

Problem Solving

Methodology and Tools & Techniques

About Problems



- A problem is an obstacle , impediment, difficulty or challenge to achieve a desired goal
 - a state of difficulty that needs to be resolved.
 - a discrepancy between existing and a desired state of affairs.

About Problem Solving



Problem Solving Process

Problem Solving is the process of tackling problems in a systematic and rational way.

About Problem Solving



Problem Solving is about to identify problems, causes and solution:

- ***Thinking Differently-Concepts***
- ***Talking Differently -Vocabulary***
- ***Doing Differently - Tools***

Why to solve Problems



Problems are solved to

- improve effectiveness and efficiency of processes
- become a "World Class Company"
- improve the customer satisfaction
- reduce COPQ
- improve the bottom line measures of the business

Problem Solving Methodology

- Step-1: Identification of Problem (work related Problem)**
- Step-2: Selection of the Problem**
- Step-3: Definition of Problem**
- Step-4: Analysis of Problem**
- Step-5: Identification of causes(Possible)**
- Step-6: Finding out the Root causes**
- Step-7: Data Analysis**
- Step-8: Development of solutions**
- Step-9: Foreseeing Probable Resistance**
- Step-10: Trial Implementation and check Performance**
- Step-11: Regular Implementation**
- Step-12: Follow up and Review**

Step-1: Problem Identification

Tool used:

Thinking Process (thought process)/Brain storming (Round Robin Method)



- Select the processes
- Team participates in listing problems
- List the problems in the selected processes/work area
- Write problems specifically and in negative form.
- Minimum 50 problems

Step-1: Problem Identification

Sl.No	Problem Description
1	Pin Holes
2	Cross cutting
3	Pallet down
4	Improper filling of paste on lugs
5	Over paste on lugs
6	Plate Bend
7	Grid jamming's at feeder
8	Plates sticking
9	More dry cycle extension
10	Low weight
11	More dross scrap
12	Low thickness
13	Lumps
14	Photo sensor not working
15	Flash Drier temperature high



Step-1: Problem Identification

SI.No	Problem Description
16	Flash drier temp Low
17	Grid lifting problem
18	Air pressure high
19	Air pressure Low
20	Flash drier chain vibration
21	Flash drier chain links damaged
22	Cutting blade problem
23	V-belt problem
24	Physical axis problem
25	Brushes worn-out
26	Side cleaning not good
27	Thermo couple sensing problem
28	Catch fingers problem
29	Grippers adjustment problem
30	Pressure plate problem
31	Pressure plate springs problem
32	Pressure Plate screws problem
33	Pressure plate bushes problem



Step-1: Problem Identification

Sl.No	Problem Description
34	Paste scrap
35	Flash drier temperature problem
36	Grids scrap at feeder
37	Bottom plate damage
38	Bottom paste re-usage
39	Prater timing changed
40	Feeder timing change
41	Drive roller problem
42	Rubber roller problem
43	Cone slide gate open / close problem
44	Ox master cone cylinder problem
45	Transfer roller speed problem
46	Knurling roller shaft problem
47	Knurling roller bush problem
48	Drive roller bush problem
49	Cutter adjustment problem
50	Water addition on hopper
51	Low density



Step-1: Problem Identification

Sl.No	Problem Description
52	More acid leaks in ACS
53	More Physical damages in 150Ah
54	Acid Specific gravity Variation in ACS
55	Operator fatigue in Manual acid filling
56	Manual preparation of initial gravity acid in ACS
57	Minimize the Circuits break time /Identification of Errors
58	Minimizing the circuit errors after switch on & during charging
59	Minimizing of temperature variation in ACS
60	Operator fatigue in ACS filter cleaning
61	Acid level variation in 150Ah
62	Frequent acid overflow in ACS
63	Frequent failure of conveyor motors
64	No FIFO system for charged batteries
65	Frequent failure of raw acid pumps
66	Reduction of post melt rejections
67	Reduction of post damage rejections
68	More Heat seal open rejections
69	No inter lock system in ACS conveyor's
70	Auto unloading system is not working in ACS
71	Manual orientation change of every battery



Step-2: Problem Selection

Problem selection consists of 3 steps

- 2a. Categorization of Problem
- 2b. Selection of Critical Problem
- 2c. Project Planning

Step-2: Problem Selection

Step-2a: Categorization of Problem

➤ Tool used: Stratification

Problems can be categorized as "A", "B", "C"

- Category "A"- can be solved by the team within the department with minimum support of others.
- Category "B"- can be solved with the Other department support during solutions implementation.
- Category "C"- can be solved with Management support during solutions implementation .

Note: it is always better to take 'A' type problems

Step-2: Problem Selection

Step-2b: Selection of Critical Problem

➤ Tool used: Ranking Method/Pareto Analysis/Priority Number

✓ If incase we have more than 10 Problems in category "A" then top ten problems are selected based on process knowledge then select top ten critical problems.



✓ The top ten problems again rank using PQCDSSME ranking method.

Step-2: Problem Selection

Step-2b: Selection of Critical Problem

➤ Tool used: Ranking Method/Pareto Analysis/Priority Number

Sl.No	Problem	Productivity	Quality	Cost	Delivery	Safety	Energy	Morale	Total
1	More plate rejections	9	1	8	1	1	1	1	22
2	More group rejections	10	5	10	3	1	1	1	32
3	Plate missing near one way	8	3	5	7	1	1	1	26
4	Plate missing near two way	9	3	5	7	1	1	1	27
5	Plate missing near 3 rd feeder	7	3	5	7	1	1	1	25
6	Groups are not disengaging from cassette	5	3	5	1	1	1	1	17
7	Semi group cylinder stuck up	5	3	5	3	1	1	1	19

Step-2: Problem Selection

Step-2c: Project Planning

➤ Tool used: Milestone chart

- ✓ Milestone chart is prepared for the remaining 10 steps when to complete what.....

- ✓ This guides us to complete the project as per schedule/ ontime

Step-2: Problem Selection

Quality Circle name		Department		Co-Ordinator		Members name						
Project		Reason for selection		Facilitator								
Project No.		Start Date		Team leader								
Meeting day		Completeion Date		Time								
Sr.no	Activity	Week	Project Status									
			W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
1	Problem definition	Plan										
		Actual										
2	Problem analysis	Plan										
		Actual										
3	Identification of Possible causes	Plan										
		Actual										
4	Finding out the root causes	Plan										
		Actual										
5	Data analysis	Plan										
		Actual										
6	Developing solutions	Plan										
		Actual										
7	Foreseeing possible resistance	Plan										
		Actual										
8	Trial Implementation	Plan										
		Actual										
9	Regular implementation	Plan										
		Actual										
10	Followup & review	Plan										
		Actual										

Step-3: Problem Definition

Problem Definition consists of 4 steps

- 3a. Where the problem is (photo graphs, video)
- 3b. Current Status of Problem (with historic/past data)
- 3c. Goal / objective set (Justification)
- 3d. Impact/Effect of problem

Step-3: Problem Definition

Step-3a: Where the problem is

- Tool used: Flow Diagram
 - ✓ High level Diagram
 - ✓ Matrix Diagram
 - ✓ Detailed Diagram

Step-3: Problem Definition



Oxide Preparation



Grid Casting



Paste mixing

➤ High level Diagram



Pasting



Plate Curing & Drying



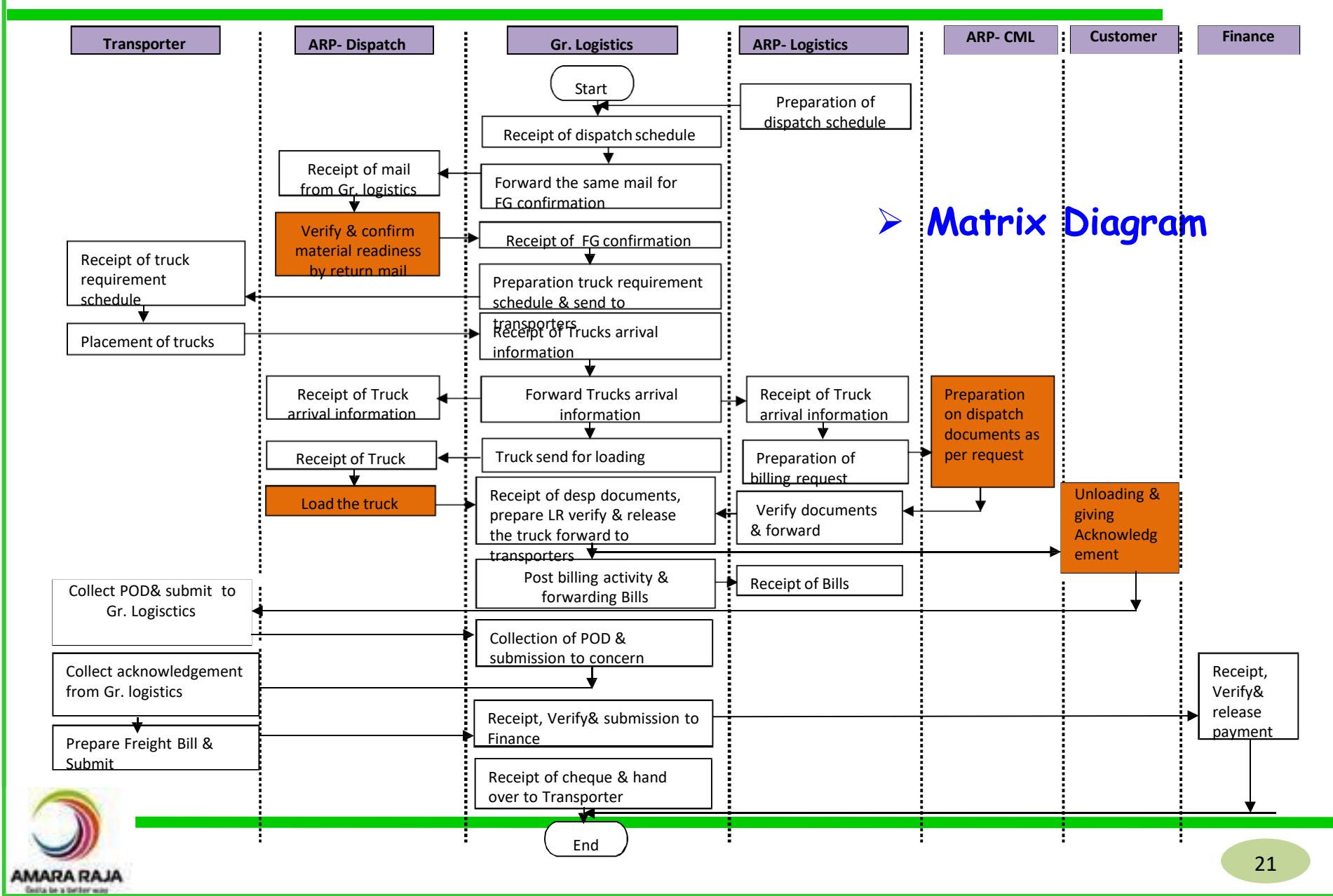
Plate Cutting



Assembly

Problem
Generated
area

Step-3: Problem Definition



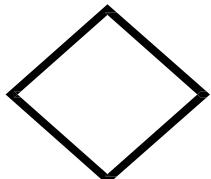
Step-3: Problem Definition



Terminator



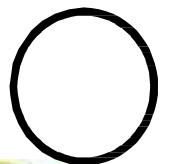
Activity



Decision

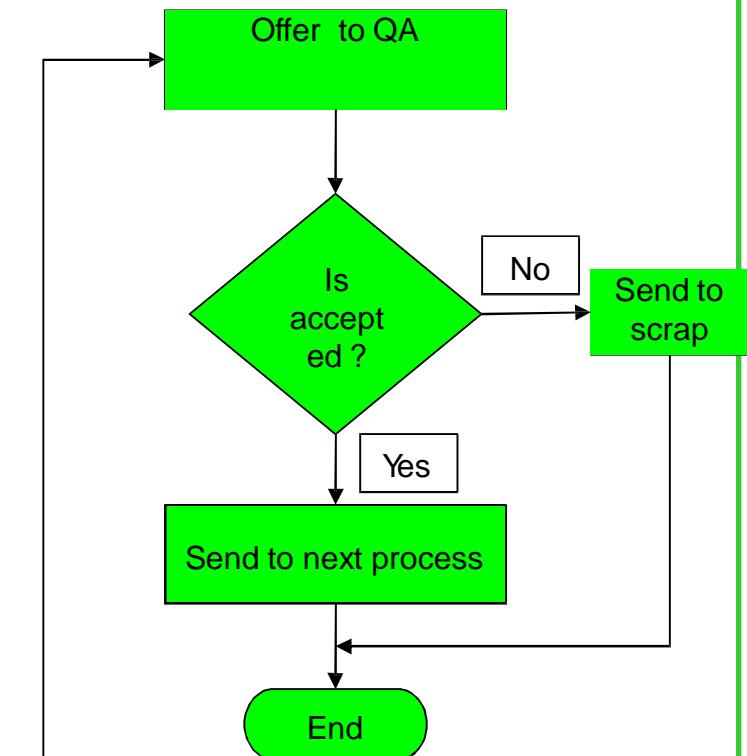
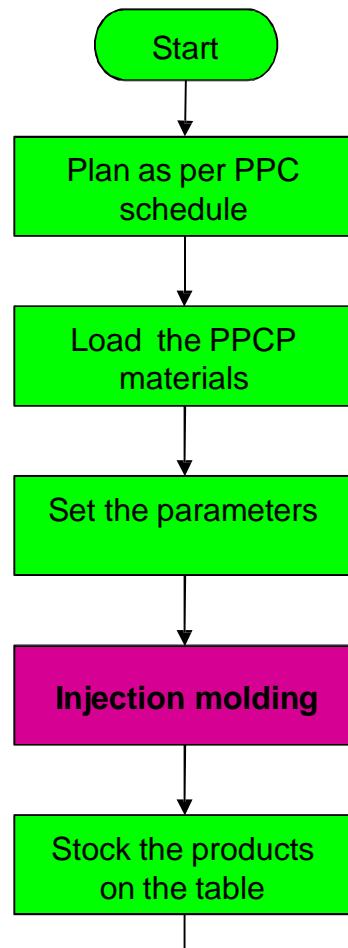


Flow lines



Connector

➤ Detailed Diagram

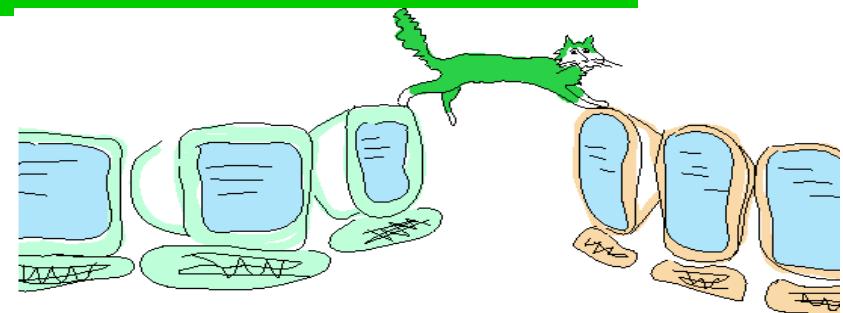


Step-3: Problem Definition

Object of the Project:- Specify the object of the project.

Goal Statement:- Specify the Target with Values. Justification need to give for Target based on Machine Reliability, Environment, Operator Capability, Machine Feasibility, Input Material and Process Capability.

Impact of the Problem:- List the Impact of the selected problem and cross verify it with PQCDSME in Step – 2

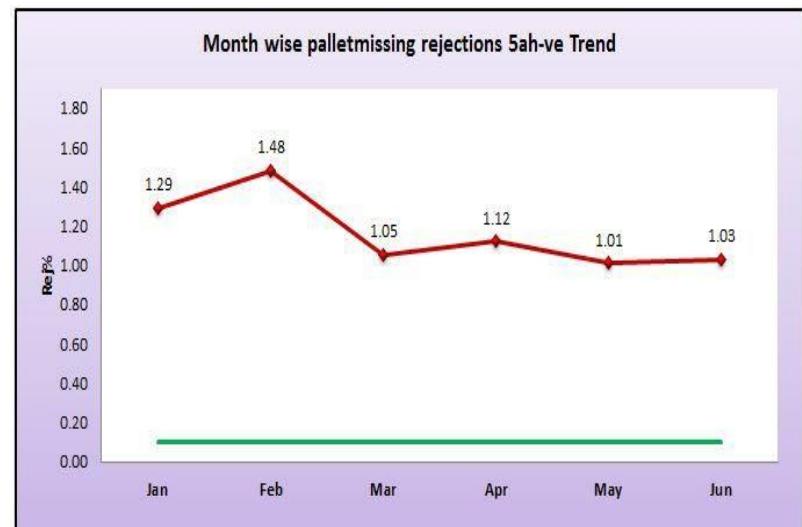


Step-3: Problem Definition

Step-3b: Current/ Present status

➤ Tool used: Bar/ Line Graph

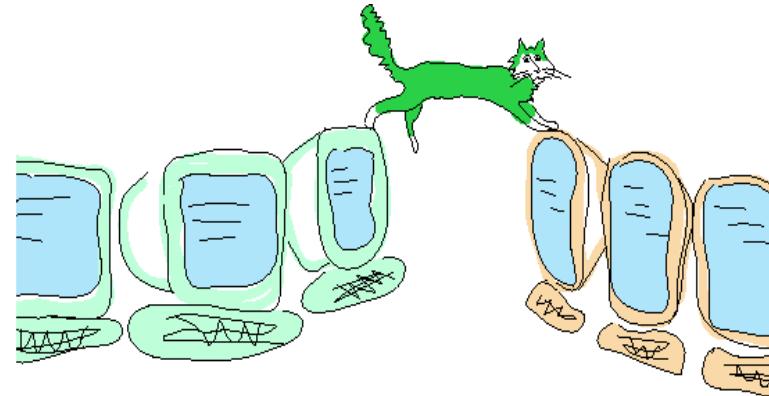
- ✓ Understand and collect data how the process is performing present, like % of scrap, % rejections, operator fatigue, productivity per shift



Step-3: Problem Definition

Step-3C: Goal setting

Need to understand where we want to be
(our aim how much to be improved)



For any process we should improve min 80%.

Justification:

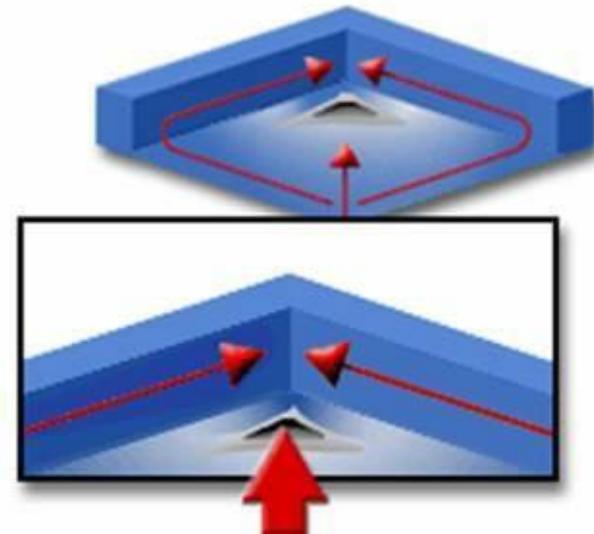
Justification for Target set is based on Machine Reliability, Environment, Operator Capability, Machine Feasibility, Input Material and Process Capability.



Step-3: Problem Definition

Step-3d: Impact of the problem

- ✓ In which way the selected problem is having impact on the interrelated process
- ✓ The impacts like productivity, customer satisfaction, energy, delivery schedules, cost, safety etc



Step-4: Problem Analysis

Step-4a: Understanding the problem



Critical step of the problem solving is to understand the problem fully as possible in the context in which way it occurs .

Understand by what means and ways the problem is creating.

Can understand contributors for the problem

Step-4: Problem Analysis

Step-4b: Understanding the problem

➤ Tool used: 4W 1H

4W 1H is a technique used to understand the problem and collect Key Information about the problem

It is an amazing tool in different situations where one needs to clarify or understands something in more depth.



Step-4: Problem Analysis

Step-4b: Understanding the problem

What is the problem -- Purpose

(We have to write our problem in detail)

Where is it happening -- Place

(On the product/process which location/area the problem is occurring)

When is it happening -- Sequence/Pattern

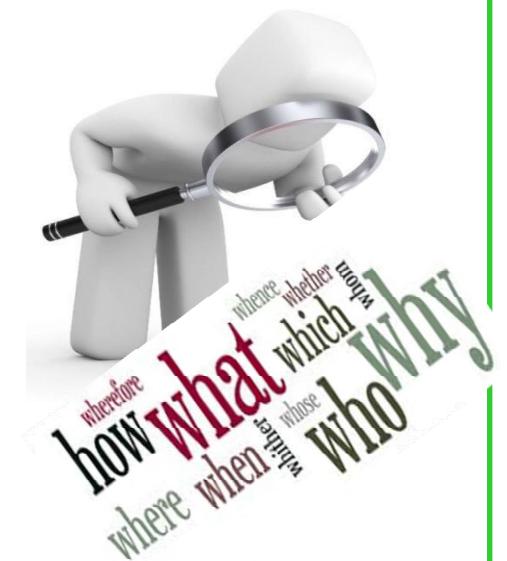
(At what time it is happening/How it is Happening)

Who is effected -- Person

(The Persons who are effecting while doing this process)

How does it happen & many times -- Means

(How the Problem is Occurring/How many times it is Happening)



Step-4: Problem Analysis

Step-4c: Collect key Information to Understand problem

Need to collect the Key Information regarding the Selected Problem/Process

Error Code	24.06.13	25.06.13	26.06.13	27.06.13	28.06.13	29.06.13	30.06.13	Average
Double Plate	72	68	75	78	69	74	81	74
Enable Rod	55	58	49	46	51	58	52	53
Two Way Track Chain	46	45	48	50	42	41	39	45
3 rd Feeder Pusher Plate	32	34	31	38	36	29	28	33
Disk Wheel	10	11	9	16	15	8	14	12
Seperator End	4	3	5	4	6	3	4	4

Average Plate Stacking Machine Stoppage per Shift is 221 Times

Step-5: Identification of Possible Causes

Tool used : Brain storming, Cause & Effect diagram

Mr. Alex Osborn of USA developed this technique in 1950s to solve advertising and marketing problems.

Brainstorming is probably the best known technique and most widely used for idea generation.

By shop floor personnel,

Managers,

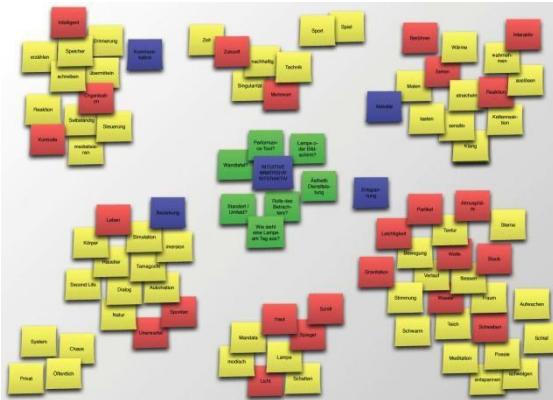
Politicians etc.



Step-5: Identification of Possible Causes

➤ Brainstorming Methods

- ✓ Free wheeling or Unstructured
- ✓ Slip Method
- ✓ Round Robin or Structured process



Methods of Brainstorming

Brainstorming can be done in three ways

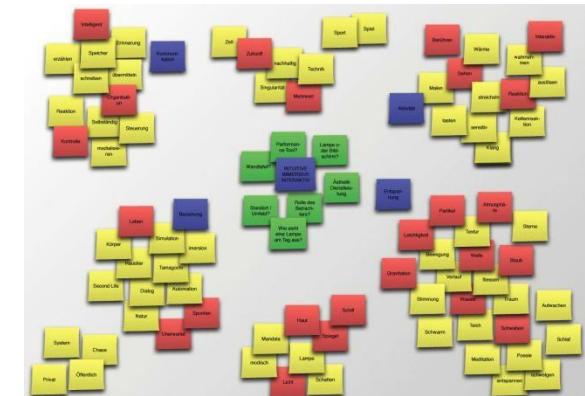
1. Free Wheeling or Unstructured

No hold ,no bar (piece) system. No limit on number of ideas at a time.



2. Slip Method

When you need the involvement of a large groups this method is essential for earning innovative ideas.



3. Round Robin or Structured Method

- a) Gather a group which is willing to work together.
- b) Select a leader. A leader is there in Quality Circle.
- c) He should have control over the group to encourage ideas.



Generally , In Quality circles , we preferred this brainstorming Method.



There are four basic rules in brainstorming :

- No criticism:** Criticism of ideas are withheld during the brainstorming session as the purpose is on generating varied and unusual ideals and extending or adding to these ideas. Criticism is reserved for the evaluation stage of the process. This allows the members to feel comfortable with the idea of generating unusual ideas.
- Welcome unusual ideas:** Unusual ideas are welcomed as it is normally easier to "tame down" than to "tame up" as new ways of thinking and looking at the world may provide better solutions.
- Quantity Wanted:** The greater the number of ideas generated, the greater the chance of producing a radical and effective solution.
- Combine and improve ideas:** Not only are a variety of ideals wanted, but also ways to combine ideas in order to make them better.



Step-5: Identification of Possible Causes

Step-5a: List out all possible causes for problem

➤ **Tool used: Cause and Effect Diagram**

Cause and Effect Diagrams help you to think through causes of a problem thoroughly.

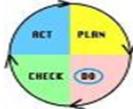
- A cause-and-effect analysis generates possible causes of problems.
- This tool provides a means of generating ideas about why the problem is occurring and possible effects of that cause.
- It allows problem solvers to broaden their thinking and look at the overall picture of a problem.
- It can reflect either causes that block the way to the desired state or helpful factors needed to reach the desired state.

Step-5: Identification of Possible Causes

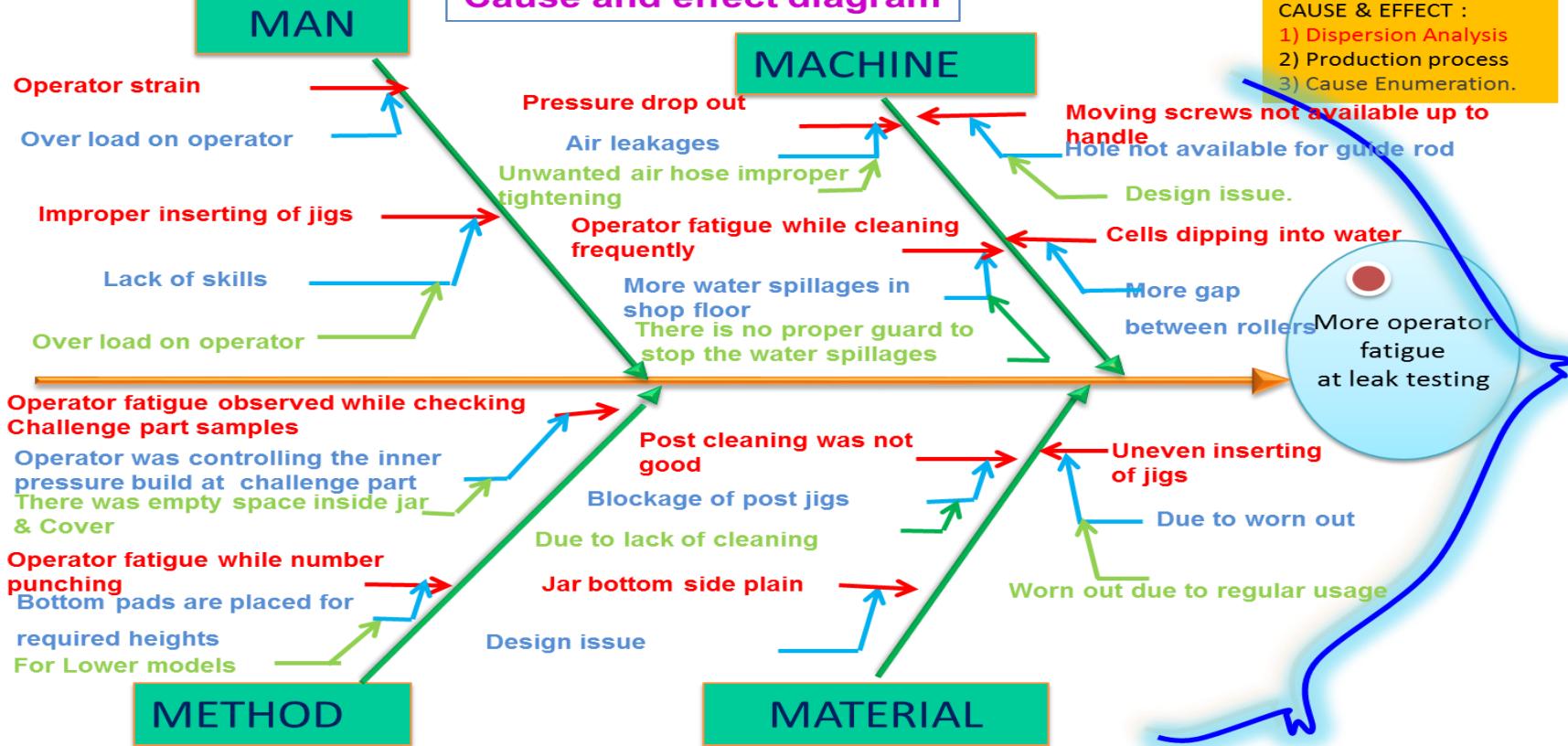
Types of Cause & Effect Diagram

- Dispersion Method
- Cause Enumeration
- Production Process Classification
- **Dispersion Method** is simple method where the causes are dispersed under Man, Machine, Method & Material Headers
- **Cause Enumeration** is a method where the causes are listed down based on the Effect selected
- **Production Process Classification** is a method where all the causes are listed down in the Process Selected

New Quality Circle Teams Uses Dispersion Method



Cause and effect diagram

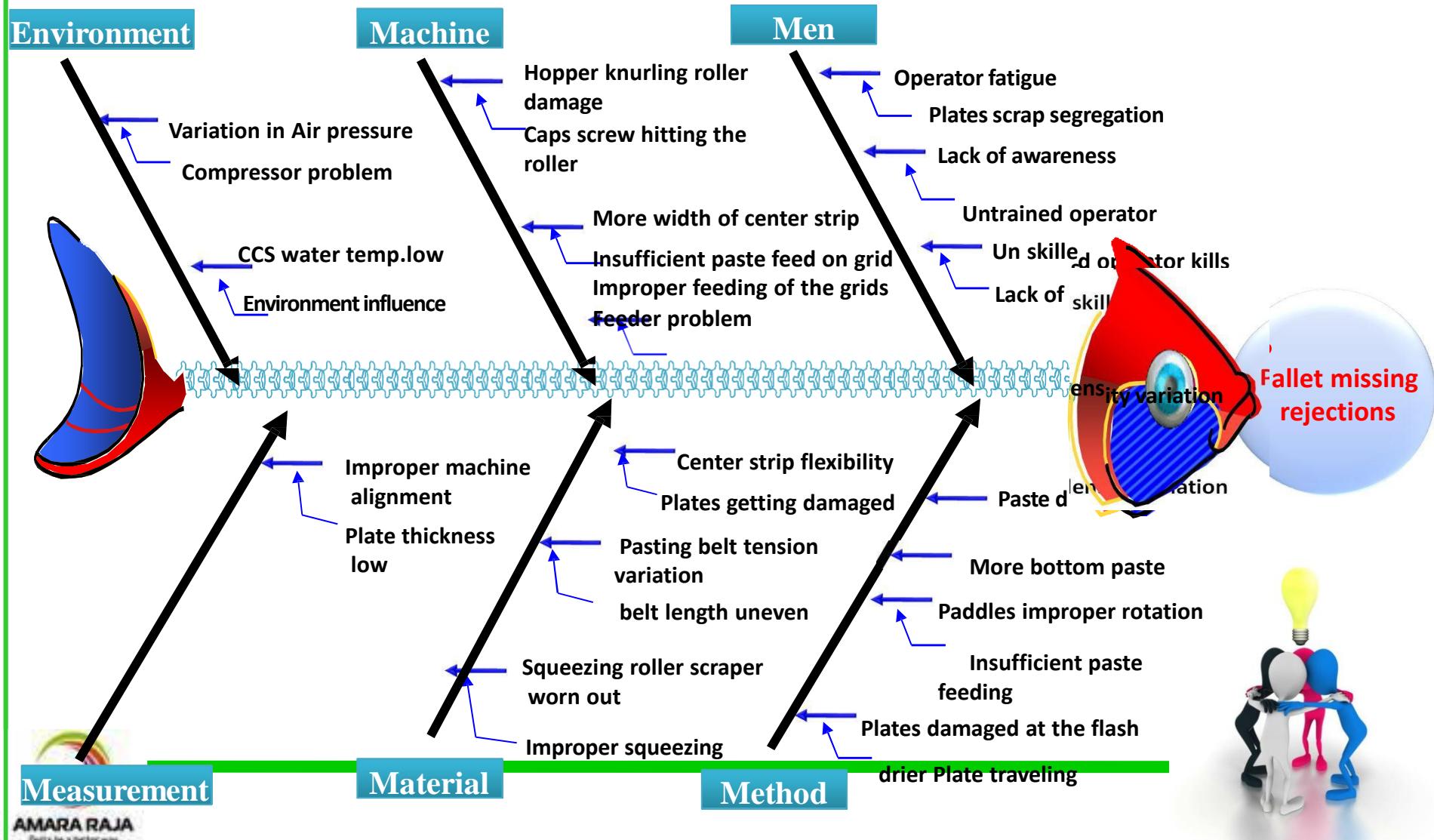


34

Step-5: Identification of Possible Causes

Step-5a: List out all possible causes for problem

➤ Tool used: Cause and Effect Diagram



Ranking Method /Cause & Effect Matrix

S1.No	Possible Causes	Ranking
1	Lack of Operator awareness	4
2	High absenteeism	3
3	Cover Shift in the Cover Pickup	8
4	Base cover terminal damage	4
5	Top cover over melt	4
6	Depth of Melt Variation	8
7	Cover height variation	2
8	Inadequate base cover melting	3
9	Pick up cylinder	1
10	Jig to Jig and Cavity to Cavity Variation	7
11	Uneven cover height	6
12	Cover damages	4
13	Applying mold release agent	4
14	Foam Thickness Variation	7
15	Rubber Seal Height Variation	7
16	Input Top & Base Cover Lip Height Variation	7



Step-5: Identification of Possible Causes

Step-5b: List out Critical Causes

➤ Tool used: Ranking method / Cause and effect matrix

	Possible Causes	Validation through Data/ Gemba observation		Critical/ Non Critical
Man	Untrained operators	Verified the Past Records Training given to all Operators		Non Critical
	Absenteeism	Absenteeism does not Influence the Current Problem		Non Critical
	Lack of knowledge	All Operators have required Knowledge based on Skill Matrix		Non Critical
	Wrong parameter setting in MIG machine	Machine will alarm if we set Wrong Parameters		Non Critical
	No regular Employees	All the Employees are Regular & ARTS		Non Critical
Method	Change over time is high	Yes Change Over Time is High due to More Tools		Critical
	More time taken for fixture change	Yes No identification of Fixtures		Critical

Step-5: Identification of Possible Causes

List of critical causes

Environment

Machine

Men

Xs	Vital Causes	Test description	Result
X1	Squeeze Roller scrapper Bend	Test with material type	Vital Cause
X2	Center strip flexibility	Test with one side fix and both side fix	Vital Cause
X3	Pasting belt tension variation	Test at different stages of belt pattern	Vital Cause
X4	More width of center strip	Change of center strip width	Vital Cause
X5	Variation in Paste density by adding bottom paste	Experiment Design (DOE)	Vital Cause
X6	More bottom paste	Experiment Design (DOE)	Vital Cause



Heaters are opened

Squeezing roller scraper worn out

Improper squeezing

Plates damaged at the flash

drier Plate traveling

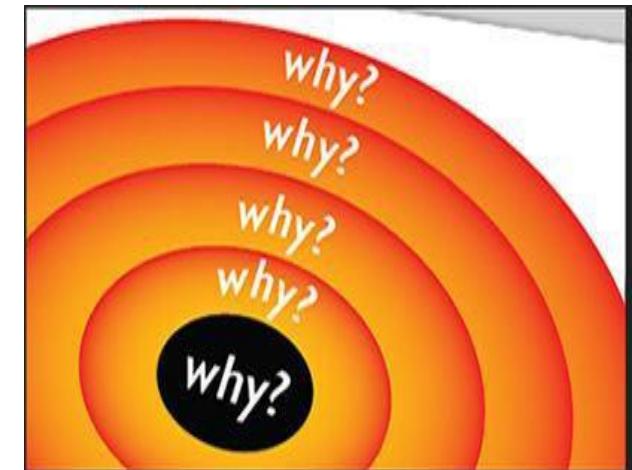
Method

Measurement

Material

Step-6: Finding out the Root causes

The technique was originally developed by Sukichi Toyoda and was later used within Toyota Motor Corporation during the evolution of their manufacturing methodologies.



Described the why why method as "the basis of Toyota's scientific approach . . . by repeating why five(5) times



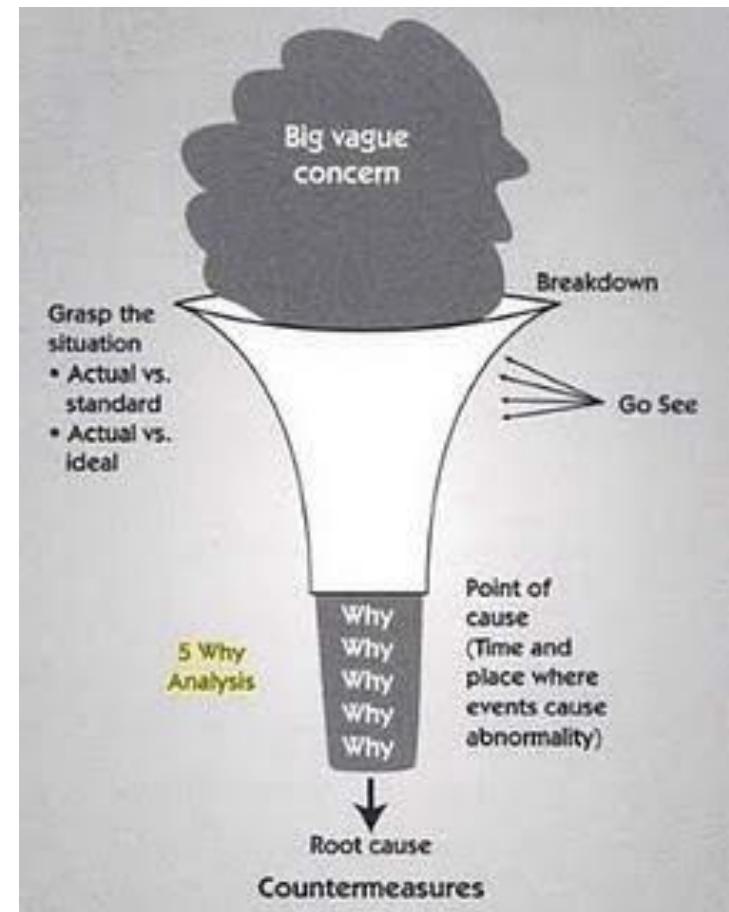
Step-6: Finding out the Root causes

➤ Tool used: Why why analysis

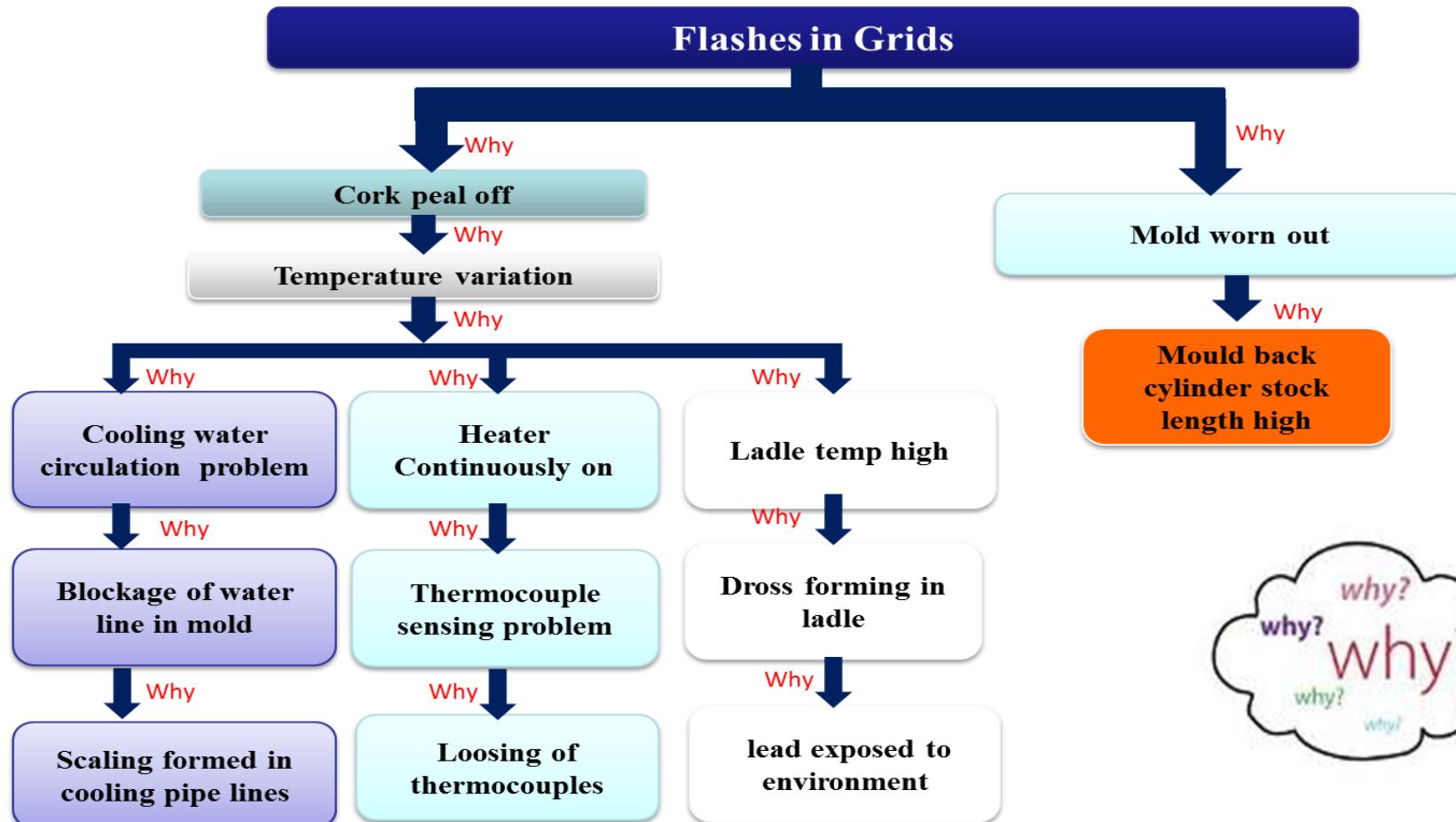
5 whys technique is used to understand/analyse the true root cause of a problem

- ✓ quick and simple to do.
- ✓ most effective when brainstorming in a small group.
- ✓ can be used for any problem or issue

Although it is called the 5 Whys technique we get root cause



WHY WHY ANALYSIS



Step-6: Finding out the Root causes

Cause	Root cause
Operator fatigue for sand blasting	Sand blasting machine is 10 meters away from mould releasing station
Operator bending at mould releasing station	Conveyor stopper switch in Panel board lying on floor
while operating air release valve	Air release valve fitted back side of machine
Keeps hands machine inside	No mechanism to sense hands during running condition
No communication mechanism	Operator shouting at semi-insertion

Step-7: Data Analysis for Root causes

Data: Data are numerical Expression of an activity or Data is a representation of facts.

Variable data:

data obtained using measuring instrument / process , is called variable data. Ex: Grid weight, thickness, Container height, cover width

Attribute data:

data obtained usually in the form of counts. These are discrete data.

Ex: Conformance or non conformance: No. of PCBs accepted/ rejected , No. of labels inspected : Good or Bad

Step-7: Data Analysis for Root causes

Data collection

Types of check sheets:

There are many types. Ex:

Process distribution check sheet

Process control information check sheet

Defective items check sheet

Defective cause check sheet



Step-7: Data Analysis for Root causes

Tool : Stratification

Stratification is a principle in which data are classified according to various possible sources of variation to identify the critical ones.

A technique used to analyze/divide a universe of data into homogeneous groups

Examples :

Supplier wise / item wise

Production shift wise / operator wise/ line wise Production shift day / night

Production separator wise

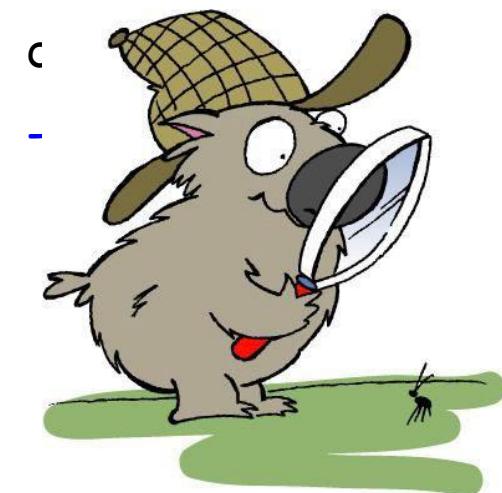
Write off Warehouse wise/RM/WIP/FG

Step-7: Data Analysis for Root causes

Tool : Pareto Analysis

Pareto analysis is a statistical technique in decision making that is used for selection of a limited number of tasks that produce significant overall effect

A Pareto chart is used to graphically summarize and display the relative importance of the difference between groups of data after doing a cause-and effect analysis.



The Pareto Principle states that only a "vital few" factors are responsible for producing most of the problems.

Step-7: Data Analysis for Root causes

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Enable Rod	55	58	49	46	51	58	52	53
Two Way Track Chain	46	45	48	50	42	41	39	45
3 rd Feeder Pusher Plate	32	34	31	38	36	29	28	33

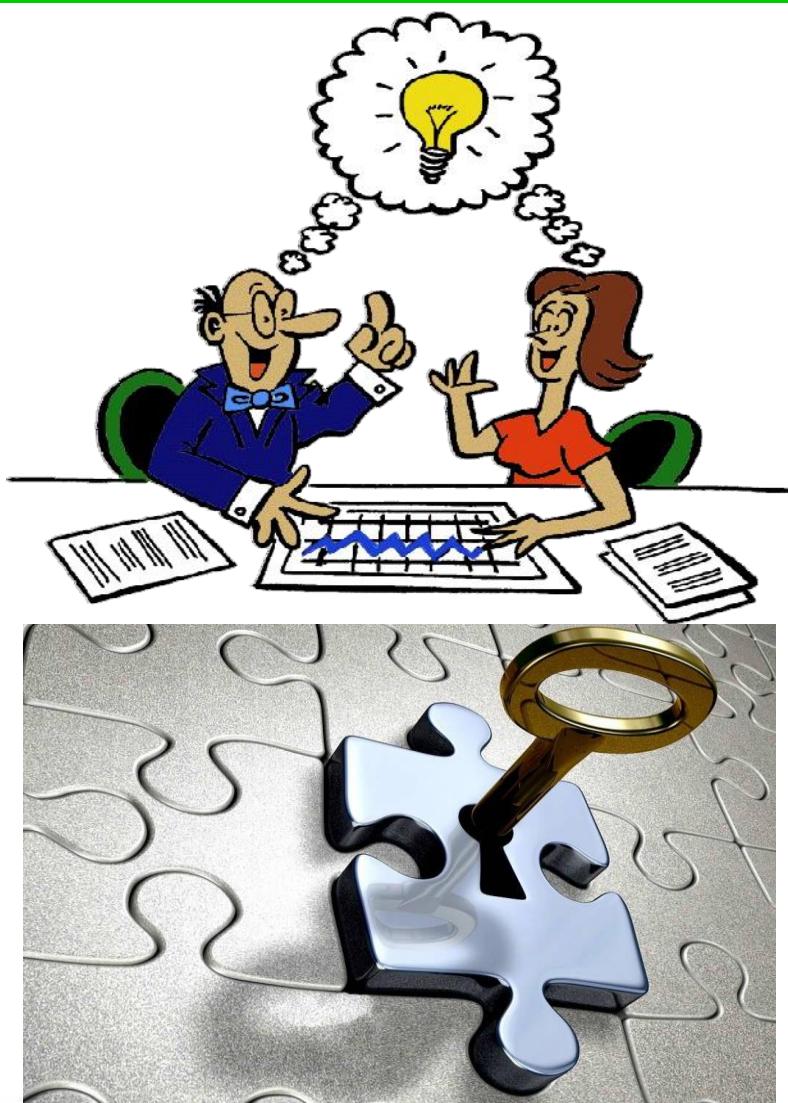
Average Double plate Picking at Feeders - 74 Times per shift

Average Enable Rod Hitting the Plates - 53 Times per shift Average

Plate Struck at Two Way Track Chain - 45 Times per shift

Average Plates Struck at 3rd Feeder Pusher Plate - 33 Times per shift

Step-8: Developing Solutions



Identify solution for each root cause through brainstorming

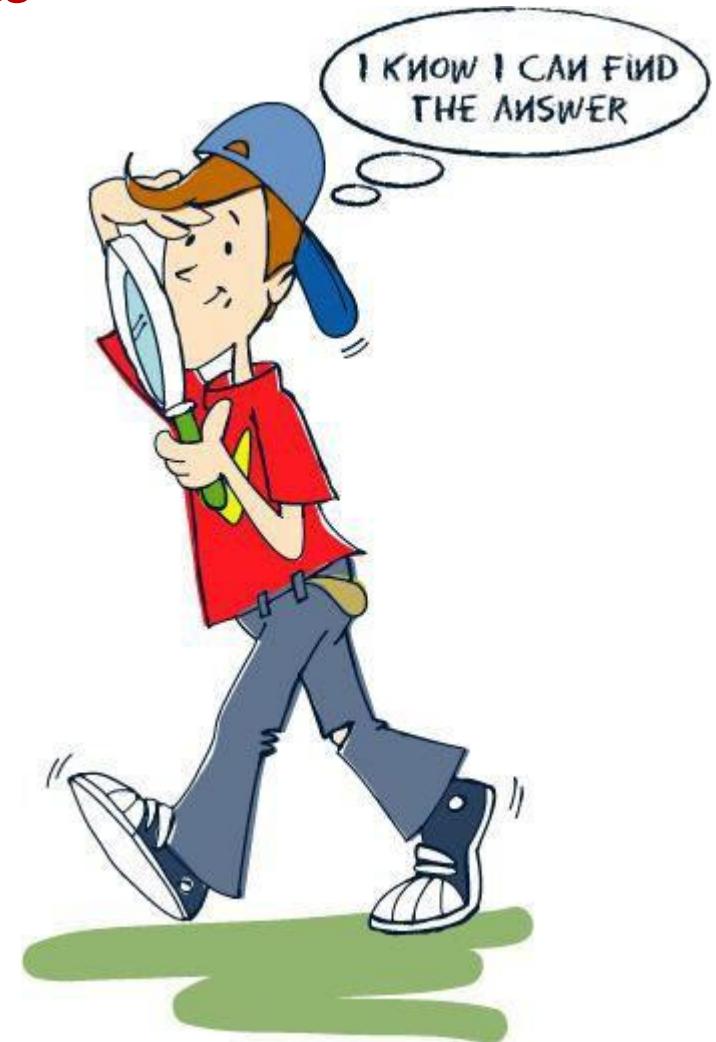
Validate feasibility to implement

Step-8: Developing Solutions

Step-8a: Develop solutions for Root causes

➤ Tool used: Brainstorming

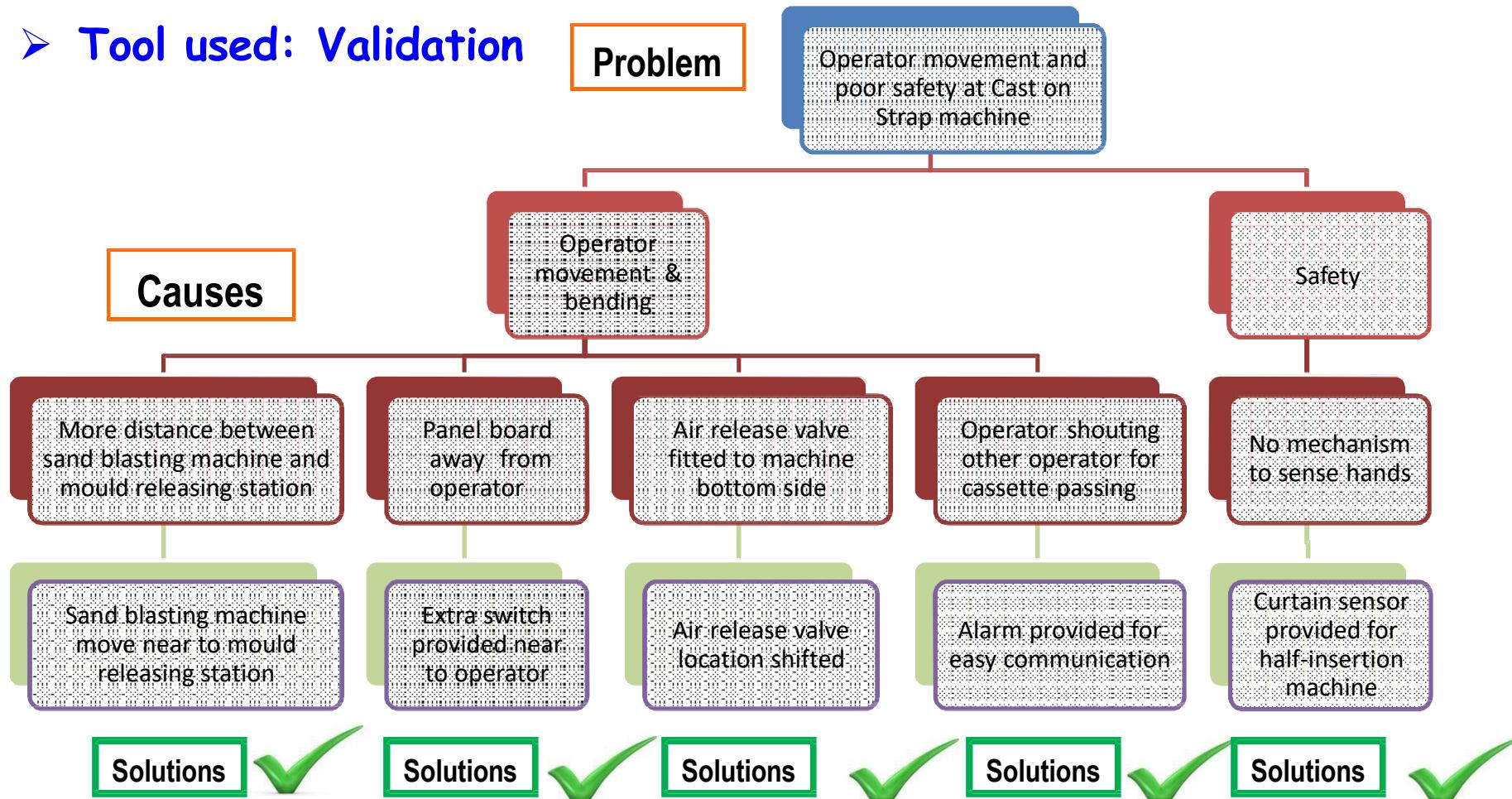
Sl No	Root cause	Solution
1	Sand blasting machine is 10 meters away from mould releasing station	Sand blasting machine move near to mould releasing station
2	Conveyor stopper switch in Panel board lying on floor	Extra switch provided beside to conveyor
3	Air release valve fitted back side of machine	Air release valve location shifted
4	No mechanism to sense hands during running condition	Alarm provided for easy communication
5	Operator shouting at semi-insertion	Curtain sensor provided for half-insertion machine



Step-8: Developing Solutions

Step-8b: Check for implementation feasibility for solutions

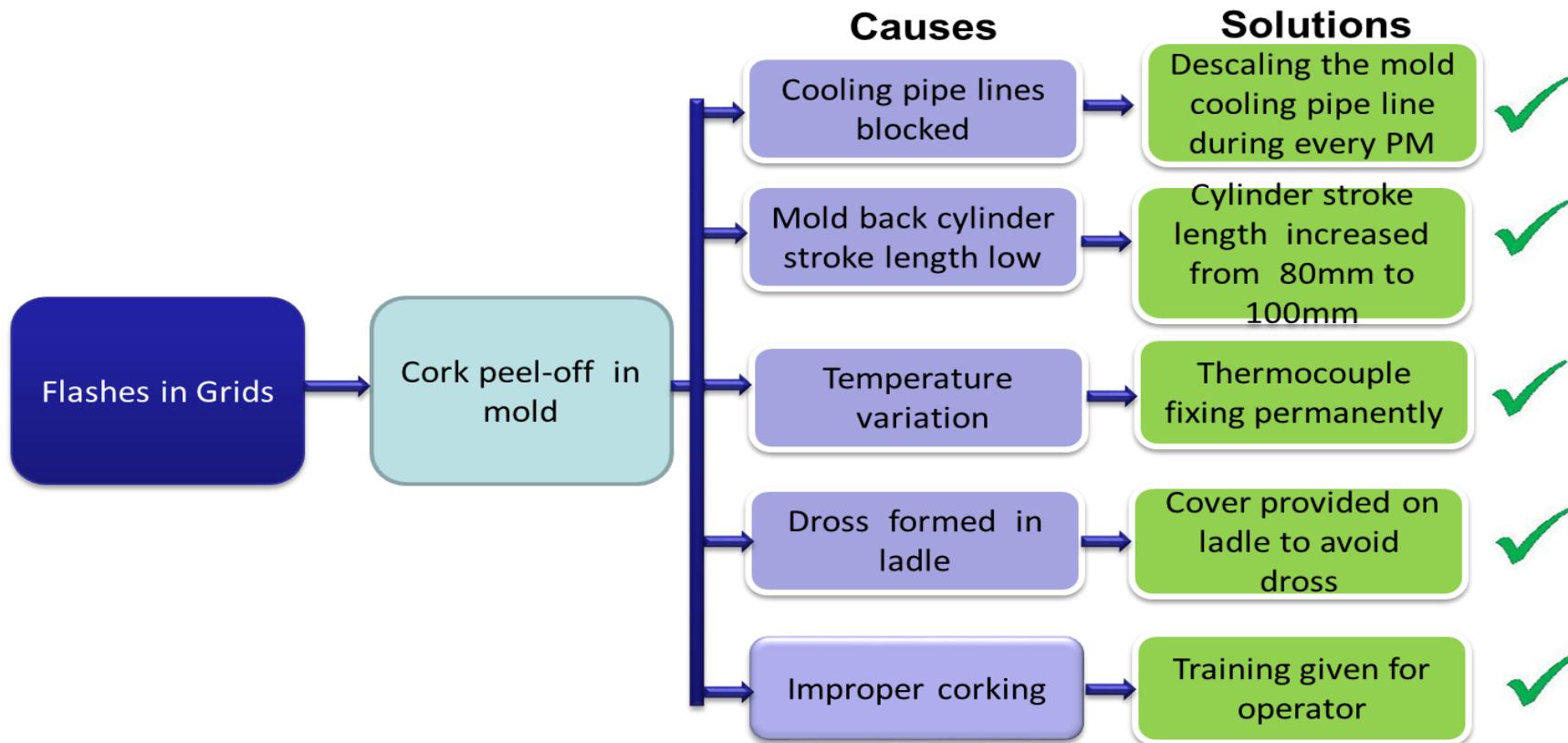
➤ Tool used: Validation



BRAINSTORMING TECHNIQUE

Using Brainstorming

Problem discussed among all QC members for developing solutions.



Step-9: Foreseeing Probable Resistance

- Identify the other negative impacts of each solution.

- Arrive the actions to overcome

- Implement actions



**YOU CAN
OVERCOME**

Step-9: Foreseeing Probable Resistance

Step-9a: Identification of Risks for Solutions

Sl. No	Identified Cause	Identified solution	Risk	Actions to Overcome
1	Double Plate Pickup at Feeders	Need to modify Feeder as one suction cup	Separate Feeder need to Maintain	We will Maintain Spare
2	Plate Falling on Track chain	Need to increase truck width	It will not Suit for Other Models	In coming months we will run the same model in this line only
3	Enable Rod Hitting at Plates Lug	Need to reduce enable dia	No Risk	Tool Maintenance Team Supported
4	End plate setup change	Need to modify as two slots for two bolt fixing	No Risk	Tool Maintenance Team Supported

Step-9a: Identification of Risks for Solutions

S.NO	SOLUTION	RESISTENCE/OBJECTION	ACTION TAKEN	CONCLUSION
1	DESCALING THE MOLD COOLINGLINE DURING PM	MAINTENANCE TEAM	EXPLAINED ABOUT IMPARTANCE FINALLY THEY AGREED	
2	MOLD BACK CYLINDER STOCK LENGTH INCREASED	MAINTENANCE TEAM	EXPLAINED ABOUT IMPARTANCE FINALLY THEY AGREED	
3	THERMOCOUPLES FIXED PERMENENTLY	MAINTENANCE TEAM	EXPLAINED ABOUT IMPARTANCE FINALLY THEY AGREED	
4	COVER PROVIDED ON LADDLE TO AVOIDE DROSS FORMATION	PRODUCTION TEAM	EASY TO IMPLEMENT	
5	TRAINING PROVIDED FOR CORK APPLICATION	PRODUCTION TEAM	EASY TO IMPLEMENT	



Step-9: Foreseeing Probable Resistance

Step-9b: Team Acceptance for Solutions implementation

Team accepted the solutions for implementation



Step-10: Trial Implementation

- Identify the team responsible for implementation
- Arrive the schedule for the implementation
- Fix batch qty for the trial



Step-10: Trial Implementation

SI.No	WHAT	WHO	WHEN	HOW	STATUS
1	Double Plate Pickup at Feeders	Dhananjuyulu	18.09.13	Need to modify Feeder as one suction cup	Completed
2	Plate Falling on Track chain	Govardhan	18.09.13	Need to increase truck width	Completed
3	Enable Rod Hitting at Plates Lug	Vamsi	20.09.13	Need to reduce enable diameter	Completed
4	End plate setup change	Santosh	20.09.13	Need to modify as two slots for two bolt fixing	Completed

SOLUTION - 1

BEFORE



AFTER



Problem

Here we observed cooling pipe line blocked due to formation of scaling

Improvement

Descaling of the cooling pipe lines during every PM
(Aprax: 100000 grids)



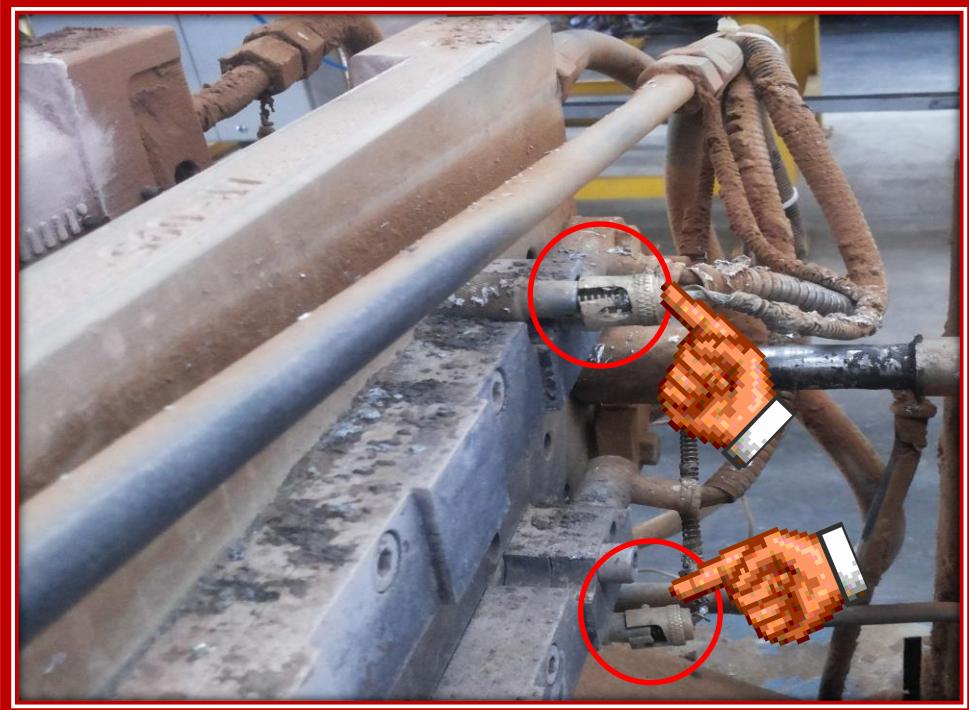
AMARA RAJA
Gotta be a better way

8/6/2021

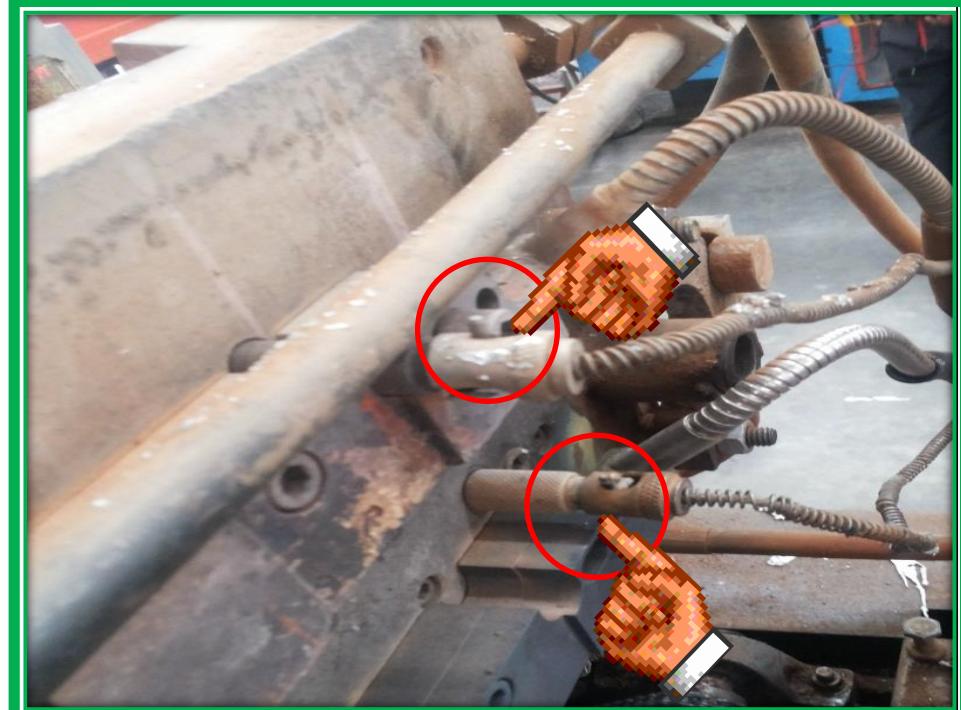
62

SOLUTION - 2

BEFORE



AFTER



Problem

Thermocouples loosing and sometimes come out from mold due to machine vibrations.

Improvement

Thermocouples are fixed permanently and provided locking method.



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Gotta be a better way

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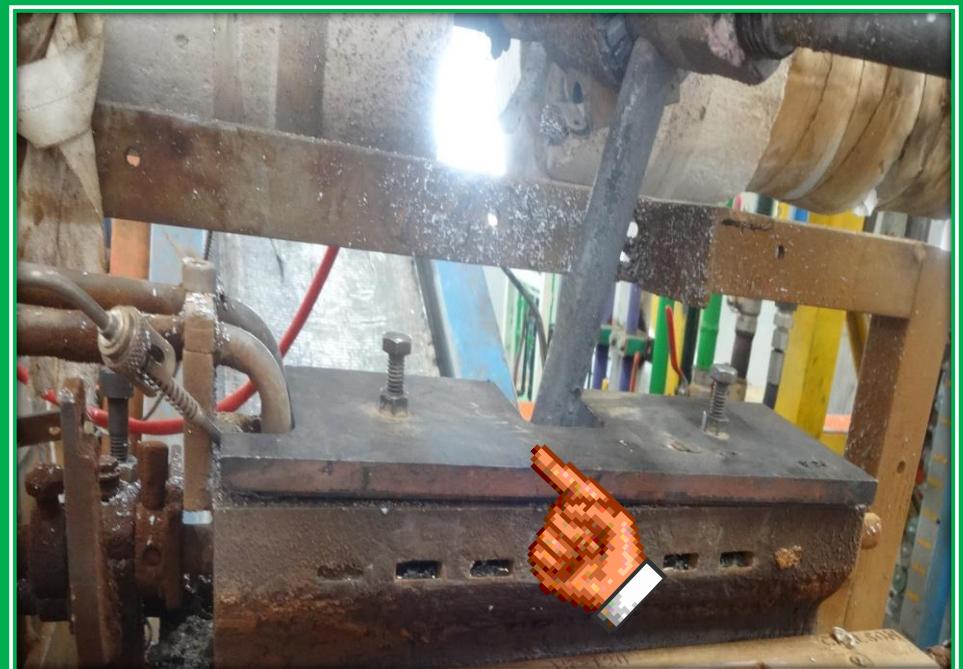
63

SOLUTION - 3

BEFORE



AFTER



Problem

No guard on ladle due to this dross formed in ladle

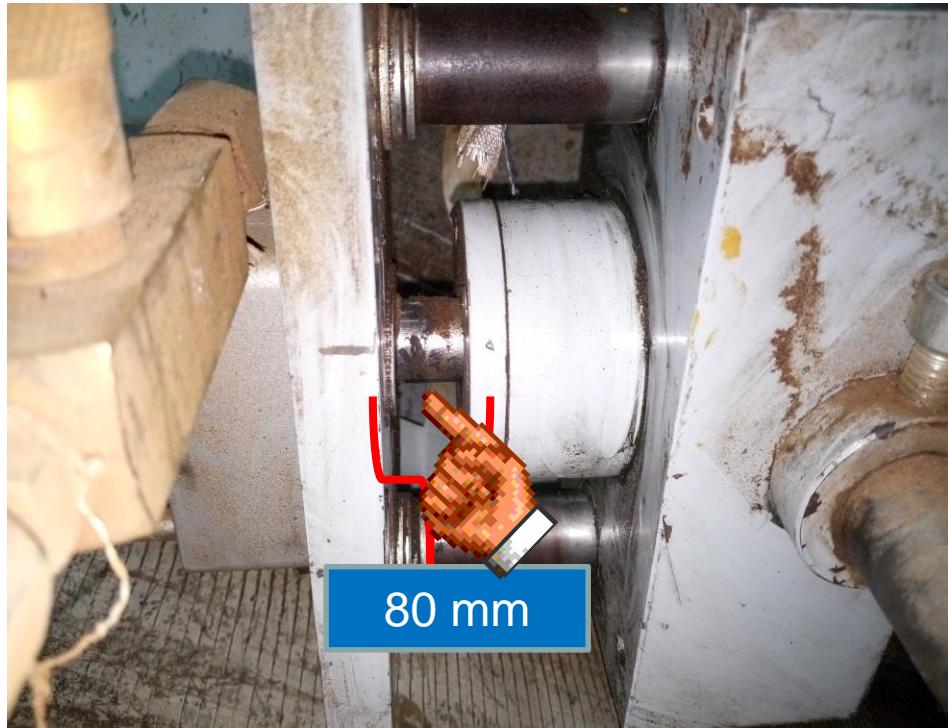
Improvement

provided guard on ladle to reduced the dross formed

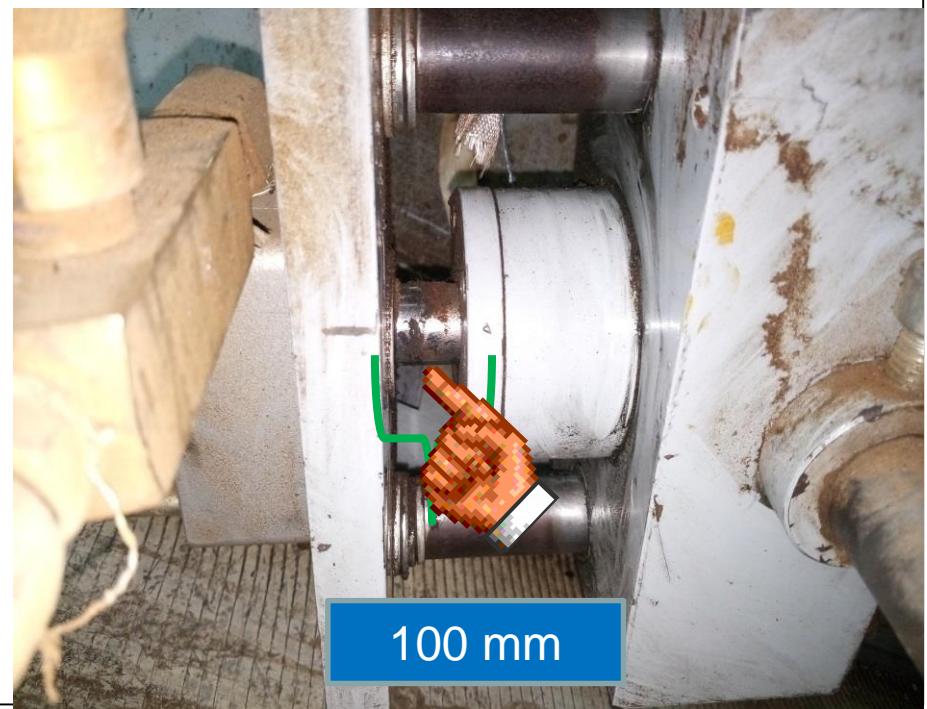


SOLUTION - 4

BEFORE



AFTER



Problem

Mold back side cylinder stock length is less

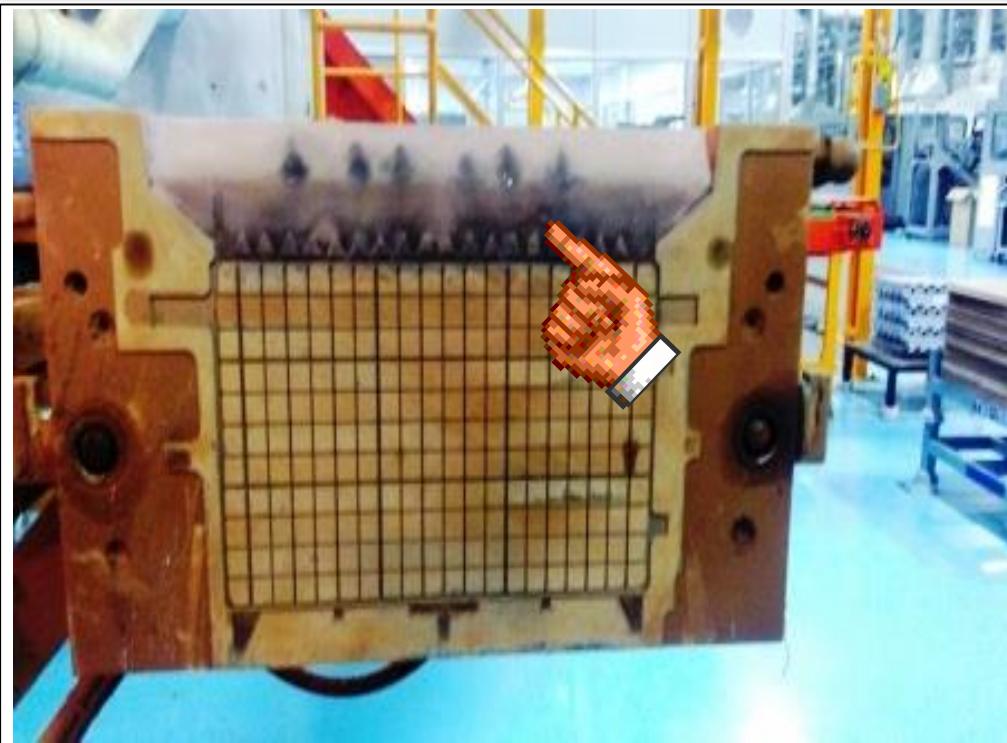
Improvement

Mold back side cylinder stock length is increases

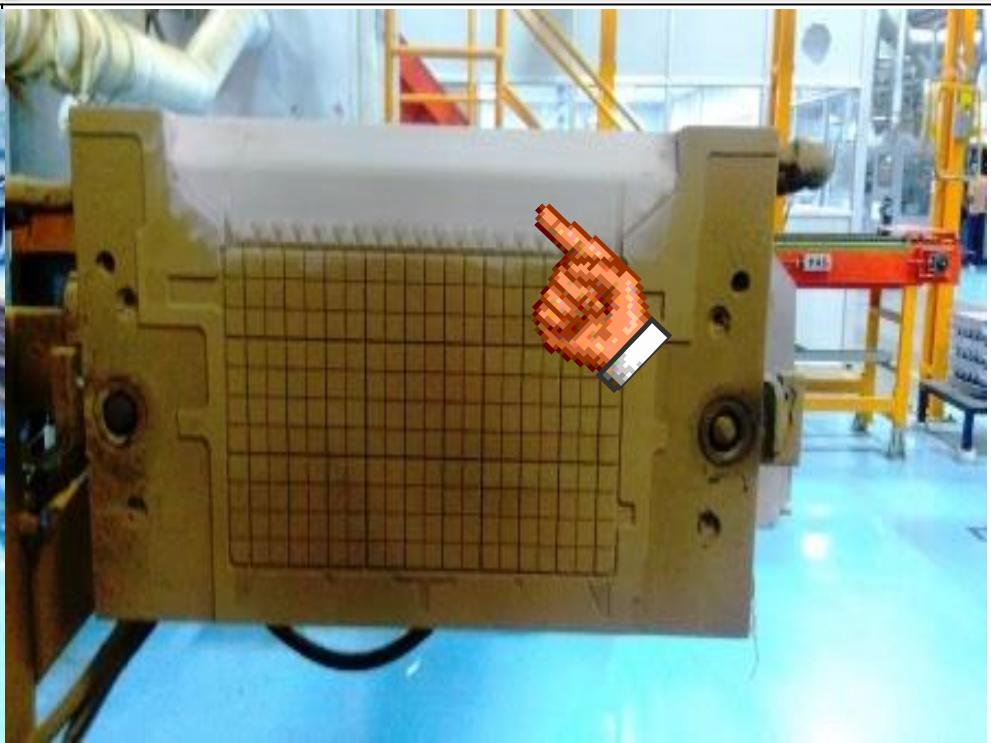


SOLUTION - 5

BEFORE



AFTER



Problem

Improper crock spraying

Improvement

Proper crock spraying

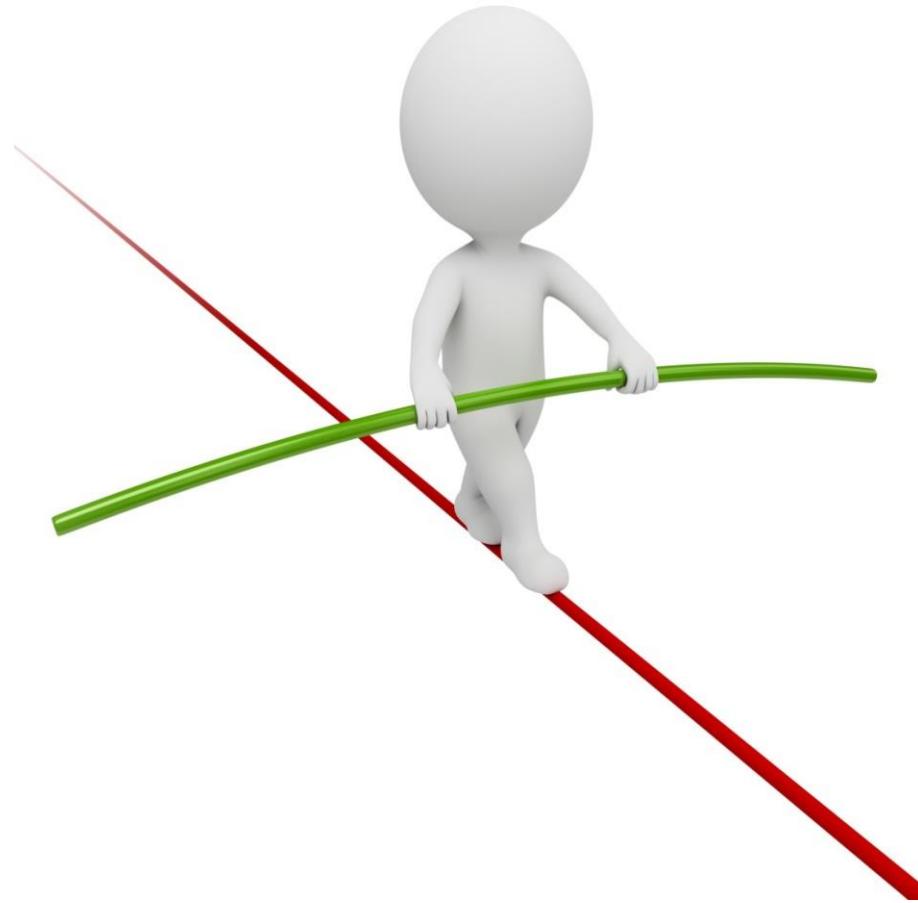


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REGULAR IMPLEMENTATION



STANDARDIZATION

After obtaining successful results during Trial implementation, the Team decided for Regular implementation of the project.

After getting successful results during first month observation, the team decided to Standardize the Solution.



STANDARDIZATION



ATTENDANCE SHEET

Ref:

Date: 20/01/17

Page: 01 of 01

Meeting Training ✓

Subject:- Training on mole flashes on Grid Casing

Internal/External faculty name:- C.Yugandhar

Venue:- _____ Time:- From:- 08:30pm To:- 04:30pm

S.No	Emp.Code	Name of the employee	Designation	Company/Division	Department	Signature
1	1005102	D.s. Arun Kumar	W.O.C	TBD	PLD	QA
2	1008557	M. Riva	W.O.C	TBD	PLD	M.M
3	1008718	C. Dinesh	W.O.C	TBD	PLD	PDD(G.C)
4	90020485	S. Muthu Krishnan	ADTS	TBD	PLD	PDD(G.C)
5	90026106	T. Rajesh	ADTS	TBD	PLD	PRD(G.C)
6	90022738	R. Adhivel Guami	ADTS	TBD	PLD	PDD(G.C)
7	90019103	V. Nagelamneni	ADTS	TBD	PLD	PDD(G.C)
8	90021412	D. Naveen Kumar	ADTS	TBD	PLD	PRD(G.C)
9	90026647	N. Vamsi Krishna	ADTS	TBD	PLD	PRD(G.C)
10	90023797	N. Dhileep	ADTS	TBD	PLD	PRD(G.C)
11						
12						
13						
14						



AMARA RAJA

Gotta be a better way

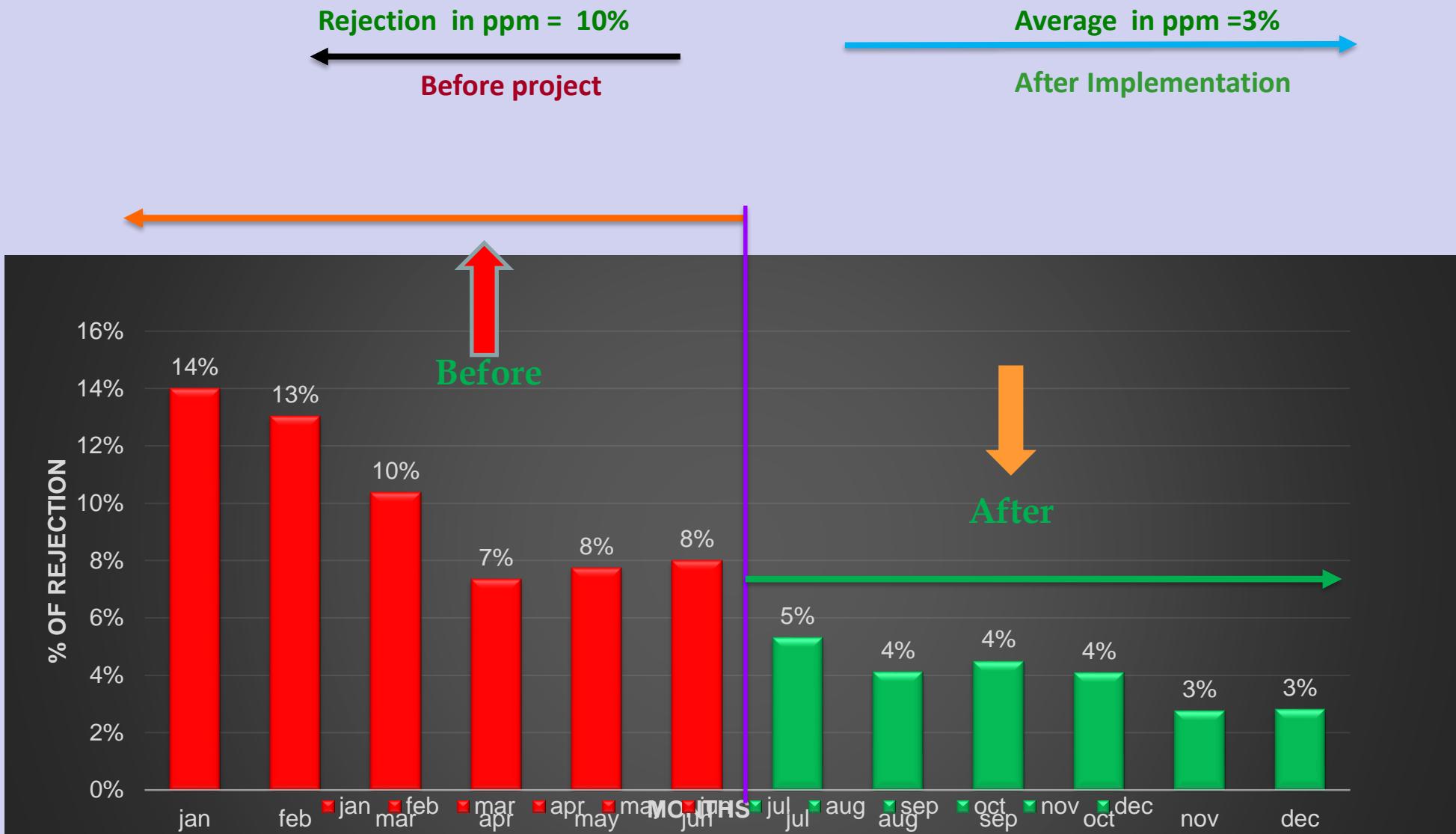
8/6/2021

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FOLLOW UP AND REVIEW



More Flashes in Grids BEFORE VS ACTUAL



GOAL AND ACHIEEMENTS

Goal :

Reduction of flashes from 10% to 4%

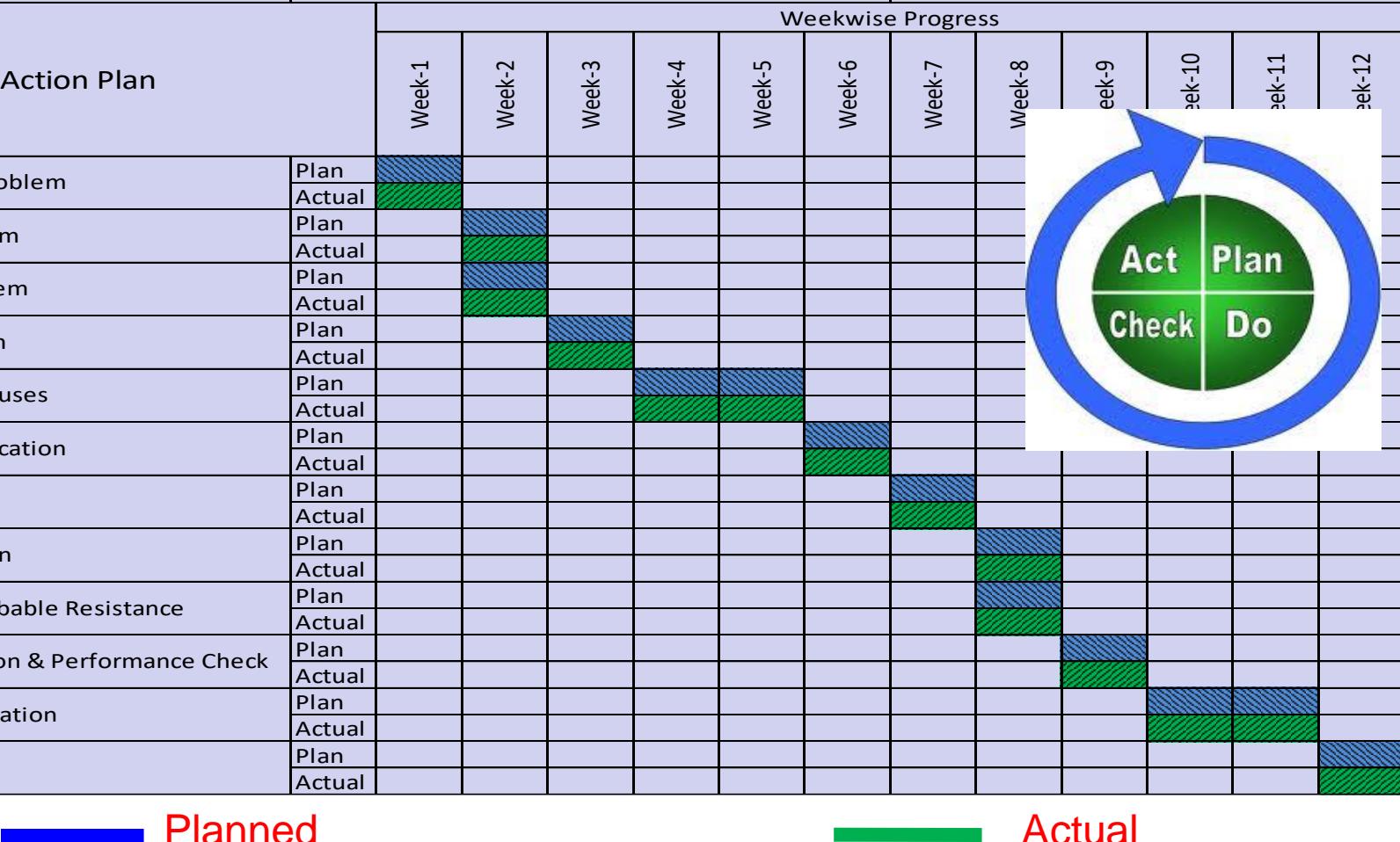


Achievement:

Reduced of flashes from 10% to 3%



MILE STONE CHART

Quality Circle Name: Creative Thinkers		Department: TBD-PLP								Team Details: C.Yugandhar D.S.Arun Kumar B.Bala Krishna C.Rajesh V.Narasimhulu - Facilitator - Team Leader - Team Member - Team Member - Team Member				
Project Name: More flashes in grid casting Meeting Day - Tuesday Time - 04:30PM to 05:30PM		Date of Beginning: 10.07.2016 Date of Ending: 10.12.2016												
P	D	Action Plan		Weekwise Progress										
C	A			Week-1	Week-2	Week-3	Week-4	Week-5	Week-6	Week-7	Week-8	Week-9	Week-10	Week-11
Plan		Identification of Problem		Plan	Actual									
		Selection of Problem		Plan	Actual									
		Definition of Problem		Plan	Actual									
		Analysis of Problem		Plan	Actual									
Do		Identification of Causes		Plan	Actual									
		Root Cause Identification		Plan	Actual									
		Data Analysis		Plan	Actual									
		Developing Solution		Plan	Actual									
		Foreseeing the Probable Resistance		Plan	Actual									
Check	Trial Implementation & Performance Check		Plan	Actual										
Act		Regular Implementation		Plan	Actual									
		Followup/Review		Plan	Actual									
							Planned	Actual						



TANGIBLE BENEFITES

- ❖ Productivity per day increased by – 2,445 No's
- ❖ Productivity per month increased by- 74,376 No's
- ❖ Productivity per annum increased by – 8,92,517 No's
- ❖ Cost saved per month Rs 1,50,000 /-
- ❖ Cost saved per annum – Rs. 1.44 Mn



Intangible BENEFITS

Intangible Benefits :

- Safe working environment
- 5s improved
- Understanding of machine function & condition
- Team work improved
- Communication skills improved
- Reduced operator fatigue
- Learned an effective problem solving methodology & QC tools



TOOLS & TECHNIQUES

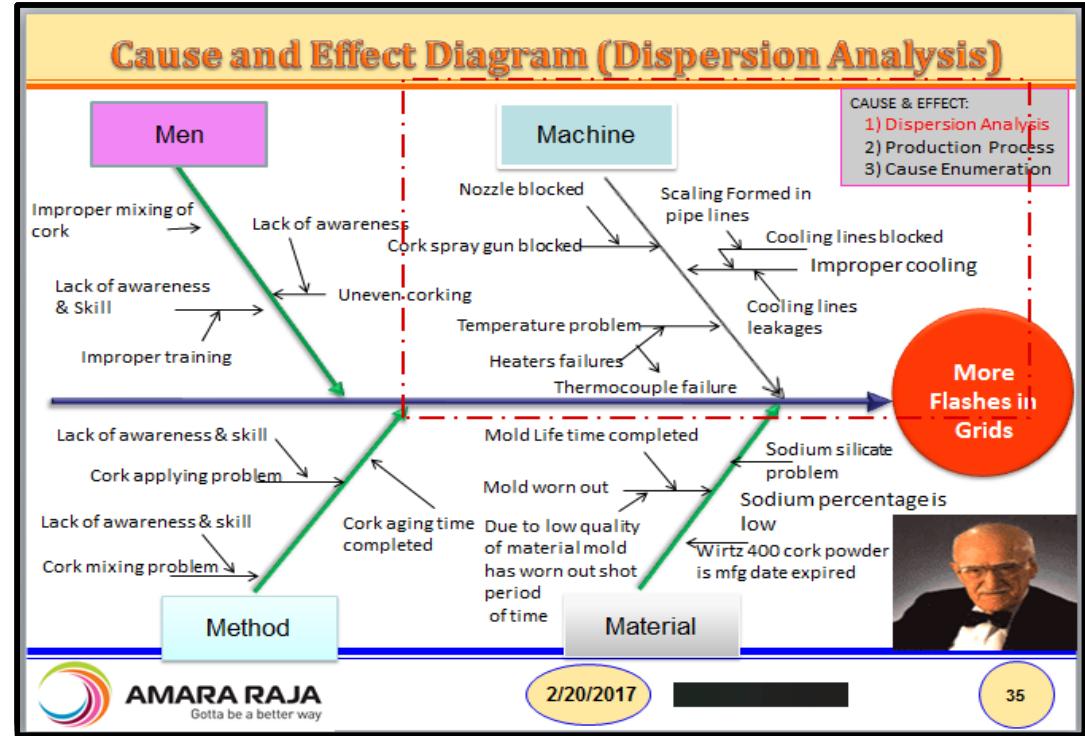
Tools :

Graphs

Check sheet

Stratification

Cause – Effect diagram



TOOLS & TECHNIQUES

Techniques:

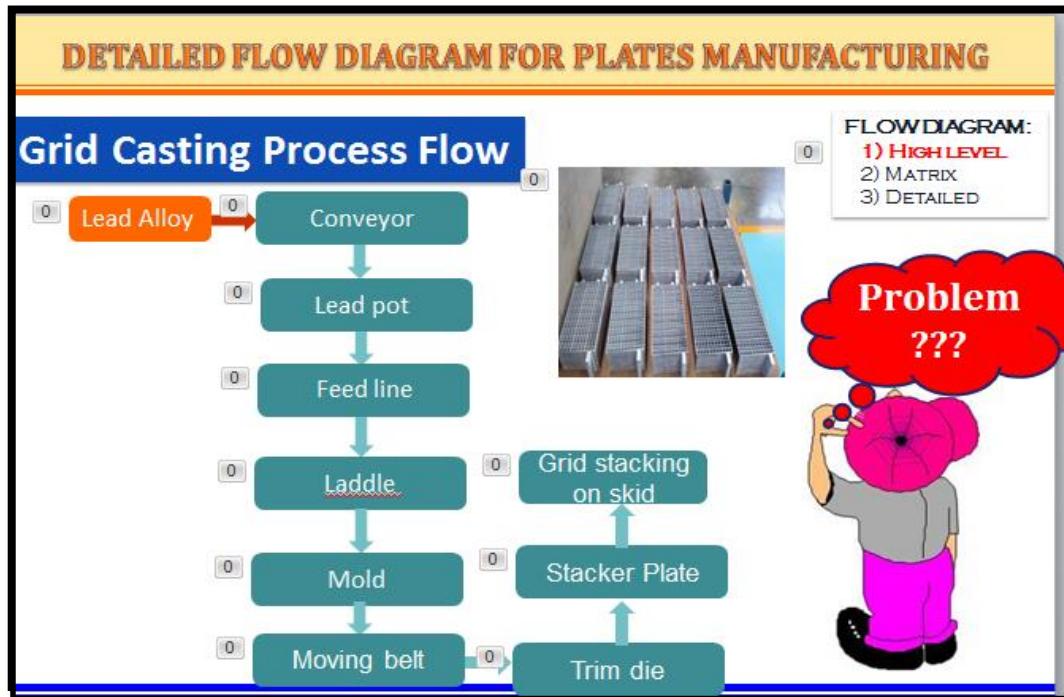
Brainstorming

Ranking

Why Why Analysis

3W1H

Flow diagram



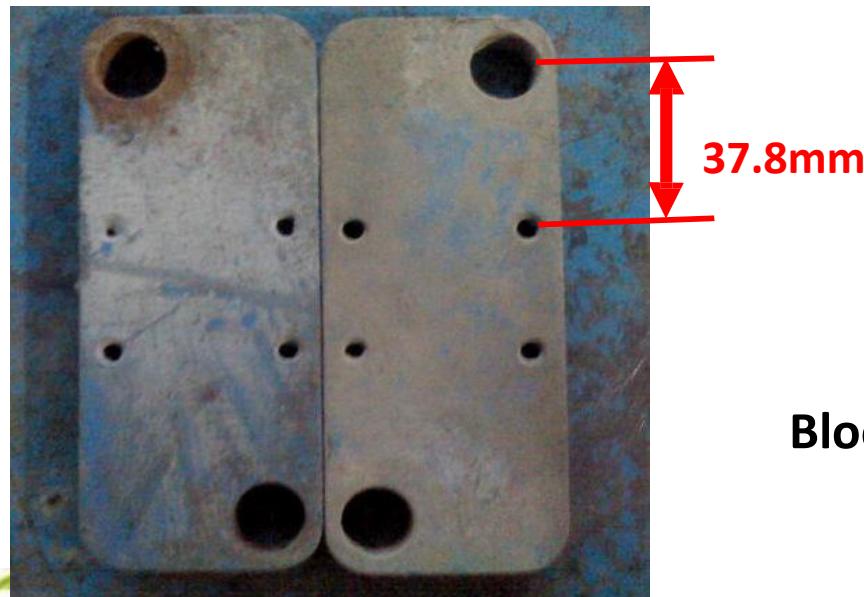
Step-10: Trial Implementation

Step-10b: Solutions before and after status

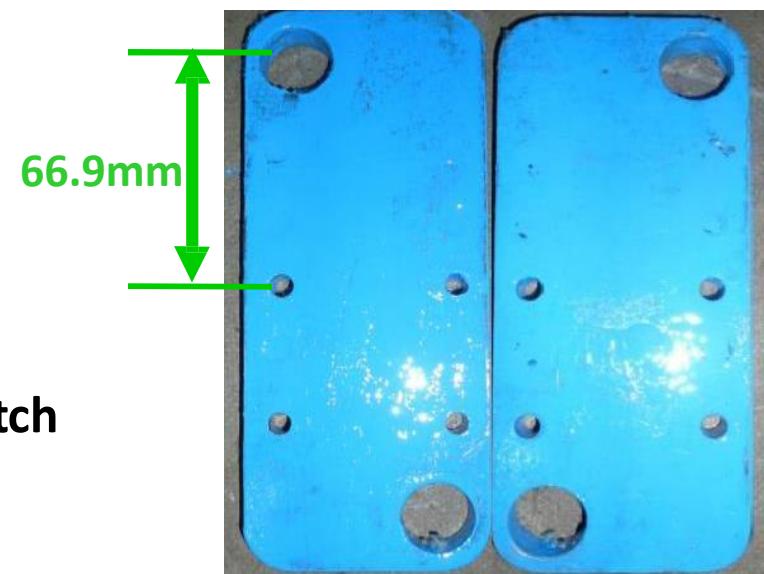
Existing



Modified



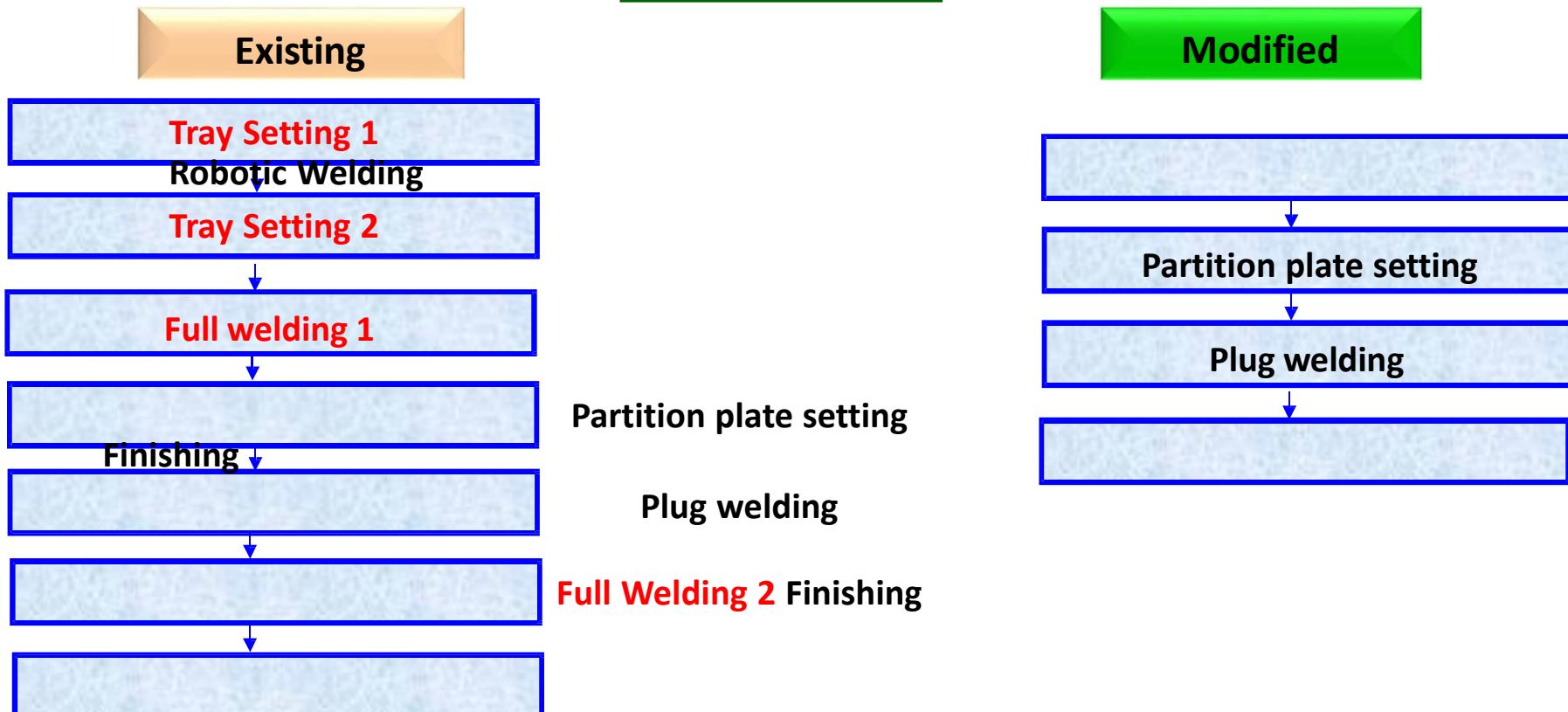
Block Pitch



Step-10: Trial Implementation

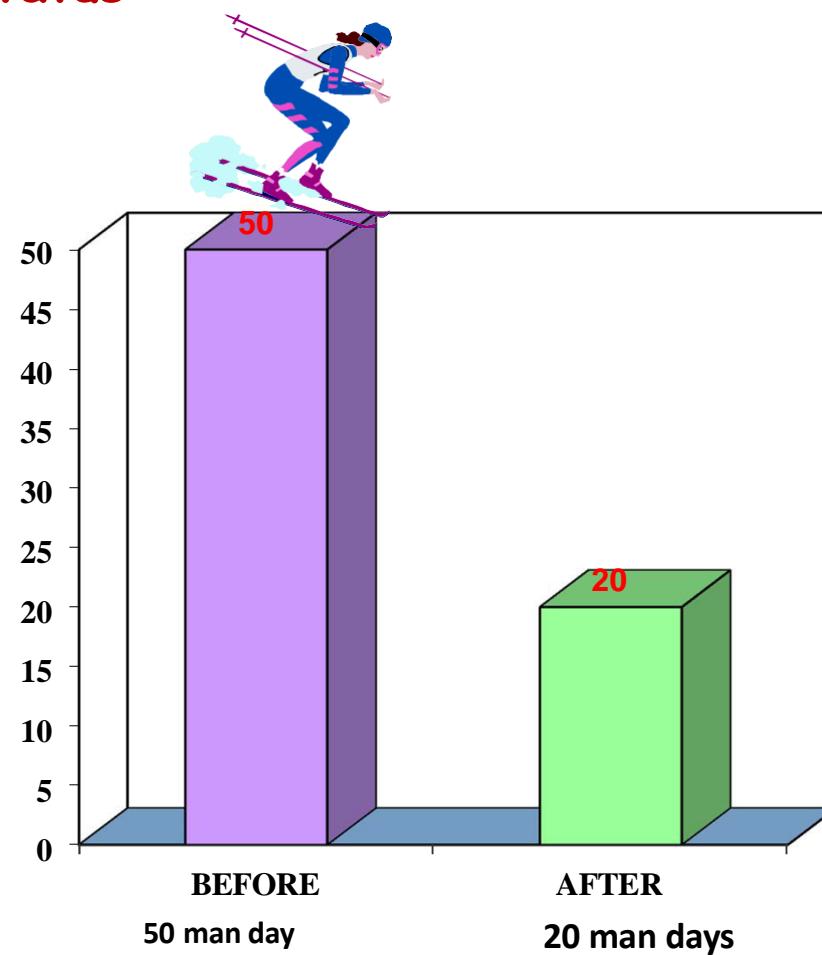
Step-10b: Solutions before and after status

Process flow



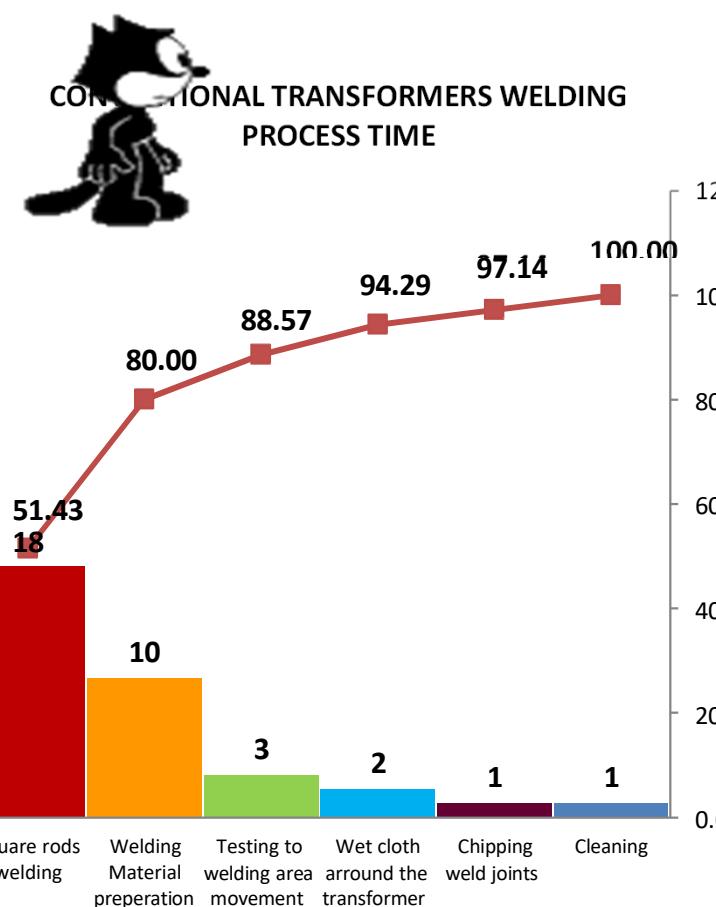
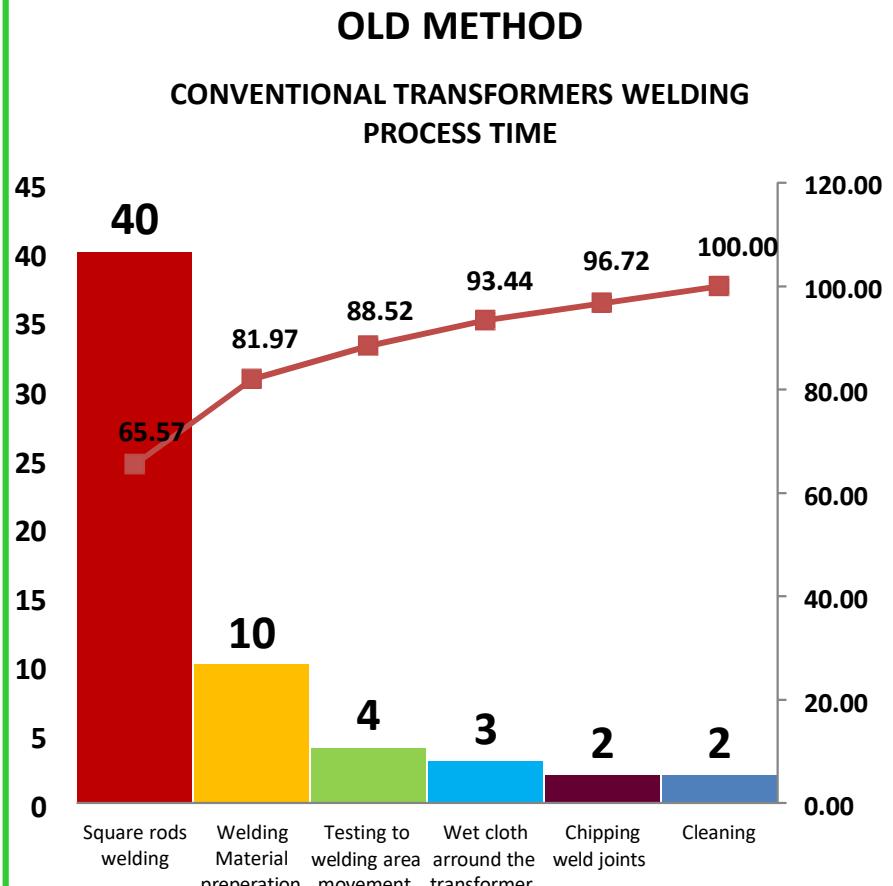
Step-10: Trial Implementation

Step-10b: Trial Status



Step-11: Regular Implementation

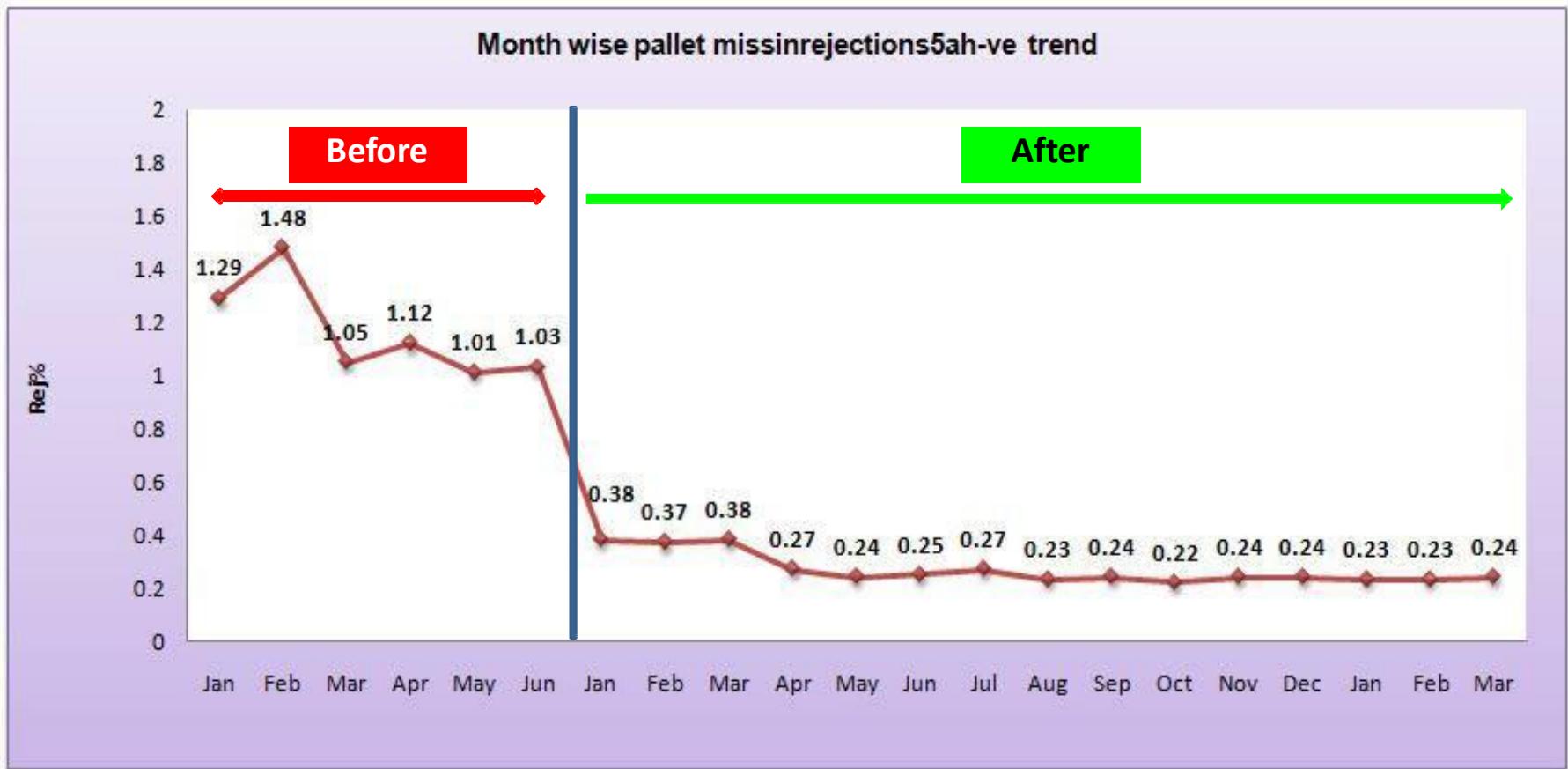
Step-11a: Result verification



Step-11: Regular Implementation

Step-11b: Result verification

- Tool used : Line Graph



Step-12: Follow up and Review

Step-12a: Standardization for sustaining the Result

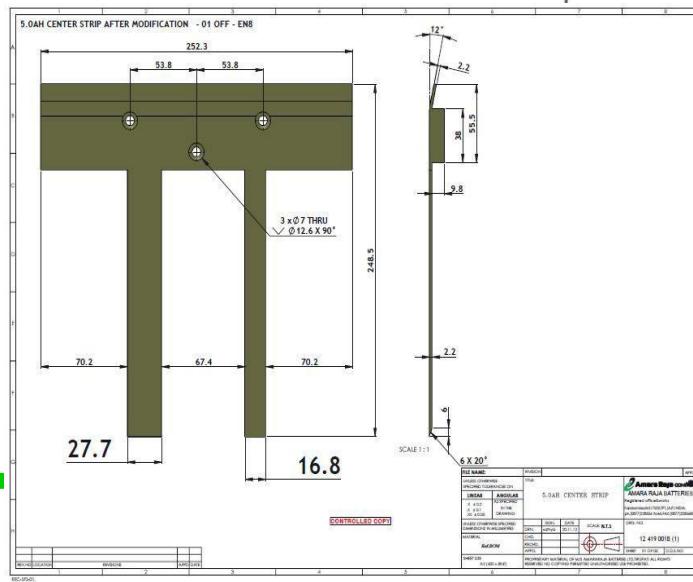
- For every action implemented, need to identify the control method that will be implemented to make sure that the actions does not deteriorate
- Update the relevant documents after achieving the results
- Related documents like work instructions/ Operational control procedures, FMEA/ PPAP documents, department ISO/TS/EMS/OHSAS procedural manuals

Step-12: Follow up and Review

Step-12a: Standardization for sustaining the Result

No	Root cause	Type of control method	Document No	Responsibility
1	Bend In Scraper	Item hide in SAP	MB21	Nagaraj
2	Pasting shoe centre strip width high	Update Drawing	12 419 001A	Malleswar
3	High paste density	Update Specification	APCE-SBD-48/12-13	Srinivas

AmaraRaja Batteries I limited		Prepared	Checked	Approved
REQUEST FOR 4M CHANGE				
REQUEST BY	V.Malleswar	APPROVED	DATE 10.01.13	
MODEL / MAC	PART NO 1747 SLC UNIT	PART NAME A-B SLC 5/03		
CLASSIFICATION	<input type="checkbox"/> MATERIAL <input checked="" type="checkbox"/> MACHINE <input type="checkbox"/> METHOD <input type="checkbox"/> MAN <input type="checkbox"/> OTHERS			
SUBJECT	Change is Grid casting w/r PLC to A-B SLC.			
CURRENT STATUS DETAILS	1. Existing model tensioner block pitch 37.5mm 2. Existing centro strip width high			
SUGGESTION STATUS DETAILS	1. tensioner block pitch increase to 68.3 2. Centro strip width reduced as per lug height			
WE REQUEST YOU TO APPROVE THE '4M CHANGE'				
APPROVAL TEAM	APPROVAL DETAILS			
ENG & T&M / QUALITY CONTROL	 EDC for W/s update - Responsibility :			
ISIR	<input type="checkbox"/> REQUIRED	<input type="checkbox"/> NOT REQUIRED	Prepared	Checked Approved
ARBL APPROVAL	<input checked="" type="checkbox"/> APPROVED	<input type="checkbox"/> REJECTED	<input type="checkbox"/> OTHERS	
REMARKS:	 ARBL APPROVAL : 			
SBD-SFS-122				



ARBL	PROCEDURE FOR RAW MATERIAL PLANNING	Ref. : PUR-DPR-03 Page : 6 of 6 Pg.Rev.: 01 Date : 01-08-2008
5.6	Purchase request for new items will be released with acceptance criteria from Concerned departments.	
5.7	HOD-Purchase/ VP-SCM will verify and authorize the materials on monthly basis	
5.8	A-class planning team & PPC-Team reviews the status of the materials on monthly Basis.	
5.9	Daily dashboards will prepared to monitor the critical items.	
5.10	Daily consumption stock status will be monitored through Dash Boards	
5.12	Weekly original documents submission status will be monitored.	
5.13	The details of consignments cleared from port.will be received from EXIM. The no of containers will be allotted to ABD and IBD stores to plan for the unloading.	
5.14	Engineer will monitor the Non Moving items on monthly basis, and if age is more than 60 Days, the status will be reviewed with concerned departments (RAD,ENG,QA etc) To take corrective action.	
		item to scrap will be raised by concern & will be authorized by VP-SCM, will scrap it physically
		to requests (PUR-SFS-01) approval (PUR-SFS-XX)

Step-12: Follow up and Review

Step-12b: Horizontal Deployment

Implementation of same actions in the similar processes to resolve the issue/ problem where the solutions can work without any investigation .

- Is the practice of copying good results in one area to the other areas



Step-12: Follow up and Review

Step-12c: Project Actual completion schedule

Quality Circle name	Lions	Department	Fabrication	Co-Ordinator	K. J. Prasad
Project	Improve productivity in IP3cell trays	Reason for selection	To improve productivity & provide on time cdeliveries	Facilitator	Mallikharjuna rao.K
Project No.	5	Date of beginning	02.06.11	Date of completion	31.08.11
Meeting day	Saturday	Time	15.30-16.30hrs	No fo projects completed	4



Benefits

Tangible Benefits

- Total savings **Rs. 21.33Mn /year (KUSD\$:522)**
- Belt cost / panel reduced from **0.32Rs to 0.25Rs (KUSD\$: 37)**
- **Productivity improved 2%**
- Spares cost reduction (**KUSD\$:** **6.6**)
- **Man power cost reduction:10%**
- Operator movements reduced from **1946 to 389 nos /shift**

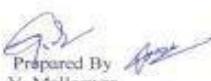
Intangible Benefits

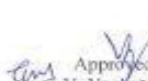
- Improved housekeeping
- Reduced material movement
- Improved problem solving capability
- Improved employee involvement
- Lead in air emissions decreased
- Meet customer future requirement without capex investment



Benefits

 ARBL COST SAVING APPROVAL DOCUMENT	Ref. : Page : 1 Pg Rev. : Date : 01.04.2014								
Department / Section : SBD-PASTING									
Nature of Project : Reduction of pallet missing rejections.									
Object of the project : Pasted plates reduction									
Target of completion : 10.01.13									
Metrics : Month wise rejection %									
Overall Responsibility : V. Malleswar									
Action Plan :									
Sl.no.	Activity	Responsibility	EDC/ REV.EDC	ADC	Remarks				
1	Reduce the paste density variation	VM/Raju	01.09.12	05.09.12					
2	Elimination of pasting belt tension variation	VM/PN	05.09.12	10.09.12					
3	Reduce center strip flexibility	VM/G.N	10.09.12	20.09.12					
4	Center strip width modification	VM/PN	20.09.12	30.09.12					
Remarks :									
After implementation pallet missing rejections reduced from 1.15% to 0.36%									
<u>Cost savings per month:</u>									
Month	Apr'13	May'13	June'13	July'13	Aug'13	Sept'13	Oct'13	Nov'13	Dec'13
Savings in Mn Rs	0.20	0.29	0.32	0.24	0.63	0.35	0.94	1.19	1.41
Jan'14	Feb'14	Mar'14	Total savings Mn Rs						
1.39	1.41	1.97	10.33	1,72,166.66					

Prepared By 
 V. Malleswar (Project Leader)

Approved By 
 V. Venkateswaran (Costing Head Office & Works)
 KARABA BATTERIES LIMITED
 Kodaikanal Road, Renigunta,
 KARIMABADI - 517 520
 TIRUPATI, Andhra Pradesh

COM-SFS-50

Plate Conversion Cost	
No of panels required/month	94700
Before no of loadings in oven (1.15%) to meet demand	9
After no of loadings in oven (0.23%) to meet demand	8
No of loadings reduced	1
Conversion cost per each product	1.93
No of panels per loading	123000
Conversion cost per month loading in Rs	237390
Conversion cost per annum in Mn Rs	2.84
In KUSD\$	47.3

Ergonomics calculation			
No of panels required/Shift/Machine	9400	No of plates produced/shift/Machine	84600
Rejections %	Total plates rejected /Shift/Machine	Operator Movement /Shift/Machine	
Rejection @ 1.15% (Before)	973	1946	
Rejection @ 0.23% (After)	195	389	
Reduced	778	1557	

Tools Used



Techniques :

- Graphs
- Stratification
- Flow Diagram
- Pareto diagram
- Cause-Effect diagram
- Brainstorming
- Ranking
- Why Why Analysis
- 4W1H

Project Summary

- ❖ We solved our problem high DUF scrap in 2.5Ah model in line-1 by implementing solutions like changing manual mould design, changing battery orientation and providing metal sensing sensor through this we got a cost saving of 3.2mn per annum and productivity by 24k per annum.

Lessons Learned

- ❖ Even some cases we can not eliminate root causes, but we can provide controls to reduce the probability of occurring of causes.
- ❖ Thinking of problems all the time cannot solve the problems. Only planning and actions will solve the problems.
- ❖ QC tools and techniques learned
- ❖ Case study presentation skills learned



thank you !!!

- Dr.walter Andrew Shewhart -- Father of Statistical Quality Control.
- Dr.William Edwards Deming
- Dr.Joseph Moses Juran
- Dr.Kaoru Ishikawa
- Prof.Prasanta Chandra Mahalanobis
- Crosby
- Shigeo shingo
- Taguchi

