Six Sigma Benefits –A Case Study

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The project was completed with BOSCH.Ltd, Nasik**.** Founded in 1951, BOSCH is the largest manufacturer of diesel fuel injection equipment in the country today and among the world's largest. The project was indentified based on the customer complaint about the cap nut leakage from Mahindra & Mahindra.

Factors such as NSS (Nozzle sitting surface) Damage, leakoff hole damage, lapping bad, body damage leads to the cap nut leakage. The major importance of this project is that it will reduce the customer compaints, it will save a huge amount of money because cost of rework and scraping of the damaged parts will be drastically reduced. Currently around 12,000 parts per month are reworked and around 700 parts per month are scraped.

Major objective of the project is Reduction in Cost per piece by eliminating the damages on NSS and Leak off hole through process optimization". While the basics for manufacturing industry success are a constant— minimize costs, maximize flexibility, and keep your systems current—it's increasingly important to be able to adapt to rapid shifts in business and technology.The best possible performance is "Optimal Operations." In the process industry it is called "Process Optimization." This project will also help the organisation in reducing scarp and rework of injector body. Ultimately the problem of cap nut leakage will be eliminated.

The major causes incudes Non-Availabilty of unloading station, improper handling of parts, improper arrangement of parts in the tray, work instructions not properly defined. Due to above causes following effects were observed It was the propable cause for injector cap nut leakage issue, rework of all rejected parts, reduction in first pass yeild, rejection of injector bodies from assembly line. some of these parts were so heavily damaged such that they were directly scraped.

The Six Sigma methodology is used to solve this problem. The DMAIC principle of six sigma was used to analyse the root cause of the problem. Steps include first creating a VSM (value stream mapping) , then using ABC analysis to prioirtize the problem, creating the pareto for defects after that ishikawa chart is used to analyse the problem and by using Why-Why analysis the root caused was found.

In Define phase, the ABC analysis of defect was done. Then through the 80-20 principle the top two defects were selected. The top two defects includes NSS damage & leak-off hole damage. then the past six month data of these defects was studied. Measure phase includes value stream mapping and trails. Trail readings helped in finding the process from were defects were coming. In analysis phase the Ishikawa tool was used to find the propable defects. Then by Why-Why analysis the root cause was found. In improve phase various actions were taken, which were the result of brainstorming process. In this phase various Causes for defects and their effects were studied. finally all the actions were implemented and a problem solving sheet was prepared. Finally in control phase the control charts were used in tracking the processes and all the results were studied. Also a standred operating procedure was made.

Currently the temporary action taken includes a visual operation to be included before the NSS grinding process, proper arrangement of parts in the tray and long term actions includes Defining a standred operating procedure and for long term sustainability a chute should be made for unloading of parts.

The sigma level improved from 4.32σ to 4.65σ. The project has added a great value to the organization because the number of defective parts was drastically reduced. The rework quantity was reduced from 12000 parts per month to 4000 parts per month and the scrap quantity was reduced from 700 parts per month to 140 parts per month. This project has lead to the saving of 2.066 MINR. Moreover this project has lead to the reduction of customer complaints and yes it will ultimately lead to customer satisfaction.

The major learnings are how to define a problem, then what are the different ways to analyse the problem, and then finding the root cause of that particular problem and then arriving at number of solutions. And then applying the best solution to that problem so that such problem does not appear again in the future. Another important learning was working in a CFT i.e. Cross functional team and then brain storming to reach at a particular solution. It also include formulating a problem solving sheet (PSS), Lean production system, Six sigma, Min-max, FIFO & Pull principal.

The benefits to the organization includes-

1. Reduction in customer complaints- both internal & external.
2. Improvement in first pass yeild (F.P.Y.).
3. Standred operating procesures (S.O.P.) Defined.
4. Self driven processes implemented.
5. Implementation of min-max & FIFO.
6. Space optimization.
7. Improvement of visualization, cleanliness etc
8. Ensured delivery within defined window timing.

9. Continuous Improvement and Horizontal implementation in related areas.

Diagrams

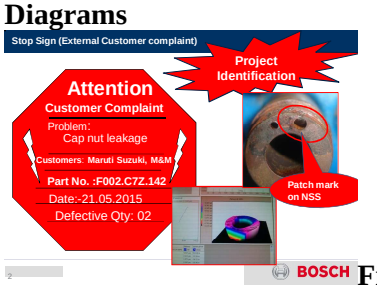


Fig1

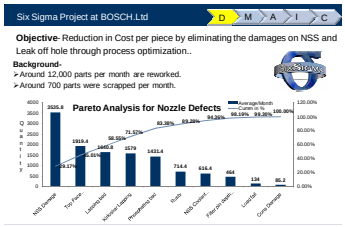


Fig2

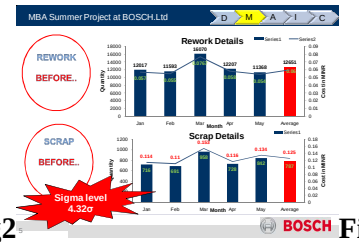
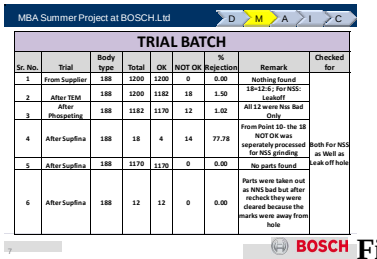


Fig3



Sr. No.	Trial	Body type	Total	OK	NOT OK	% Rejection	Remark	Checked for
1	From Supplier	188	1200	1200	0	0.00	Nothing found	
2	After TEM	188	1200	1182	18	1.50	18=12.6 ; For NSS: Leakoff	
3	After Phospating	188	1182	1170	12	1.02	All 12 were Nss Bad Only	
4	After Supfina	188	18	4	14	77.78	From Point 10- the 18 NOT OK was seperately processed for NSS ginding	Both For NSS as Well as Leak off hole
5	After Supfina	188	1170	1170	0	0.00	No parts found	
6	After Supfina	188	12	12	0	0.00	Parts were taken out as NNS bad but after recheck they were cleared because the marks were away from hole	

Fig4

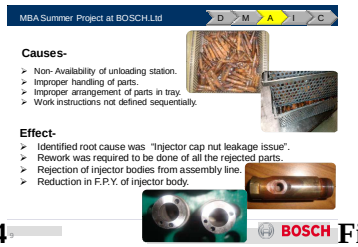


Fig5

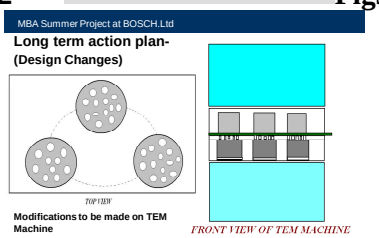


Fig6

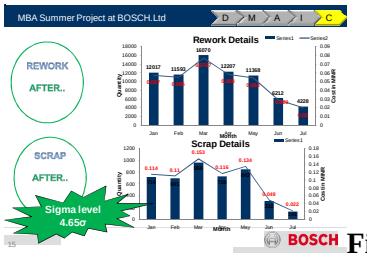


Fig7

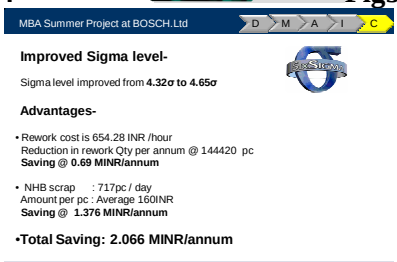


Fig 8

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