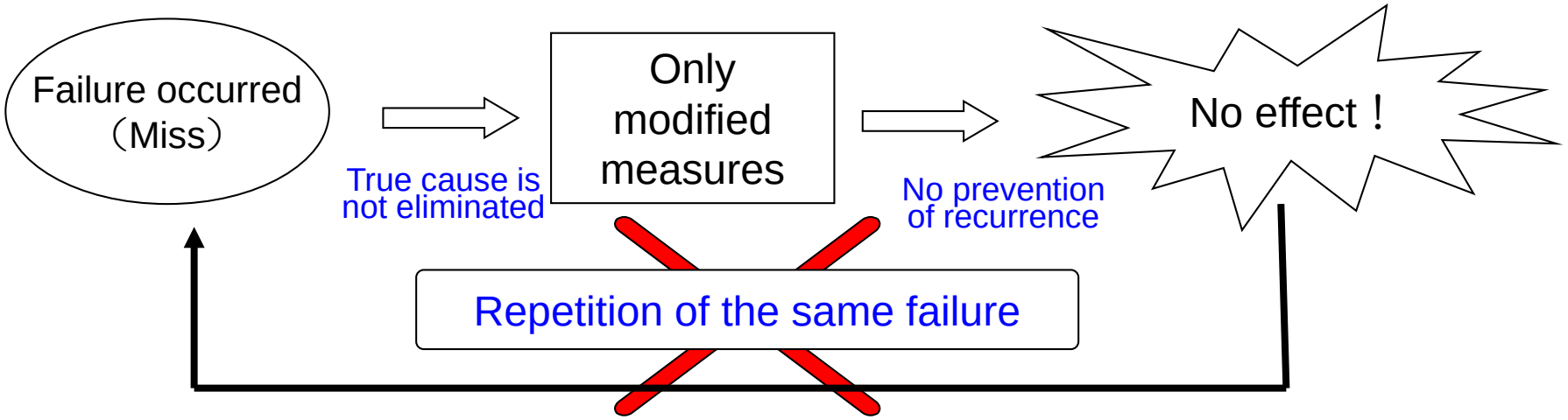
Why-Why Analysis

Ⅱ. Why is “Why-Why” analysis necessary?

If we take measures without eliminating the true cause of the problem, can we prevent recurrence of the same failure?

Unfortunately we often see repeat failures similar to the failure that occurred in the past. To achieve zero quality problems, we deeply need to understand the problem and promote no recurrence.

To do so, it is necessary to cultivate a habit to think “Why-Why" and identify the true cause, and carry out countermeasures.



Let’s cultivate a “habit” to think “Why, Why”!

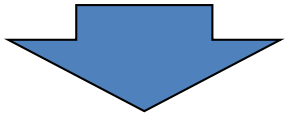
Why-Why Analysis

Ⅲ. Preparation of “Why-Why” analysis

Ⅲ－1　Step of preparation

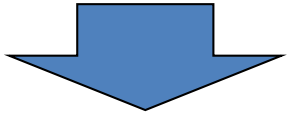
（A）Identification of problem

Most important is “Understanding problems precisely"



（B）Identification of problem process

Trace back from the problem process to a previous process and observe the product.



（B）Determine the problem occurrence condition

Using analytical and statistical methods, grasp the depth and breadth of problem occurrence situation.

Why-Why Analysis

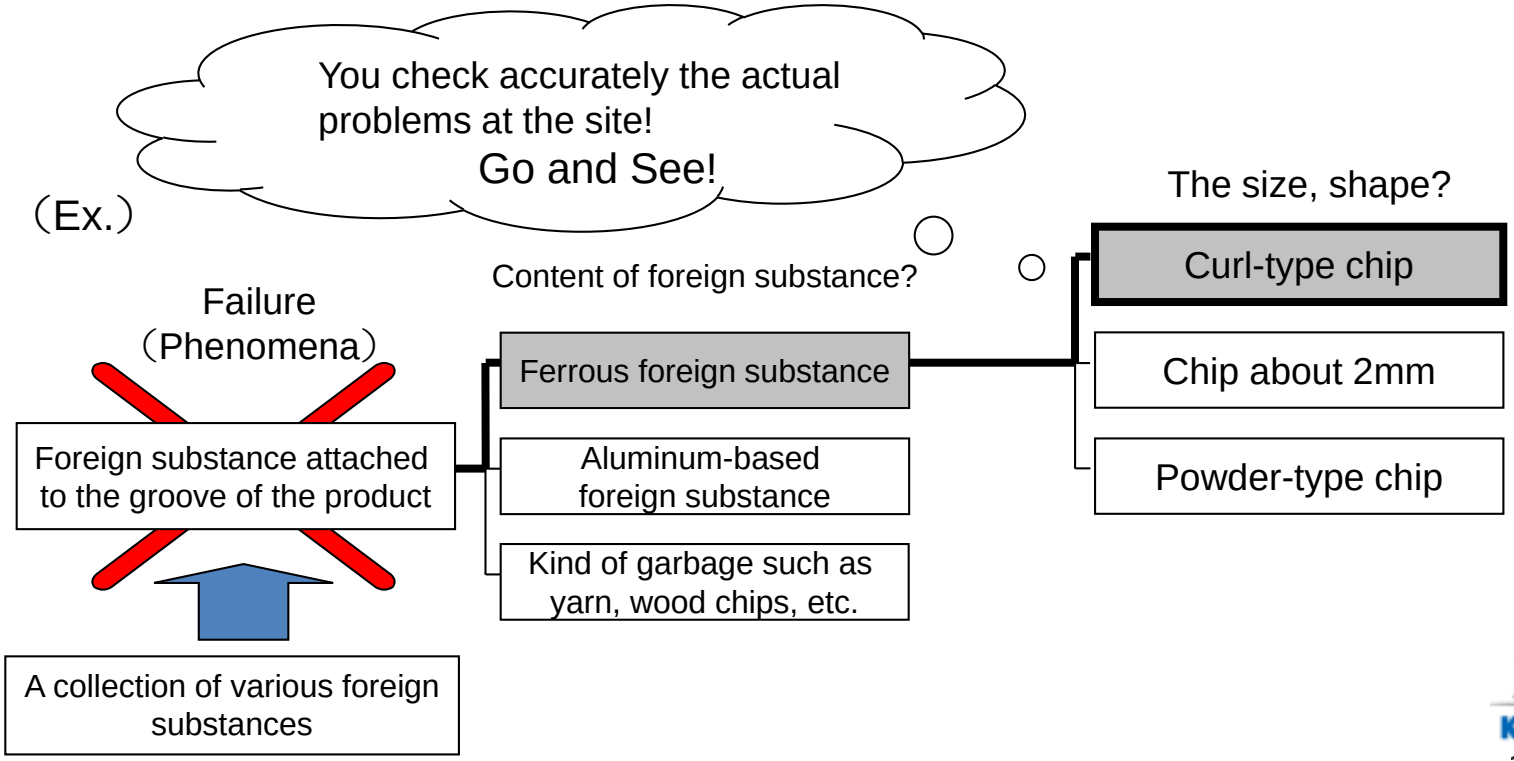
（A）Identification of problem

When you start "Why- Why", if you cannot accurately capture the phenomena, you need to change the route of the problem identification.

The most important step in "Why-Why" analysis is " understanding problems precisely “.

If you don’t understand the problems precisely, you can not determine true cause even after you have analyzed the problem. Also, you will expend a huge effort.

For all members to understand the problem, we need to grasp all conditions correctly and show detail circumstances clearly so others can grasp easily.



Why-Why Analysis

（B）Identification of problem process

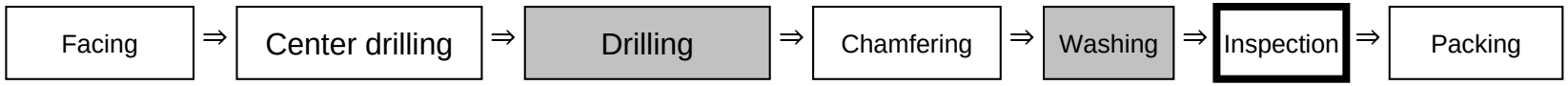
For “Understanding problems precisely,” you have to, follow the process backwards, step by step, until you find the problem with actual article at the site, and observe the product, to pursue the cause. Identify the occurrence process and outflow process.

＜EX：Curl-type ferrous foreign substance attached＞

＜Process order＞

Follow process backwards to observe the product

The process where the problem is found



Identify the occurrence process

Chips attached into the groove in the drilling process

Identify the outflow process

Chips did not wash off in the washing process

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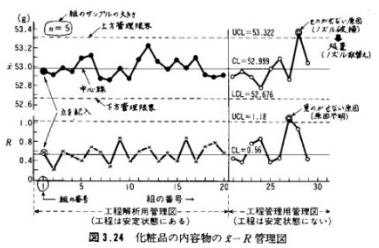
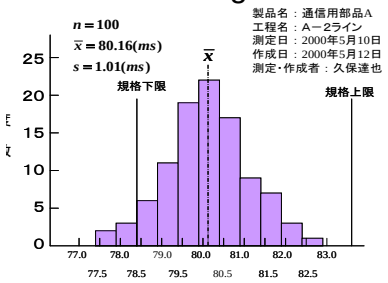
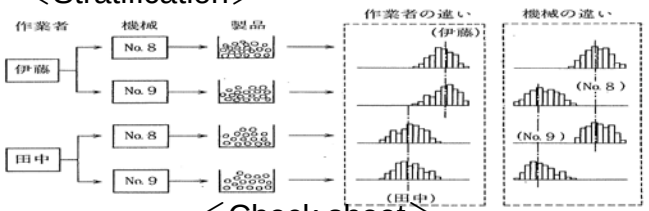
Why-Why Analysis

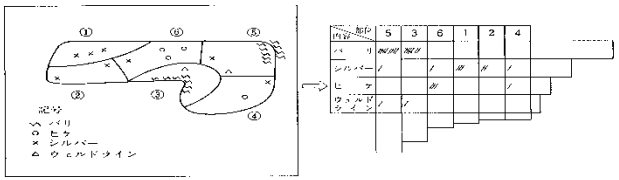
(C) Determine the problem occurrence condition – Evaluate the data using 3 factors

Study the actual process to find the problem	Analyzed by statistical method (QC method)
① Did the problem become worse suddenly? What has gone wrong in the past? If it became worse suddenly, the true cause can be found by looking for the changing point.	＜Graph • Control chart＞ ＜Histogram＞
②Is it sporadic? continuous? Is it periodic or not? If it is periodic, to find the true cause, you need to understand what changes periodically.	＜Stratification＞
③What data are concentrated and where? Concentrated or widely dispersed?	＜Check sheet＞









EX：Curl-type ferrous foreign substance attached

Result of the determination of the occurrence situation

Occurrence was sporadic, it could not be found by sampling inspection.

＜Process order＞

Facing ⇒ Center drilling ⇒ **Drilling** ⇒ Chamfering ⇒ Washing ⇒ Inspection ⇒ Packing

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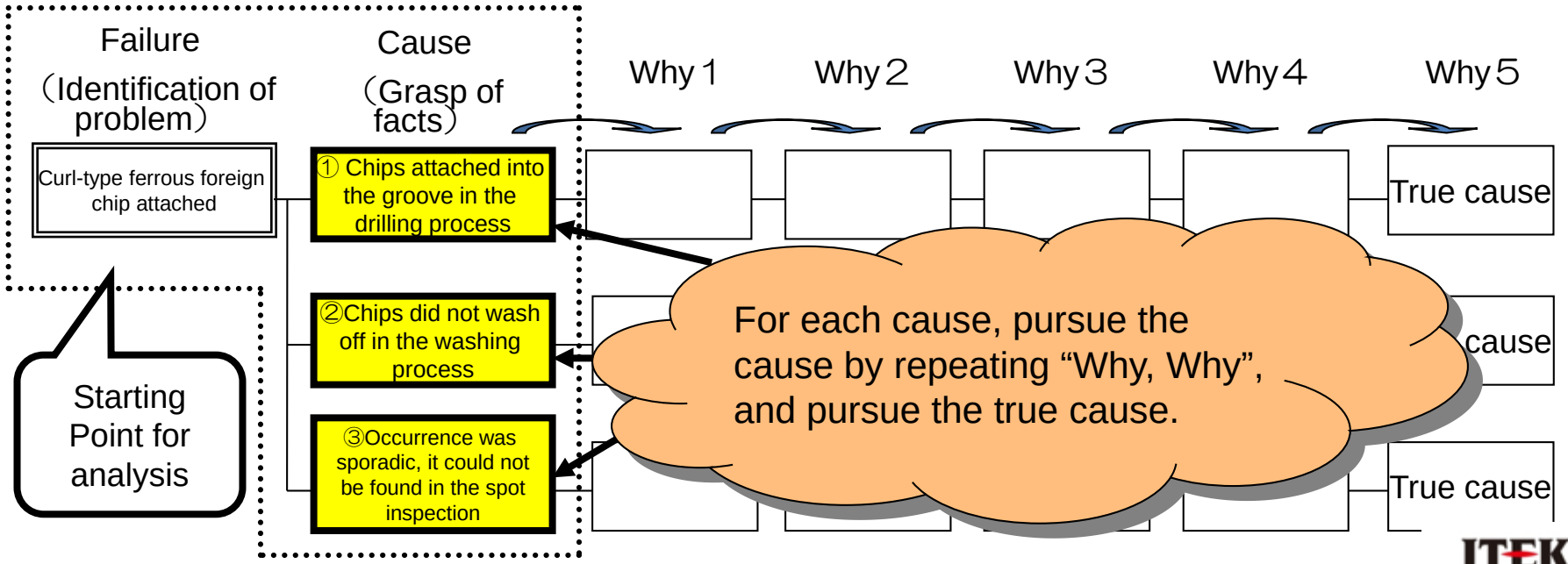
Why-Why Analysis

Ⅲ - 2　Decide a starting point for analysis

Use the previous example “foreign object attached product”, and try to organize your information,

（1）Identification of problem ⇒ Curl-type ferrous foreign substance
（2）Identification of problem process
⇒ Occurrence：① Chips attached into the groove in the drilling process
Outflow：②Chips did not wash off in the washing process
（3）Determination of problem occurrence situation
⇒ ③ Occurrence was sporadic, it could not be found in the spot inspection.

Now you can clearly grasp the phenomena.



As above, by determining the starting point for analysis,

we can develop the subsequent “Why, Why” analysis.

Why-Why Analysis

Ⅳ. Operation of “Why-Why” analysis – 6 Steps

Once the cause of the problem is clear, find the actual root cause by using the following steps.

Step IV. 1

- Write the first “Why”. Why the phenomenon has occurred?

Step IV. 2 (5 Points)

- To the answer of the first “Why”, write the cause of “Why” it happens. Repeat this until you reach the true cause.

Step IV. 3

- When you reach the last "why", trace back to the phenomenon and verify the logical flow

Step VI. 4

- Check whether you have found all true causes – have we missed any

Step VI. 5

- Take a countermeasure against the true cause.

Step VI. 6

- Confirm the countermeasure effect. When it's ineffective, execute “Why, why” analysis again.

Why-Why Analysis

Step IV.1: Write the first “Why”. Why has the phenomenon occurred?

<Point 1> “Why did we have this issue?”

Give a concise short phrase like “XX was YY” (do not put 2 verbs)

Use the past tense which shows fact. “～ was ～”, “～ ***ed ～” etc.

(A bad example - often seen)

Failure phenomenon	Cause	Why 1	Why 2	Why 3	Why 4	Why 5
Process stopped	The expected location of the mechanism changed	Limit switch didn’t activate, and process overran				True cause

There are two verbs (Cause)

Process overran → <The verb which shows a result>

Limit switch didn’t activate → <The verb which shows a factor>

Problem

Difficult to write next “Why” to either cause

(A good example)

Failure phenomenon	Cause	Why 1	Why 2	Why 3	Why 4	Why 5
Process stopped	The expected location of the mechanism changed	Mechanism went beyond where it should have	Limit switch didn’t activate			True cause

By using only one verb per “Why”, it is easy to connect the next “Why”.

Why-Why Analysis

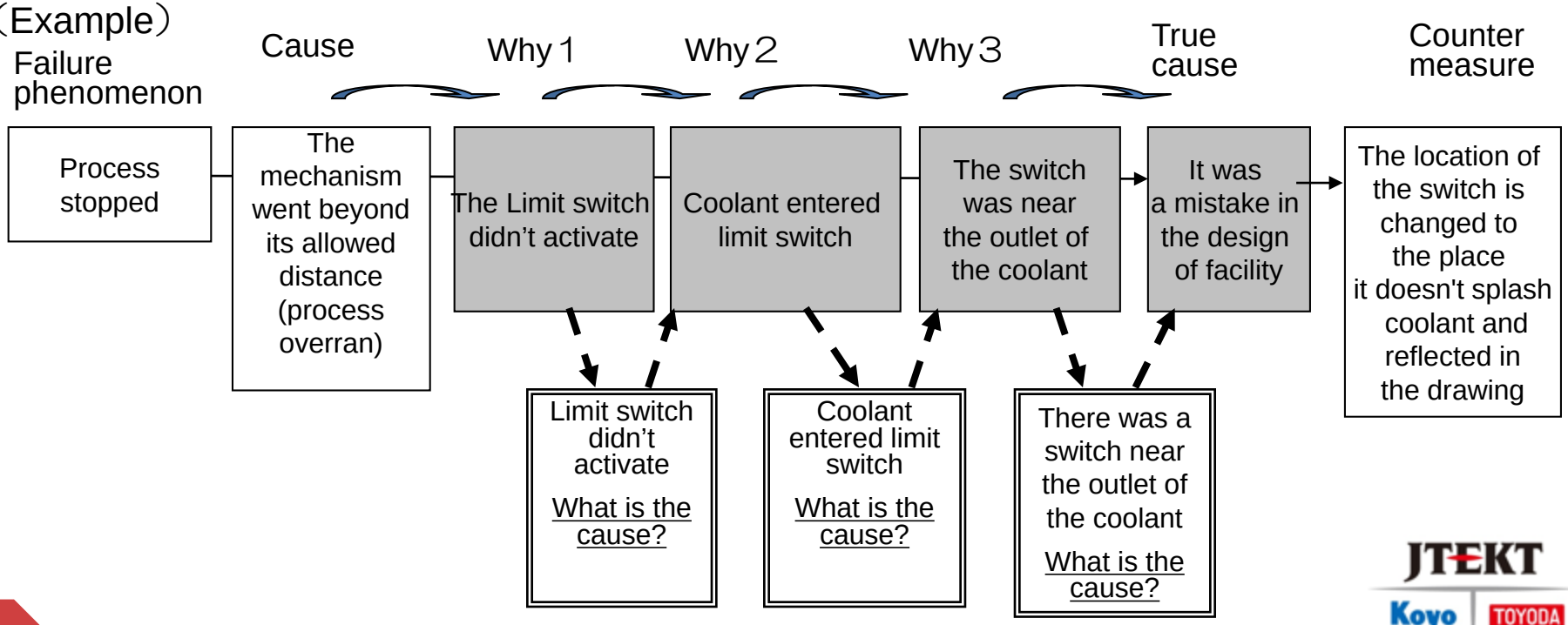
Step IV.2: To the answer of the first “Why”, and write the cause of “Why” it happens.
Repeat this until you reach the true cause.

5 Points in step 4.2 to remember

<Step IV.2 Point 1 >

To the answer of the first “Why”, as “What is the cause - It was so? The cause is • • •, and the cause is • • • ” , it's repeated persistently “Why” “Why” from every angle until a concrete recurrence preventive measure can be made.

(Example)



Why-Why Analysis

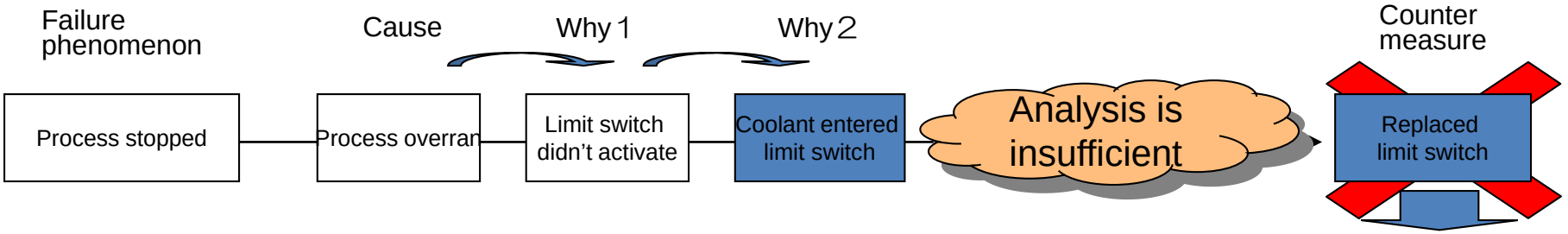
<Step IV.2. Point 2>

Confirm the fact of the actual problem at the site, and exhaust the causes until there is nothing is left. If an analysis is insufficient, attention is needed that you don't just take a quick "band-aid" fix as corrective action.

It is a natural instinct to determine a countermeasure based on past experience and fill out the "why, why" analysis to justify the countermeasure. This should be avoided.

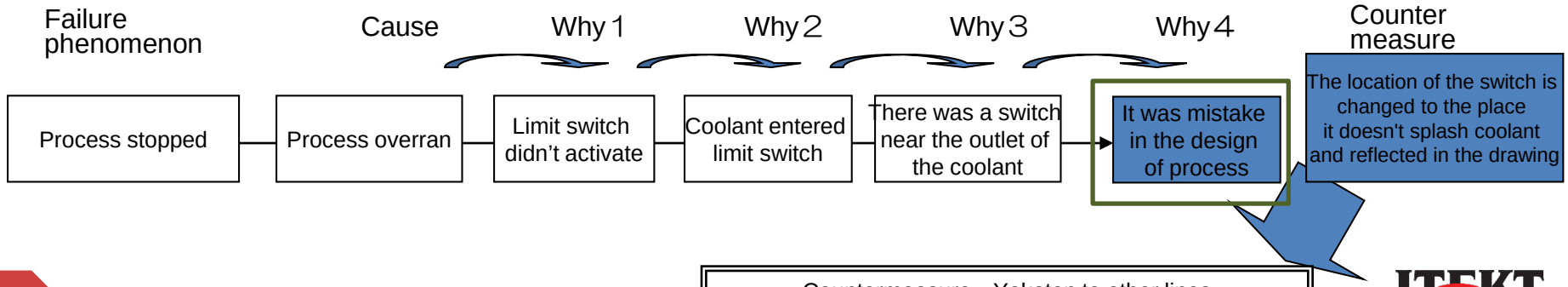
The ultimate goal is to eliminate and to prevent reoccurrence of the problems.

(The bad example often seen)



It ended by simplistic response (corrective action)

(The good example)



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Why-Why Analysis

＜Step Ⅳ.2 Point 3＞ Do not use ambiguous words

"AA was bad, or BB is bad", an expression using an ambiguous word is useless.

To avoid having different interpretations, it's necessary to use clear and concrete words. And it's necessary to write an analysis using concise sentences.

Such as, "OD was 0.05 below minimum spec" !

In the sentences, don't use the word "bad".

＜Bad example＞

✕ "Washing is bad"

- OOO?
- OOO?
- OOO?

There is no clarity - it is not clear what is wrong.

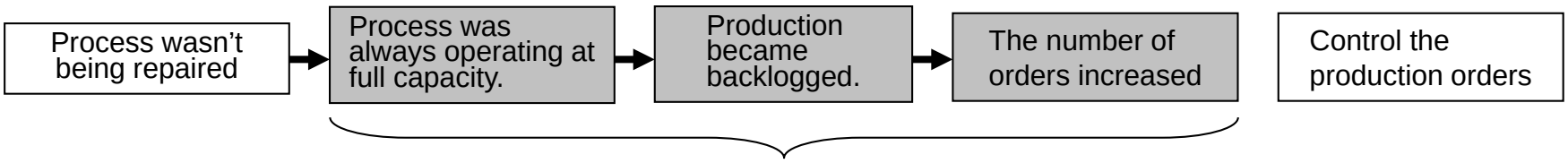
＜Good example＞

○

- Nozzle direction was incorrect
- Volume of cleaning solution was low.
  How low is low?
- Cleaning solution was dirty.
  How dirty is dirty?

＜Step 4.2 Point 4＞ "Why, why" is a failure analysis, so excuses should not be presented as causes. You will reach a strange countermeasure as below.

Excuse is not reflection, so it's removed from the cause.



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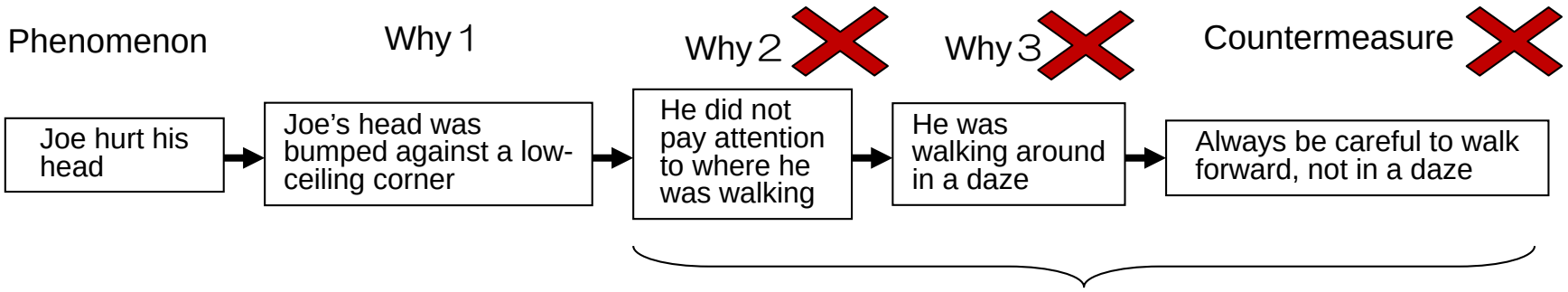
Why-Why Analysis

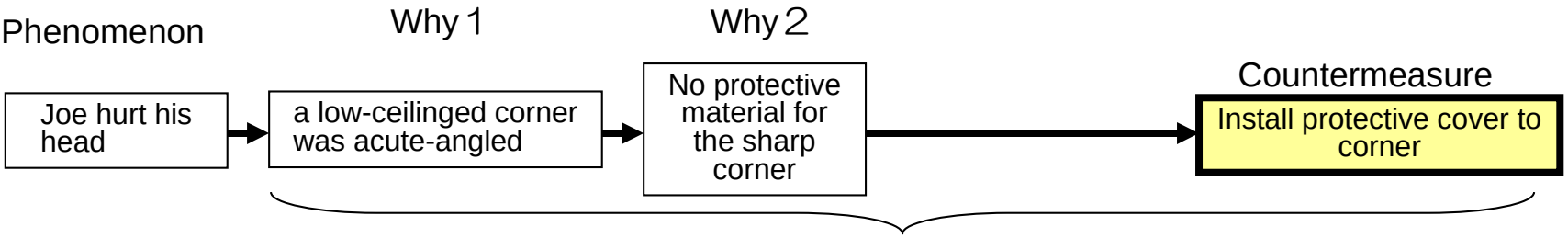
＜Step Ⅳ.2 Point 5＞ Blaming human behavior must be avoided. A “person's behavior is affected by health and the situation”.

• For a true cause, like the below case “protective material is stuck on a corner”, it is better to pursue a cause to a hardware side or a mechanism of management.

＜Bad example＞



＜Good example＞



The cause is pursued to a hardware side and mechanism of management!

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Why-Why Analysis

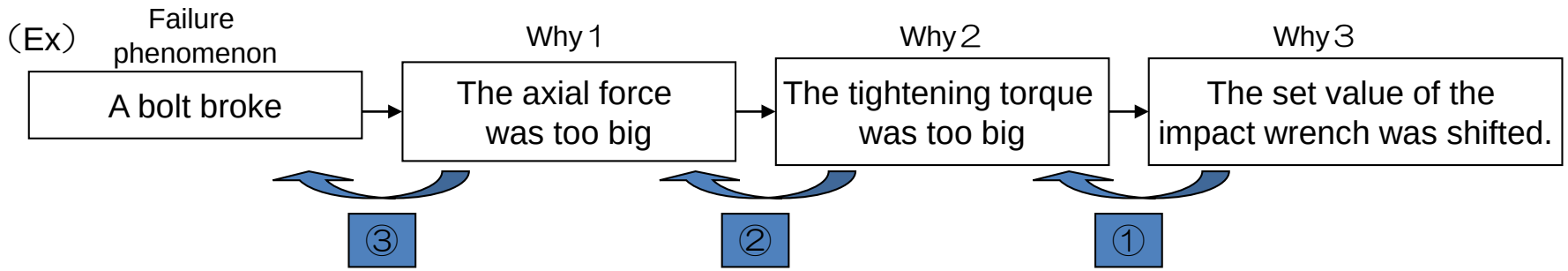
Step Ⅳ.３：When you reach the last “Why", trace backward to the problem and verify the logic of your flow

＜Point＞ After completing the “Why, why” analysis, always confirm if it makes sense by tracing back to “Phenomenon” from the last “Why” part.

Use the conjunction therefore, and re-read back from the conclusion.

A cause with incorrect logic can be identified fairly quick.

＜Trace back to “Phenomenon” from “Why”＞



①	The set value of the impact wrench was shifted	therefore	The tightening torque was too big
②	The tightening torque was too big	therefore	The axial force was too big
③	The axial force was too big	therefore	A bolt broke

Why-Why Analysis

Step Ⅳ.4：Check whether you have found all true causes - Have we missed any?

＜Point＞ Did all causes get mentioned? - check by going in reverse.

- Check “if this cause did not happen, could the previous phenomenon not occur?

＜Bad example＞

Cause	Why 1	Why 2
The axial force was too big	The friction coefficient was small	Oil was stuck on the shaft

Consider “if oil was not on the shaft, would the friction coefficient not be small?“ ・・・

Review

＜Good example＞

Cause	Why 1	Why 2
The axial force was too big	The friction coefficient was small	Oil was stuck on the shaft
		Surface roughness of the thread was too good
		Effective diameter of internal thread was oversize

The new cause comes out

Why-Why Analysis

Step Ⅳ.５：Take a countermeasure against the true cause.

＜Point＞

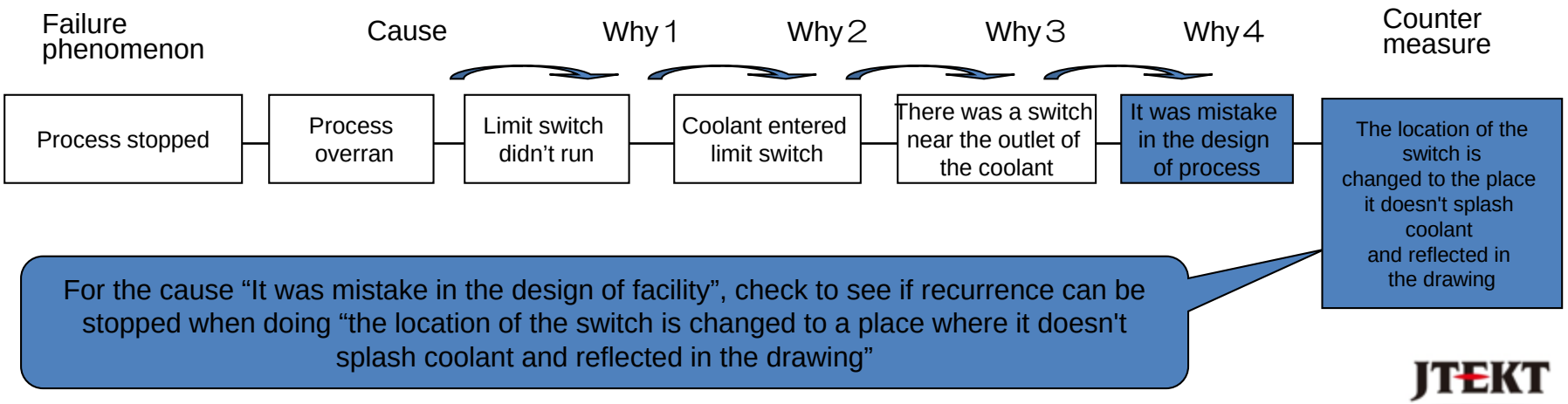
Even if it isn‘t repeated 5 times “Why” , we can get a true cause. Do we need to do 5 times?

The goal is “**To find a true cause.**”, and **“5 TIMES” IS AN ONLY TARGET**.

But, if executed only 2 or 3 times, it **may give the illusion you’ve reached the true cause**. It is important to check **whether recurrence can actually be stopped when taking a countermeasure against the cause**.

So, if you found the cause leading to the prevention of recurrence, you can end with “Why 4”. On the other hand, when the cause which leads to prevention of recurrence is not found even if it's repeated 5 times, “Why" must be followed until the cause comes out.

（Ex）



Why-Why Analysis

Step IV.6：Confirm the countermeasure effect. When it is ineffective, execute “Why-Why analysis again

- All corrective actions need to be verified before determining if you have prevented an occurrence
- Methods to verify
  - Turn the problem on and off by implementing and removing the countermeasure
  - Put a measureable detection in place for a period of time to verify that the problem no longer occurs
  - Put an audit in place for a period of time to verify that the problem no longer occurs

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Ⅴ. Summary

1. What is “Why, why” analysis?

It is a technique to investigate the true cause which lies in the root of the malfunction, not the superficial, by repeating “Why” for the occurred problems.

2. Preparation of “Why, why” analysis

Evaluate your data using 3 factors (see next slide), and organize.

3. Operation of “Why, why” analysis

Confirm the facts of the actual defect at the actual site, and exhaust all the possible causes.

4. Main Points to remember of “Why, why” analysis

（1）Express “Cause” and “Why” by short and concise sentences

（2）Repeat “Why” until a cause that can connect to a true problem prevention comes out.

（3）Don’t use ambiguous words like “bad”

（4）Check that you have caught all causes by asking yourself if this cause did not happen could we still have had the issue.

（5）Confirm whether logic is followed from reading the why-why in reverse.

（6）If the countermeasures are not effective, perform the “Why, why” analysis again.

Why-Why Analysis

The 3 Legs of a Why-Why

- **Direct root cause: How did the problem occur? Or Why made?**
- Start with the actual problem.
- Keep the focus simple

- **Detection of root cause: How did the problem escape? Or Why shipped to the customer or next step in the process?**
- Focus on inspection system.
- How did it fail?

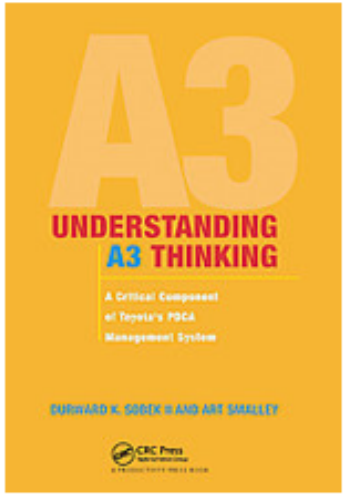
- **Systemic root cause: Why didn't our systems protect the customer?**
- Look at the problem from a bigger perspective
- Find organizational flaws.

Appendix B

Recommended book

“Understanding A3 Thinking”

Durward K. Sobek II and Art Smalley
CRC Press



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Appendix C

A3 Examples

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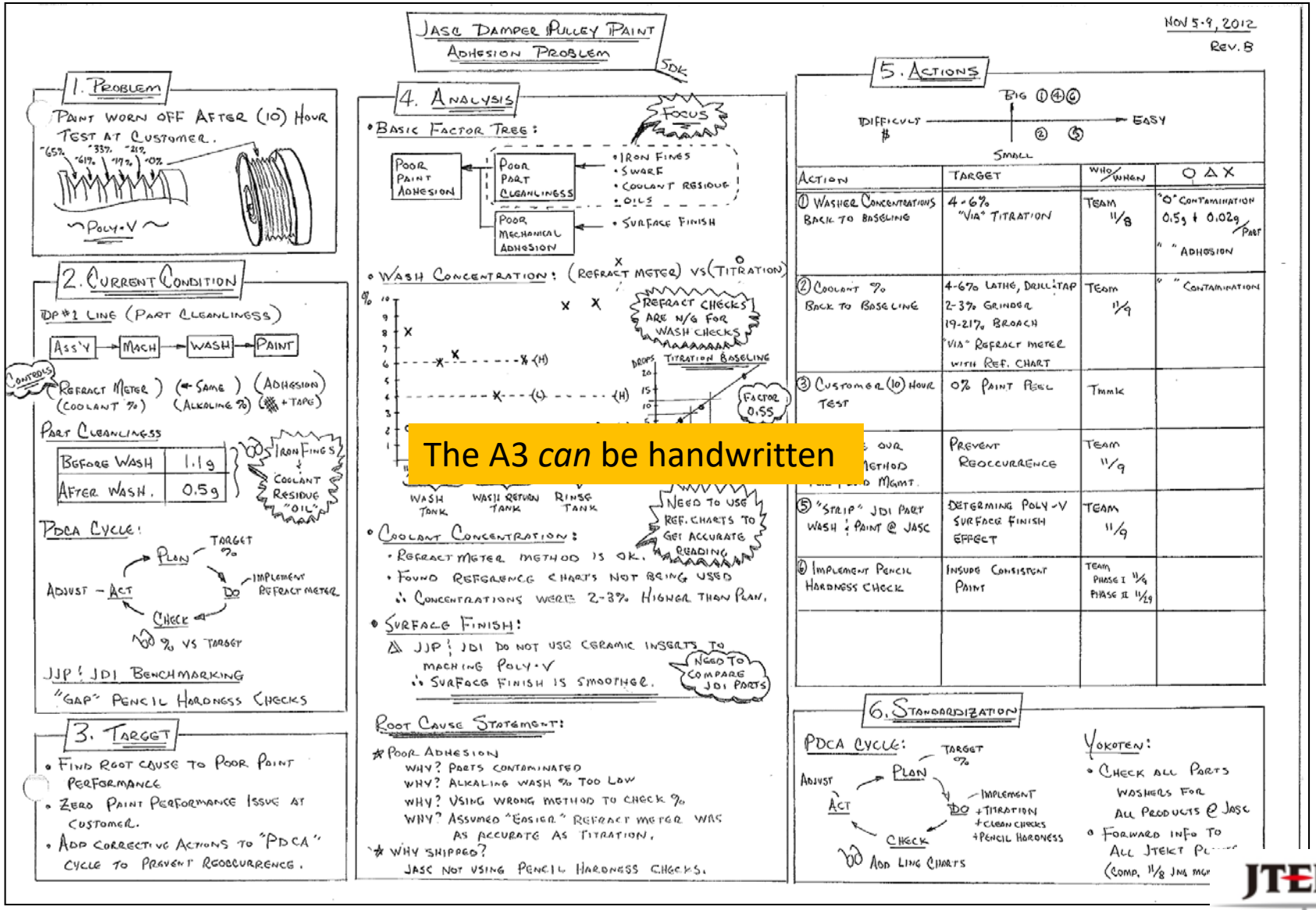
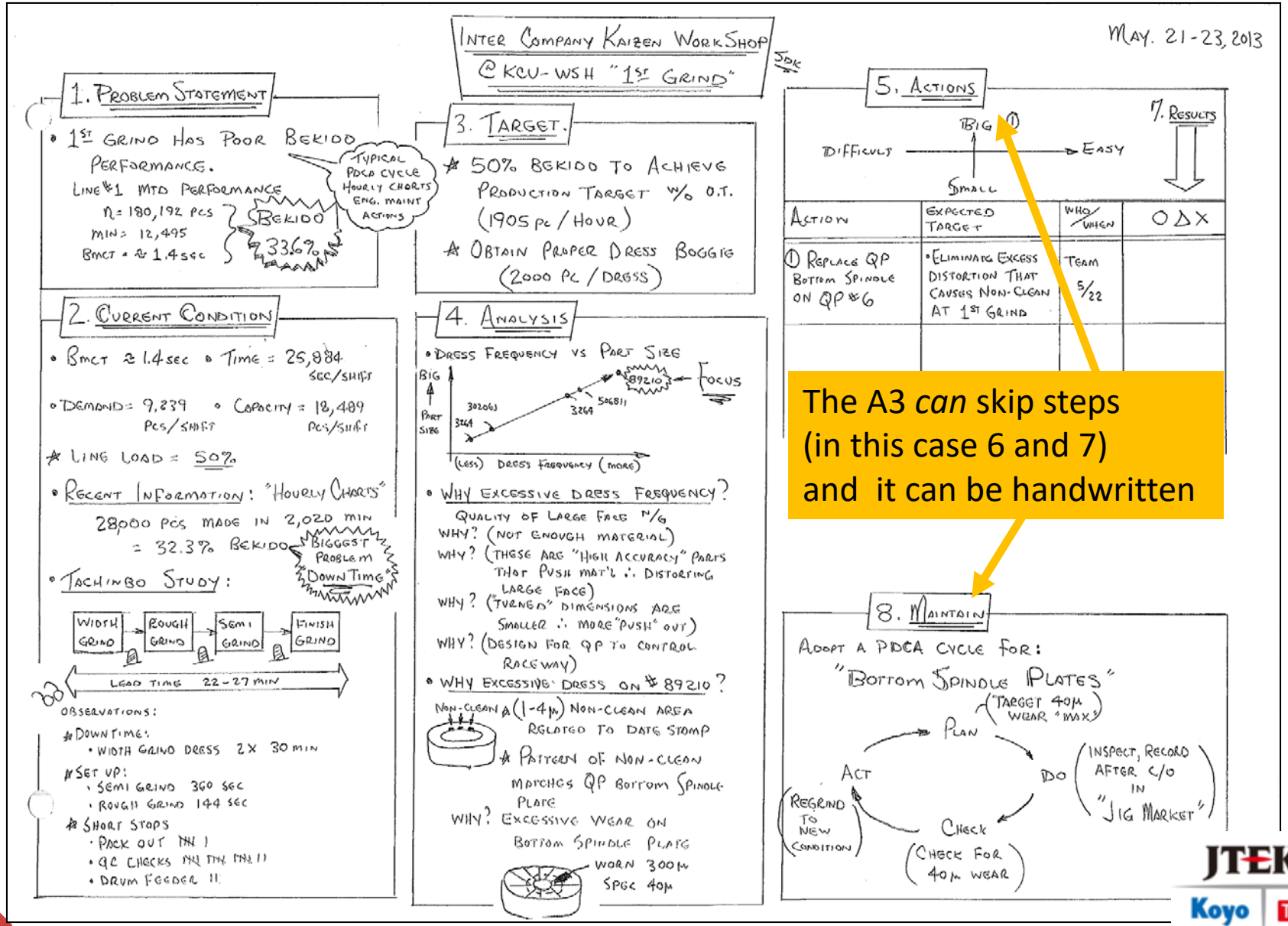
Example A3's

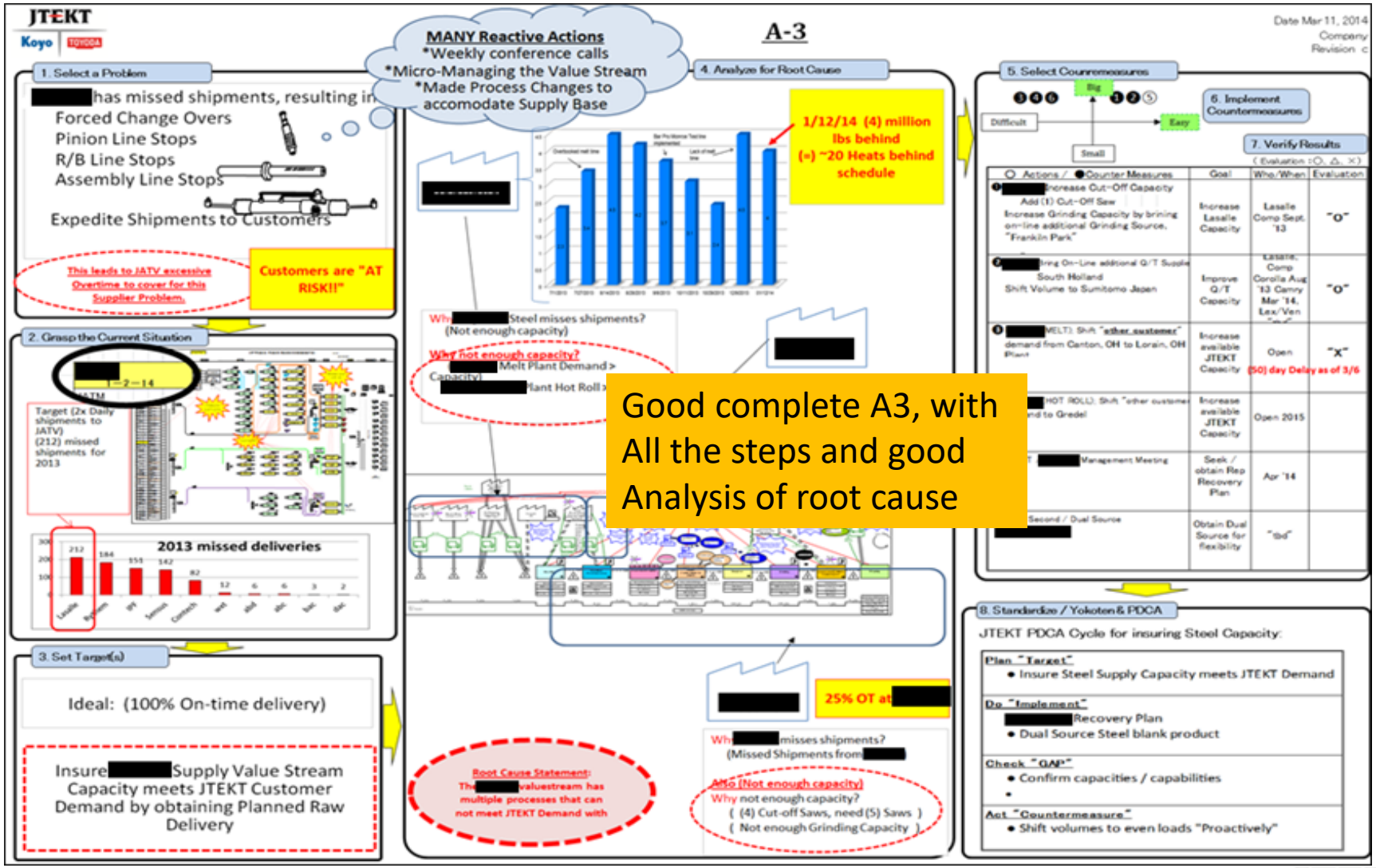


The A3 *can* be handwritten

Example A3's


INTER COMPANY KAIZEN WORKSHOP
@ KCU-WSH "1ST GRIND"
MAY. 21-23, 2013
1. PROBLEM STATEMENT
• 1ST GRIND HAS POOR BEKIDO PERFORMANCE.
LINE #1 MTD PERFORMANCE
N = 180,192 PCS
MIN = 12,495
BMCT = ≈ 1.4 SEC
BEKIDO
33.6%
TYPICAL PDCA CYCLE HOURLY CHARTS ENG. MAINT ACTIONS
3. TARGET.
★ 50% BEKIDO TO ACHIEVE PRODUCTION TARGET W/O O.T. (1905 PC / HOUR)
★ OBTAIN PROPER DRESS BOGGIE (2000 PC / DRESS)
2. CURRENT CONDITION
• BMCT ≈ 1.4 SEC • TIME = 25,984 SEC/SHIFT
• DEMAND = 9,239 PCS/SHIFT • CAPACITY = 18,489 PCS/SHIFT
★ LINE LOAD = 50%
• RECENT INFORMATION: "HOURLY CHARTS"
28000 PCS MADE IN 2,020 MIN
= 32.3% BEKIDO
BIGGEST PROBLEM
DOWN TIME
• TACHINBO STUDY:
WIDTH GRIND
ROUGH GRIND
SEMI GRIND
FINISH GRIND
LEAD TIME 22 - 27 MIN
OBSERVATIONS:
★ DOWN TIME:
• WIDTH GRIND DRESS 2X 30 MIN
★ SET UP:
• SEMI GRIND 360 SEC
• ROUGH GRIND 144 SEC
★ SHORT STOPS
• PACK OUT #1
• QC CHECKS #1 #11 #11
• DRUM FEEDER #1
4. ANALYSIS
• DRESS FREQUENCY VS PART SIZE
BIG
PART SIZE
SMALL
302063
3269
3269
526811
89210
FOCUS
(LESS) DRESS FREQUENCY (MORE)
• WHY EXCESSIVE DRESS FREQUENCY?
QUALITY OF LARGE FACE N/G
WHY? (NOT ENOUGH MATERIAL)
WHY? (THESE ARE "HIGH ACCURACY" PARTS THAT PUSH MAT'L ∴ DISTORING LARGE FACE)
WHY? ("TURNED" DIMENSIONS ARE SMALLER ∴ MORE "PUSH" OUT)
WHY? (DESIGN FOR QP TO CONTROL RACEWAY)
• WHY EXCESSIVE DRESS ON #89210?
NON-CLEAN @ (1-4μ) NON-CLEAN AREA RELATED TO DATE STAMP
★ PATTERN OF NON-CLEAN MATCHES QP BOTTOM SPINDLE PLATE
WHY? EXCESSIVE WEAR ON BOTTOM SPINDLE PLATE
WORN 300μ
SPEC 40μ
5. ACTIONS
7. RESULTS
BIG
DIFFICULT
EASY
SMALL
ACTION
EXPECTED TARGET
WHO / WHEN
○ △ ×
① REPLACE QP BOTTOM SPINDLE ON QP #6
• ELIMINATE EXCESS DISTORTION THAT CAUSES NON-CLEAN AT 1ST GRIND
TEAM 5/22
The A3 can skip steps (in this case 6 and 7) and it can be handwritten
8. MAINTAIN
ADOPT A PDCA CYCLE FOR:
"BOTTOM SPINDLE PLATES"
PLAN
(TARGET 40μ WEAR "MAX")
DO
(INSPECT, RECORD AFTER C/O IN "JIG MARKET")
CHECK
(CHECK FOR 40μ WEAR)
ACT
(REGRIND TO NEW CONDITION)

Example A3's



Good complete A3, with All the steps and good Analysis of root cause