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"Evaluation of Part Production Methodology In Automotive Industry"

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Abstract *–Methods of Production, Planning & Inventory Control, Industrial Layout, and Statistical Quality Control of component in Industry gives new era for production of defect free components. When creating the design solutions the following challenges arose: failure in function, costumer complaints, limited space in production floor, implementing without impacting the production process or the associate's tasks, upholding the company's ethics code and creating solutions compatible with the company's technology. For better process performance each component would be assigned a bin in the production line, and the material handler would be in charge of loading the components into the bins and need to have proper design analysis (DA).*

This resulted less material on the production floor, better utilization of the company's transportation trucks, and more efficient material flow since smaller batches are easier to control and transport within the facility. This resulted in a simpler, more intuitive database which will facilitate the data recollection process and a better record for scrap/reworked materials. This project, Freight Data Analysis, creating a detailed freight database so all the data could be found in a single place and creating a Standard Operating Procedure (SOP). Both of these solutions were aimed towards creating a better record and control for the freight expenses. With more detailed and accessible records it will be easier to identify opportunities to reduce costs and control freight expenses; it will guarantee that all expenses regarding fright are thorough hlyexamined before being approved in fabrication and assembling of different components etc

.***Keywords- Production methodology of part production and failure analysis.***

Failure/performance evaluation with case study:

Methodology options in process improvement / FIGURE 1

	Solution known	Solution unknown	Type of problem
Low complexity	1 WorkOut. Nike projects. Who will address it? By when?	2 Team problem solving* Kepner-Tregoe. Why did it happen?	(Problem solving—special cause)
High complexity	3 Lean (*kaizen*) event reengineering. How should we implement the solution?	4 Lean Six Sigma, Taguchi methods, TRIZ. What is the solution?	(Process improvement—common cause)

*Structured team problem solving, using the magnificent seven tools, for example.

Problem selection matrix:

Problem definition : Metal Chips in Threading of Top Link Spindle (Tls) During Threadrolling Operation On Thread Rolling Machine Rt-02

Current Status of the Problem / Issue (Quantified) : From last 2 month there is no part found having metal chips on threading

Improvement Target (Quantified): Reducing the production loss and zero rejection / rework.

1. Benefits projected / Impact of Project: Saving production loss.
2. Customer satisfaction

Chapter 5:

Failure / performance evaluation:

5.1 : Select the Theme

- **Problem Selected:** Metal chips found in treading of Top Link Spindle during thread rolling on thread roll machine RT-02

Line Rejection:

Month	Production	Line Rejected for Threading Chips
Aug-17	10559	379
Sep-17	15450	547
Oct-17	6021	218
Nov-17	13492	628

Rework done by Hand die pass and remove chips in thread

5.2. Justify the Choice

5.2..1 History of the Problem

07 No. TLS was rejected on 05/10/2017

21 No. TLS was rejected on 06/12/2017

5.2.2 Containment action taken (Immediate Correction) to Protect Customer:

Segregation & Rework of parts done at customer Plant by extra manual on contract ,sent two Quality person for segregation & Reworked of 3000 No. parts so that the production will not get affected till permanent solution through this project is institutionalized.

5.3 Understand Current Situation:

5.3.1 **Understand & Mention Present Process Controls through**

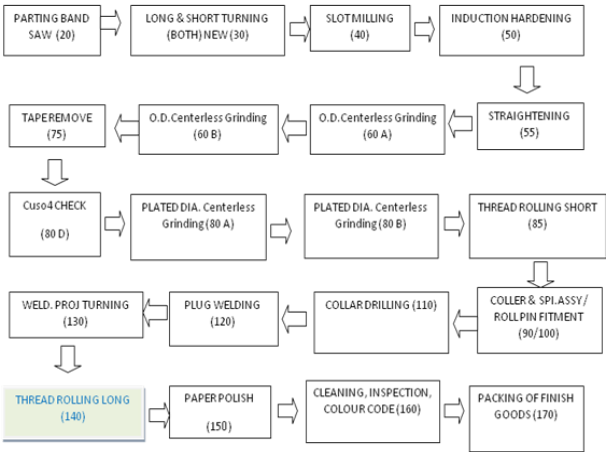
- ❖ Recommended actions specified in FMEA/QCPC for the problem selected.
- ❖ Action taken on past complaints.

5.3.2 **Observation of the Process:**

Threading Operation Photo

5.3.3 Observation of the Process

Process Flow Diagram



5.3.4 Observation of Symptoms:

- ❖ Burrs / Chips in threads
- ❖ Thread go gauge not enter in thread ¾" x16 unf-2A due to burr's in thread.
- ❖ Fitment problem during assembly.

5.3.5: **Observation of Variation:**

For the brainstorming session all the members of our team were present. We Identified various suspected source of variation for chip formation in thread during thread rolling and we identified 38 source of variation during brain storming session by the team. Following are SSV

- ❖ Hydraulic Pressure Excess
- ❖ Hydraulic Pressure Low
- ❖ Blade height less or more
- ❖ Improper Machine Setting
- ❖ Rolling Time not set properly
- ❖ Unskilled operator

- Unbalancing part during operation
- Machine slide loose / gap
- Thread Roll damage
- Material soft
- Roller diameter undersize
- Thread Height less
- Roll matching setting not ok
- Variation in OD of Bar
- Dusty / Dirty / Metal chips in cutting oil
- Effective dia. Oversize
- Loose chips in antirust oil at final stage
- Wire brush cleaning not done
- Improper supply of cutting oil
- Cutting oil not as per required specification
- Guide blade not set
- Center height of roll wheel not set
- Center height of part not set
- Wire wheel not clean well
- Cleaning wire wheel dirty / metal chip

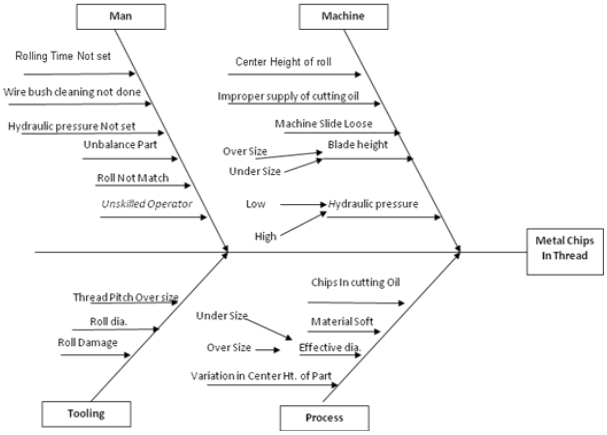
5.4 ANALYSIS

5.4.1 : Possible Causes:

Brainstorming- Total 21 possible cause were generated during Brian storming session

- Cutting oil not as per Specification
- Hydraulic Pressure variation
- Blade height variation
- Machine slide loose / gap between slide
- Rolling Time not set properly
- Unskilled operator
- Unbalancing part during operation
- Thread Roll damage
- Material soft
- Roller diameter undersize
- Thread Height less
- Roll matching setting not ok
- Metal chips in Cutting Oil
- Effective dia. Oversize
- Loose chips in antirust oil at final stage
- Wire brush cleaning not done.

5.4.2 Cause and Effect Diagram:



5.4.3 Probable Causes:

- Machine slide Loose
- Unskilled operator
- Material Soft
- Metal chips in Cutting Oil
- Roll matching setting not ok
- Blade height variation
- Thread Roll damage
- Effective dia. Oversize

5.4.4 Testing of Hypothesis:

Sr. No.	Probable Root Cause	Method of Testing	Observation	Result (Valid / Invalid)
1	Machine Slide loose	Dial Indicator	On full Load Thread roll was getting deflected by 1 mm against 0.2 mm	Valid
2	Thread roll Machining	Checked on trial piece & no mismatch found on thread impression is observed	Checked on trial piece & no mismatch found on thread impression is observed	Invalid
3	Hyd. Pressure variation	On Pressure Gauge	Pressure observed < 15 ton	Invalid
4	Center height of part variation	50 parts lot check height by dial on machine	Observed variation on height 0.1 to 0.08 mm	Valid
5	Guide Blade height variation	Checking by vernier caliper	Observed as per required	Invalid
6	Unskilled Operator	Selection of Operator as per skill matrix	Skilled operator was used	Invalid
7	Metal chips in Cutting Oil	Filter and separator	Fine chips found in oil	Valid
8	Material Soft	Hardness tester	As per material specification	Invalid
9	Thread Roll damage	Visual checking	Observed no damage	Invalid
10	Effective dia. Oversize	Increase the diameter of Part	Observed Chips formation in thread	Valid

5.4.5 Possible Root Cause:

- Machine Slide loose
- Center height of part variation
- Metal chips in Cutting Oil
- Effective dia. Oversize

Sr. No.	Dia. Of Part	Observation of Chips in thread
1	17.900 mm	OK
2	17.905 mm	OK
3	17.910 mm	OK
4	17.915 mm	OK
5	17.920 mm	OK
6	17.925 mm	OK
7	17.930 mm	OK
8	17.935 mm	OK
9	17.940 mm	OK
10	17.945 mm	Not OK
11	17.950 mm	Not OK
12	17.955 mm	Not OK
13	17.960 mm	Not OK
14	17.965 mm	Not OK
15	17.970 mm	Not OK

5.4.6: **Final Validated Root Causes**

- Center height of part variation
- Effective dia. Oversize
- Metal chips in Cutting Oil
- Machine Slide Loose

5.4.7:Why –Why analysis for arriving at the possible solution :

Sr. No.	ROOT CAUSES	WHY?	WHY?	WHY?
1	Machine Slide loose	Gap Between Slide	Slide Worn Out	Scarping Not Done
2	Center height of part variation	Part diameter vary	Tolerance very wide	
3	Metal chips in Cutting Oil	Oil not filter	No metal separator	

5.4.8: Implementation Plan for the Remedies developed:

Sr. No.	List of Root Causes	Remedial Action
1	Machine Slide loose	Machine Slide scraping
2	Part Diameter over size	Machining Tolerance Change +/- 0.1 to +/- 0.05 mm
3	Metal chips in Cutting Oil	Magnetic Separator place into Oil tank

5.4.9: **Confirm the Effects:**

Month	Production	Line Rejection
Feb-18	12481	8
Mar-18	10897	0

Intangible Benefits:

Line Rejection of TLS chips in Threading on Thread Roll was reduced 90 % in month of January 2018 and Zero line rejection in month of February 2018. We are observing continuously there is not found the chips in thread .

5.5 STANDARDIZATION:

5.5.1 List of Documents changed :

These are Document are at thread rolling of TLS were Updated

a. Control Plan
b. SOP
c. Process Diagram

5.5.2 Horizontal Deployment:

We have Planned to Implement same control on other thread rolling machine and part having Thread rolling.

5.5.3 : Training given to concerned people

Operator at thread rolling operation and Supervisor were given training about new SOP, Control Plan and Other related document.

5.5.4 Additional audit checks introduced for:
Line Inspector and final inspection 100% visually inspected.

CONCLUSION

The evaluation of part production methodology helpful to optimize use of resources, equipments and manpower. Somehow help to reduce total time cycle for part production.

It can be utilize to improve new techniques for process qualification and capability of part production studies. Now a days the statically quality control plays vital role in 7 qc tools for problem solving.

This project summaries part production methodology and the possible causes in threading spatter problem. Meanwhile it is associated with all similar problem arose. The customer may benefit with such studies taken in-house defect before dispatch lead customer satisfaction.

FUTURE SCOPE

- Part production with scheduling Process flow diagram, control plan and failure mode effect analysis.
- Improvement in conventional production techniques with statistics.
- Design analysis and reduce future failure
- To reduce the overall cost of manufacturing and to make it Economic.
- To reduce wastage of time (time required for repairing and re-manufacturing)
- To achieve production in time
- To reduce work in inspection department

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