Application of DMAIC to Decrease Rejection Rate of PV-Assembly Line

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Abstract

In the era of super-fast life, companies also need to increase their production in order to meet the demand of the market otherwise any other company will take over other company's market, so with 24×7 running production of product, it is also necessary to have minimum defects that's why it will effect price of the product. Here Six Sigma come in to play for minimization of defects, here in this thesis it is shown that how to minimize rejection of hydraulic powered steering by using Six Sigma, in the thesis it is also shown that how any company can use the method effectively in order to implement it in their company for the minimization of defects.

Keywords— *DMAIC, PV- Assembly, Six Sigma, Decrease Rejection Rate*

I. INTRODUCTION

Due to advancement of technology world is shrinking day by day. Globalization of economy is becoming a worldwide phenomenon. But survival and economic growth of any country will depends on increase of productivity of their manufacturing units. This is particularly very important in developing countries like India because of higher growth of population, burden of higher interest, rising in inflation, competition in domestic and international market, limited raw materials etc. These problems can be minimized by paying greater attention to managing and improve production to improve productivity. Productivity has come to mean different things by different people.

The ratio of the output to the input is known as Productivity. The inputs are generally included Men, Machine, Material, and Method to produce output of any product in the form of Money. The concept shows that productivity is concerned only with the production function. This approach shows a narrow and restricted understanding of the concept of productivity. Methods and models to measure the productivity are essentially the translation of the various definitions and concepts of productivity. Most of the approaches are focused on production and production function. Any organization has several different objectives. These are not only in the form of products to be manufactured and marketed, but also include goals of effective utilization of capacity, making profit as well as objectives of customer and employee satisfaction and societal goals. Resources are utilized as inputs to get these objectives.

Production improvement included all facts related to the art of perfect utilization of resources to increase productivity for its successful implementation. It is necessary to have an organization, an inspection system and a controlling plan. For improvement of productivity an organization requires identifying plans, identifying desired actions; fixing responsibilities and laying down of time schedules and should take proper corrective measure.

II. PRODUCTION IMPROVEMENT

Production Improvement is a essential system of an organization structure, procedures, processes and resources to meet the higher productivity objectives. It is primarily designed to satisfy the management of the organization and therefore it may vary from one organization to another. It help in achieving higher financial goal as well as customer and employee satisfaction.

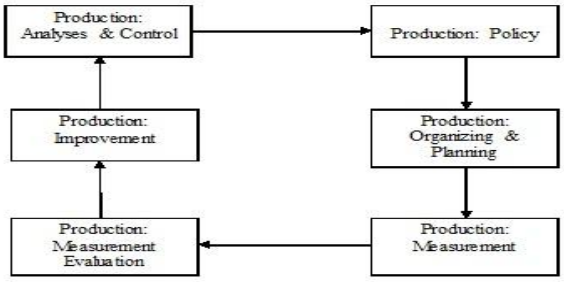

Fig.1 Closed Loop Cycle of Production Improvement

Defines it as formal management process involving all levels of management and employees. Production improvement calls for a planned, systematic and formally structured approach in planning, deployment and usage of several resources to achieve system performance. It calls for a systematic evaluation so as to identify areas for improvement 0 and a control mechanism to monitor progress of implementation programmed to achieve improvements in different areas.

There are six stages in the cycles of production improvement shown in figure 1.1, which are:

1. Production : Policy
2. Production : Organizing & Planning
3. Production : Measurement
4. Production : Measurement Evaluation

5. Production : Improvement the system
6. Production : Analyses & Control

III. PRODUCT STUDY

The company manufactured various parts related to power steering in their various plants. It also manufactured various parts related to PV assembly like input shaft, valve body, pinion shaft, torsion bar etc. and assembled and tested in PV assembly line in same unit. In this research work the product under study was Pinion Valve Assembly which is a part of hydraulic power steering, as shown in figure 4.1. It is a hydraulic fluid controlling valve which regulates the hydraulic fluid. This fluid power provides an assisting power to the driver in turning the vehicle.

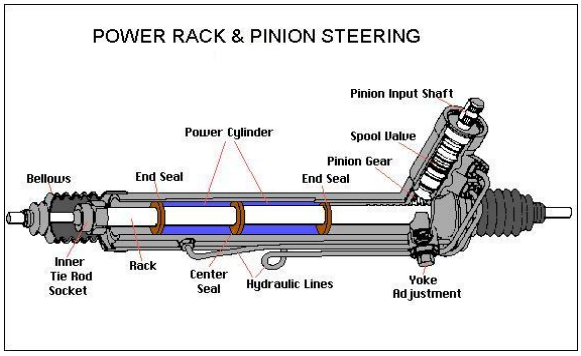

Figure 3.1: Hydraulic Power Assembly

The initial observation showed very high rate of rejections during manufacturing of PV Assembly due to various reasons like bent of torsion bar in crimping machine, chamfer burning, low pull out load of torsion bar in pinion, internal leakage in PV assembly, length of torsion bar, noise, flow rate, pin fitting load and various other rejections. As the initial observation show very poor results of quality and the staff and management was willing to reduce the rejection rate and was cooperative in implementing the six sigma even in individual production line, so a single production line in a small scale industry was chosen for study on implementing Six Sigma. The entire study was focused on main component of PV Assembly production and various machines and process to carried out production of PV assembly.

The various parts are:

- Input Shaft
- Valve Body
- Pinion
- Torsion Bar

These parts are manufactured sparely in different production line and then supplied to the pinion valve assembly dept. for assembly and testing.

A. Layout of Assembly Shop

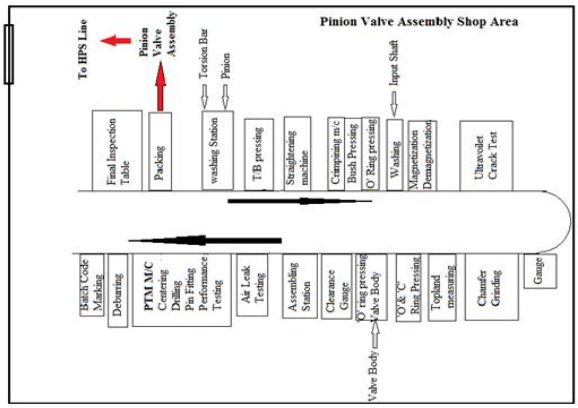

Figure 3.2: Layout of Pinion Valve Assembly Shop

Before study and analysis of any process, firstly it is important to know about the process flow and the layout of the shop area under study. The above figure 3.2 shows the layout of the working area. It should be very important to any researcher or any research team to know about complete information about the process, product and functional information of the part under study. Only in that case he or they will be able to find out the minor defects in the process and product and the cause of the defect. So in this study we found some defect that causing rejection of product in large scale. Table 3.1 shows the various defects causing rejection in various Machines in the PV-assembly line.

B. Hysteresis Graph for Balancing

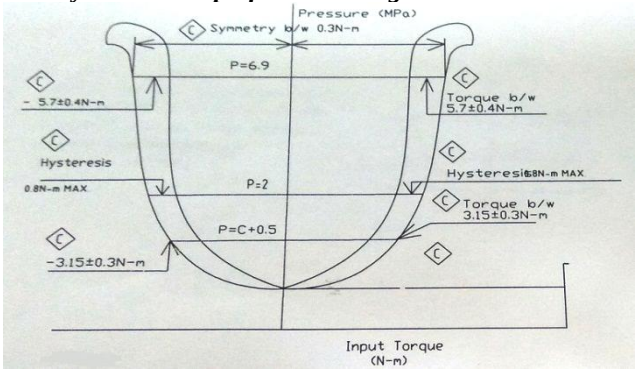

Figure 3.3: Hysteresis Graph for Balancing, Pin Fitting &Performance Testing Machine

C. Sigma Level For PV Assy. PTM after Improvement in process (May Month)

Number of Defects in PV Assy. Part = 47
Number of Defect Opportunities per unit = 5
Total Opportunities = 18048
Corresponding Sigma Level is 4.78

IV. RESULT

It's an important field of research to grow our country economy.

It justify the successfully application of six-sigma in Small scale industry production line. If we concentrate on the line to line improvement of sigma level, ultimately increase overall productivity and sigma level of an enterprise. A small scale industry improve the sigma level from 4.16σ to 4.92σ and it

help in increasing overall productivity index of an enterprise.

Improved result in form of process capability analysis graph is shown in figure 4.16. With the proper management of recourses & application of six-sigma by following all quality related parameter Six Sigma in Industry help to improve sigma level up to 4.92 from level of 4.16 and total reduction of defects level to 0.05% of production in PPM.

Six-Sigma for SSI is a very important sector to grow over the last two to three years. Very few studies have been reported about the successful applications of Six Sigma in SSI. In the small companies is much easier to buy-in management support and commitment, as opposed to large organizations. The education and training component is much harder for smaller companies.

V. CONCLUSIONS

In the present research work, an initiative has been taken to apply Six Sigma in a production line of small organization which manufacturing and Assemblage of Pinion valve Assembly which is used in Hydraulic Power Steering. The results of the study shows that Six Sigma is a versatile strategy to achieve increase in productivity and has a lot of opportunities for the small industries which are being highly afraid of by high economic growth of industries and facing competition.Thermal analysis is a good technique to control carbides, shrinkage and micro-shrinkage formation.

Major reasons identified for the high rejection rates were on few working station as well as in process, that was minimized by adopting 100% at necessary Point and by adopting great quality standards in assembling and machining. If some deviation found in the standard and parameter that will immediately eliminated and try to eliminate the reason of defect and eliminate it. These activities are easily defined and controlled by six sigma methodology. Human errors can also eliminated by adopting step to step operation sequences. Initially the process capability analysis for Sigma level was 4.16. But after implementing Six Sigma, values for process capability Sigma level were found out to be 4.92s. This case study clearly discards the myth that Six Sigma is the domain of only large companies. It can be concluded that Six Sigma is not merely a simple statistical quality tool for application in large corporate companies; in fact the present work has attempted to prove that it can be successfully applied as a process improvement tool in smaller organizations and even in their sub Parts also.

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