Process improvement in R-Armature line

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Abstract: Process optimization to reduce IDC (Internal Defect Cost) by Poka yoke. Poka Yoke means "Fool Proofing" or "Mistake Proofing''. Basically to avoid Inadvertent mistake and also to optimize the process. Eliminating the cause of error to avoid their occurrence and detecting errors as they occur in production. With the ultimate goal of preventing the bad parts from being passed downstream. So in a particular part manufacturing process interlinking is done, in order to prevent skipping of the operation in that process. There by reducing the scrap at the end of the line(EOL).

1. INTRODUCTION

In a Starter Motor manufacturing company, there are more than 98 types of them manufactured and classified basis on power output and specifications required by the customer. These starter motor functioned by important component i.e., Armature. Further these armatures are classified on length of the shaft and Diameter of the shaft. These armature costs 15% of the entire starter motor assembly. So there were few disadvantages found in assembly line of a armature, where the process needed to be improved to overcome the losses incurred as IDC(internal defect cost). Then out many other assembly stations of armature, the two stations were mainly concentrated with upgradation i.e., Green Test Bench & Ring Pressing stations were observed with problems and hence required and improvement which reduces cost of IDC (internal defect cost).

1.1 Green Test Bench

This process checks for the

i. Inter turn short test (IT).
ii. High Voltage Test (HV).

Test Conditions:

i. IT tests: Checks for Dis-Continuity of flow of Current due to improper welding and Element failure.
ii. Tolerance of voltage supplied at 2kw to check flow of current.
iii. HV test: Checks for generation of minimum voltage 0.9kw and leakage of current for less than 3mA

1.2 Ring Pressing

Here the upper and lower rings are inserted on the armature to hold firmly the copper windings.

WHY?

1. To avoid flare.
2. To maintain the elemental diameter.

2. METHODOLOGY

i. Identification of the problem.
Initially each station of assembly line of the armature was observed, where the process upgradation would reduce the maximum losses incurred.
ii. Defining the problem.
The observed drawbacks in the process were briefly explained.
iii. Analyzing the problem.
Problem was analyzed based on TPM (Total production management system) which are implemented to every station in the manufacturing plant.
iv. Developing the logic.
v. Selection of required components for connection.
vi. Validating by trails.
vii. Obtaining the results.

3. EXPERIMENTAL RESEARCH

Poka yoke differs as any process is made error proof in different methods, the interlinking of these two process is also a kind of it. Basically implementing or solving problem in simplest way and less expenditure.

3.1 Problems faced without interlinking of these processes.

1. Preliminary testing was missing.
2. Operator Accountability.
3. Huge numbers of parts were being scrapped at the end of the line.

3.2 Interlinking Setup

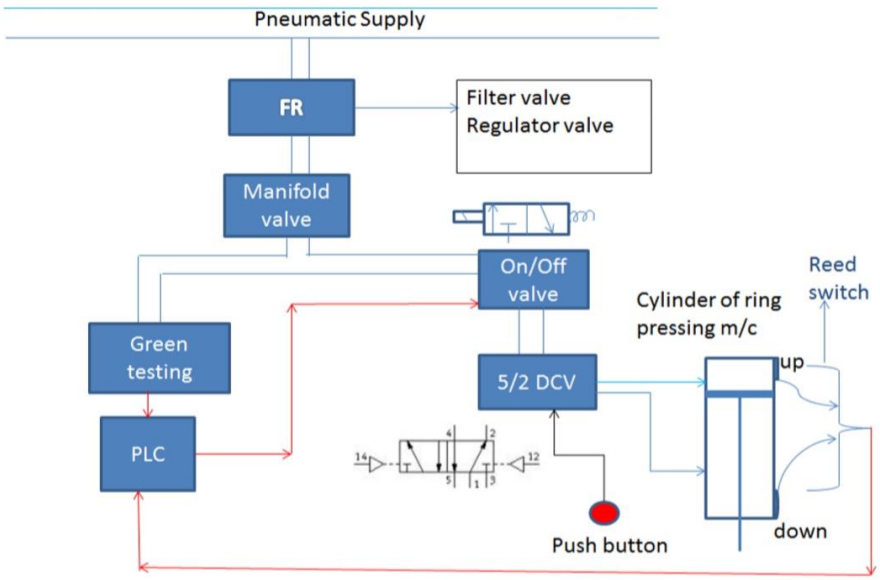

Fig: 3.2.1 Circuit for Interlinking

FRL (Filter, Regulator and Lubricator valve):

- Airline filters remove contaminants from pneumatic systems, preventing damage to equipment and decreasing production losses due to contaminant-related downtime.
- Air regulators are special valves that reduce supply pressure to the level required for efficient operation of downstream pneumatic equipment.
- Many pneumatic system components and nearly all pneumatic tools perform better when lubricated with oil. Injecting an oil mist into the air-stream which powers them can unceasingly lubricate valves, cylinders, and air motors for proper operation and long service life.

Directional Control Valves:

(DCVs) are one of the most crucial parts of hydraulic and pneumatic systems. DCVs allow fluid flow (hydraulic oil, water or air) into different paths from one or more sources. DCVs will usually consist of a spool inside a cylinder which is mechanically or electrically actuated.

Manifold valve:

Manifolds are equipment which connects two or more **valves** of a hydraulic system. A variety of block/isolate **valves** can be combined in a single body configuration.

Shut off valves (control valves):

They are ON/OFF valves either allows full flow or shut off completely. Shut off valves can be operated by hand or automatically.

Reed switch:

A reed switch is an electromagnetic switch that is used to **control** the flow of electricity in a circuit. They are made from two or more ferrous reeds enclosed within a small glass tube-like envelope, which gets magnetized and move together or separate when a magnetic field is moved towards the switch.

3.3 Working of Logic

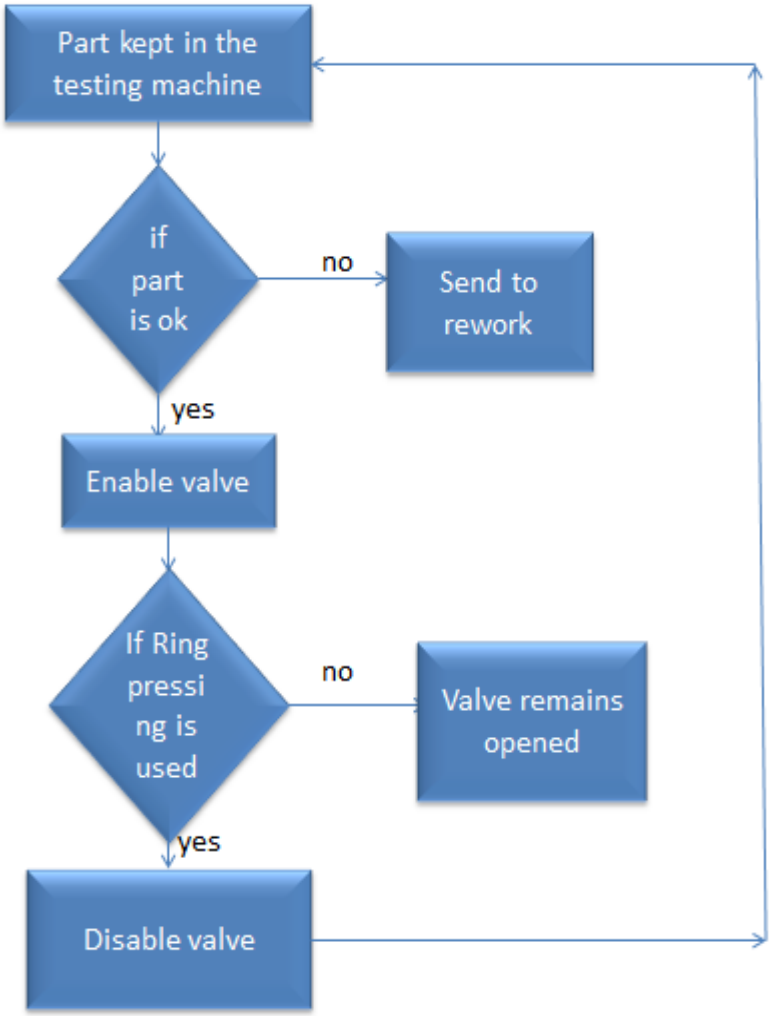

Fig 3.3.1: flow chart of the logic implemented

The above flowchart is the logic that represents the work flow that has to be carried out between the Green testing machine and Ring pressing machine.

4. RESULTS AND DISCUSSION

4.1 Return replacement scrap data

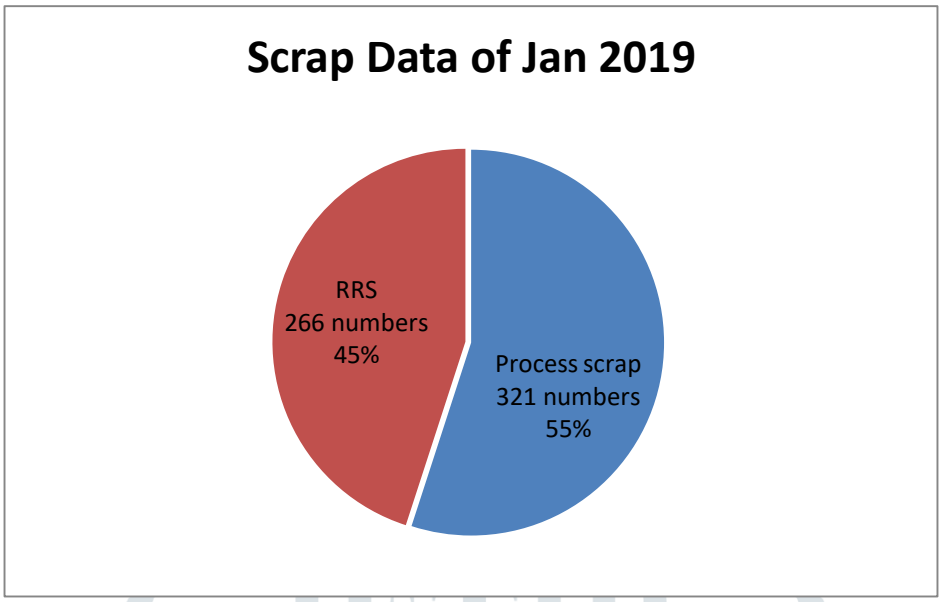

Fig 4.1.1 Rejection scrap data sheet of armature.

The above pie chart gives the process scrap and Return replacement scrap (RRS) for the month of January. The process scrap and return replacement scrap is found to be 55% and 45% respectively.

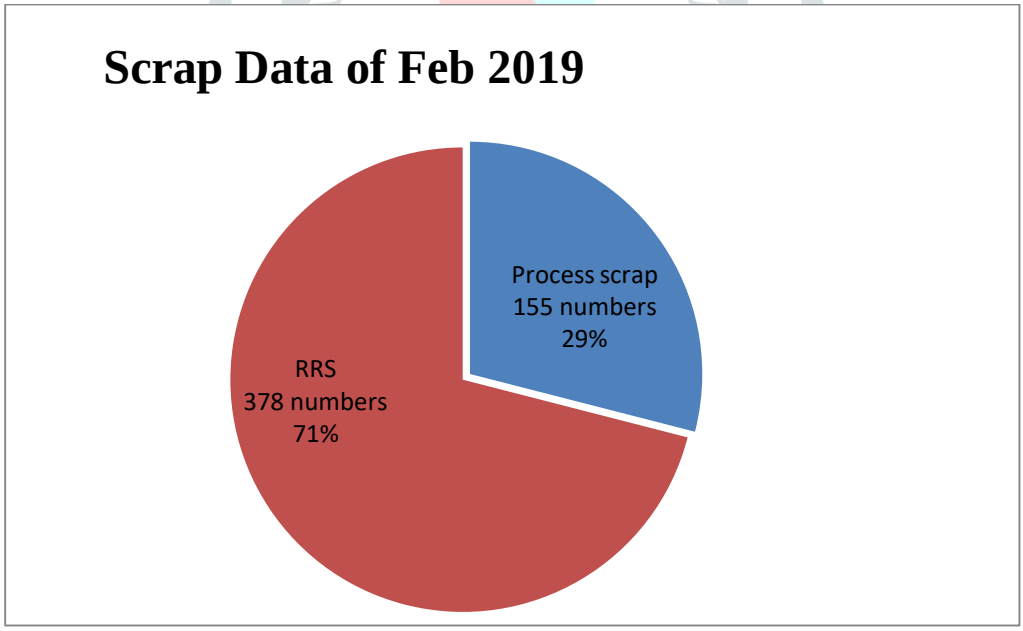

Fig: 4.1.2 Rejection scrap data sheet of armature.

The above pie chart gives the process scrap and Return replacement scrap (RRS) for the month of February. The process scraps and return replacement scrap is found to be 29% and 71% respectively.

By comparing the above two months data we can say that interlinking of green testing and ring pressing machine has done some contribution in reducing the process scrap.

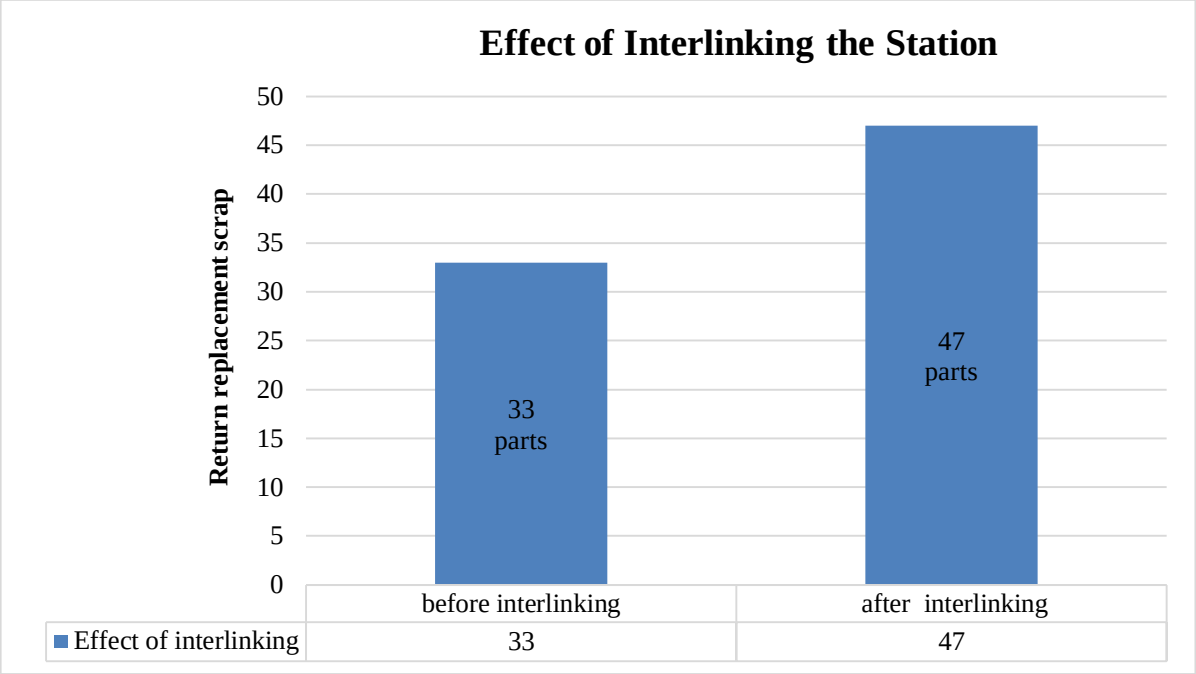

Fig 4.1.3: Rejection tracking sheet for the month January and February

The above bar graph shows the number of parts rejected before interlinking and after interlinking. The data is taken from Rejection tracking sheet of the month January and February.

Results:

Number of components rejected through HV and IT failures before interlinking (Jan) = 33

Number of components rejected through HV and IT failures after interlinking (feb) = 47

Difference= 47-33= 14

i.e., from complete scraping, we have saved 14 components extra when compared to previous month.

Data:

Price of each armature= 550Rs.

Amount that can be saved per component when the rejection is identified in loop1=200rs

Thus the amount that we have saved is = 14*200 = 2800 Rs.

If that 14 components are complete scrap then the amount that would cost us is = 14*550 = 7700 Rs.

Therefore, we have saved 2800Rs out of 7700 Rs.

Conclusion: Therefore, by calculations we can say that 36.36% of the total wastage cost can be saved.

4.2 Data and Sources of Data.

The data is collected from an Automotive manufacturing company (SEG) which is located at Bangalore.

5. CONCLUSIONS

- By comparing the above two months data we can say that interlinking of green testing and ring pressing machine has done some contribution in reducing the process scrap.
- By calculations we can say that 36.36% of the total wastage cost can be saved.
- Operator accountability has been reduced.
- To avoid the usage of further process for the defective part.

Acknowledgement

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