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PRODUCTIVITY IMPROVEMENT-A CASE STUDY

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ABSTRACT

Six Sigma is a philosophy based on setting attainable short-term goals while striving for long-term objectives. Six sigma is a highly disciplined approach used to reduce the process variations to the extent that the level of defects are drastically reduced to less than 3.4 per million process, product or service opportunities (DPMO). Six Sigma, in many organizations, simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process; from manufacturing to transactional and from product to service. The Six Sigma method allows us to draw comparisons to other similar or dissimilar products, services, and processes. In this manner, we can see how far ahead or behind we are. Six Sigma helps us to establish our course and gauge our pace in the race for total customer satisfaction.

The work is carried out at Tulja Engineering Aurangabad, a Medium scale manufacturing unit. The project aims to reduce tool changing time at grinding wheel station. This problem was rectified to a great extent using Metrics, why? Why? Analysis and root cause analysis techniques. This work is expected to increase number of Six Sigma users after the impact of this result on the performance of the firm.

The authors are trying to prove that six sigma could be implemented with the existing improvement approach to small as well as medium scale industries. Six sigma can also be used to solve the complicated problems which may be of technical or non-technical in nature. We conclude that successful implementation needs top management support, involvement of people concerned, organizational infrastructure, training of manpower and thorough process analysis.

KEYWORDS: Metrics, Cp, DMAIC, Root Cause Analysis

INTRODUCTION

The aim of this paper is to explain the use of 6 sigma in a simplified manner. There are some tools suggested by six sigma philosophy.

FUNDAMENTAL TOOLS OF SIX SIGMA

- Brainstorming.
- Force field analysis.
- Pareto analysis
- Fishbone diagram.

- Project management.
- Stakeholder analysis.
- SWOT analysis.
- Project charter.
- Theory of constraints (TOC).
- Process mapping.
- Value stream analysis.
- Lean manufacturing.

Six Sigma Perspectives

- Statistical approach.
- Quality conscious approach combined with profit.
- Customer satisfaction approach.

Process capability is defined as the probability of a product or service meeting customer requirements. The process capability index is defined as allowable process spread over actual process spread.

Thus:

Cp = (USL –LSL)/6s

Where, USL and LSL are the process upper and lower specification limits. A three-sigma process (normally distributed) gives a Cp of 1.0 with 66,807 defects per million opportunities. In contrast, a six-sigma process will give a rate of only 3.4 p.p.m. outside the limits. The higher the Sigma level, the less likely a process is to create defective parts. (See figure 1).

This is a normal distribution curve which shows number of parts falling within and outside the control limits.

IMPLEMENTING LEAN SIX SIGMA

Knowing about Six Sigma is not enough to start implementation. First, problems are identified, they are analyzed for priority and then brainstorming is done to find root causes. Sometimes obvious looking reasons do not hold good for typical problems, here **CTQ** (Critical TO Quality) plays its role. Simple procedure for implementation is **DMAIC.**

- Phase 1 - Define (D). Define the problem
- Phase 2 - Measure (M). Measure the problem for its severity & quantity
- Phase 3 - Analyze (A). Analyze the probable causes.
- Phase 4 - Improve (I). Improve the present condition by applying new solution
- Phase 5 - Control (C). Control the process after improvement to maintain the stability.

From the collected case studies we came to the conclusion to select a problem area which can be easily sorted out and solved with minimum expenditure. Machine problems are easy to understand and comparatively cheaper to solve.

To prove our methodology the following data was collected for implementation purpose.

Implementing Findings in an Industry

After analyzing and designing the methodology it is time to prove our findings. To verify our results of the work we have selected an industry having following description.

Name of the Company: Tulja Engineering

Medium Scale Industry.

Nature of Activity: Manufacturing.

Dependency: Independent.

Organization Type: Pvt. Ltd.

Problem Area: Machine.

Criticality: Medium.

Define Problem: Tool changing time loss at grinding wheel station.

Tools Suggested: PIE diagram, flow chart, metrics, activity chart, root cause analysis, why? Why? Analysis.

Problem Definition: Excess time taken for grinding wheel changing

Aim: REDUCTION IN GRINDING WHEEL (TOOL) CHANGE TIME.

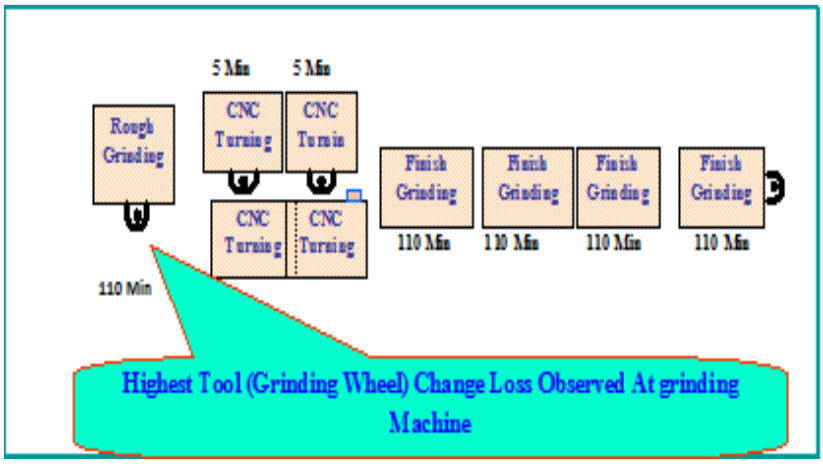

Figure 1: Reason for Selecting the Project

Table 1: Data Collection

Description	Jan 07	Feb 07	Mar 07	April 07	Total
Total Production	89900	98296	98397	98481	385074
Number of Machines Available	15	15	15	15	15
Number of times wheel is changed	15	14	15	16	60
Time required for wheel change/occurrence	110	120	110	115	455
Total Time Required for wheel change/month	1650	1680	1650	1840	6820

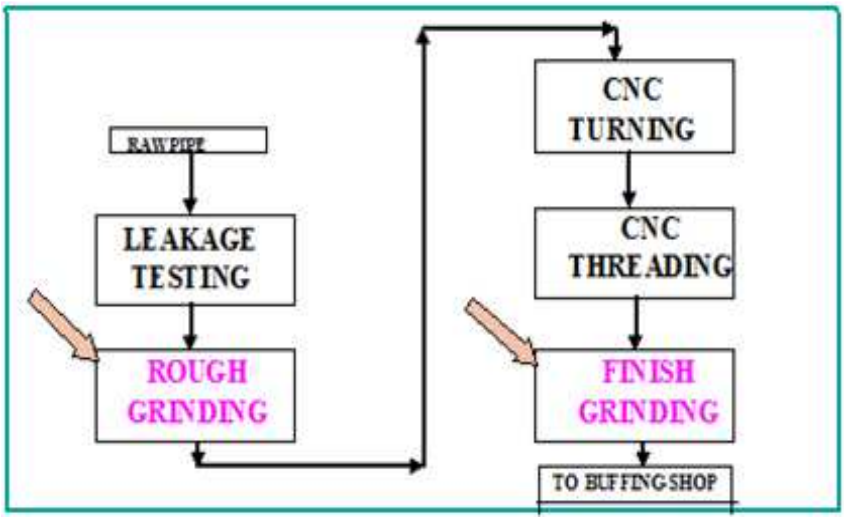

Figure 2: Manufacturing Process Flow Diagram

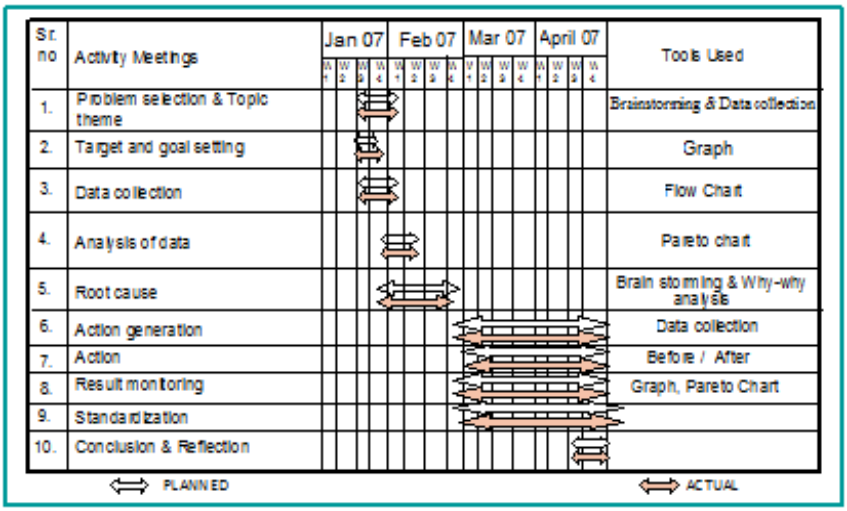

Figure 3: Activity Chart with Metrics

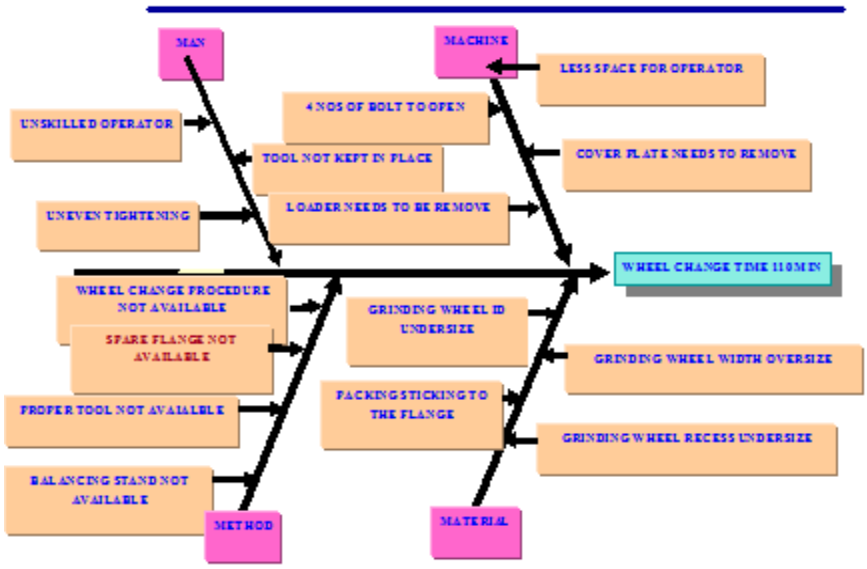

Figure 4: Cause and Effect Diagram

Problem / Present Status

*Average Tool Change time Observed: - 110 Min./Occurrence

*Occurrences/Month /Machine : - 1 Nos.

*Total Time loss/Machine/Month : - 110 Min.

*Number of Machines : - 15 Nos.

*Average Total Loss/Month : - 1650 Min.

*Total Production loss/month : - 4950 Nos.

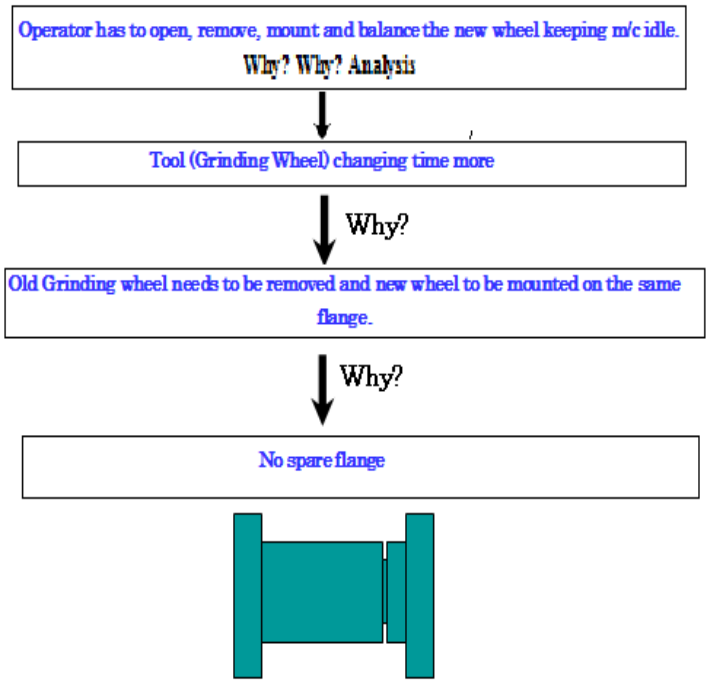

Figure 5: Why? Why? Analysis

Idea: Countermeasure

Figure 6: Balancing the Spare Wheel on Wheel Balancer

Figure 7: Comparison of Activities Flow Chart

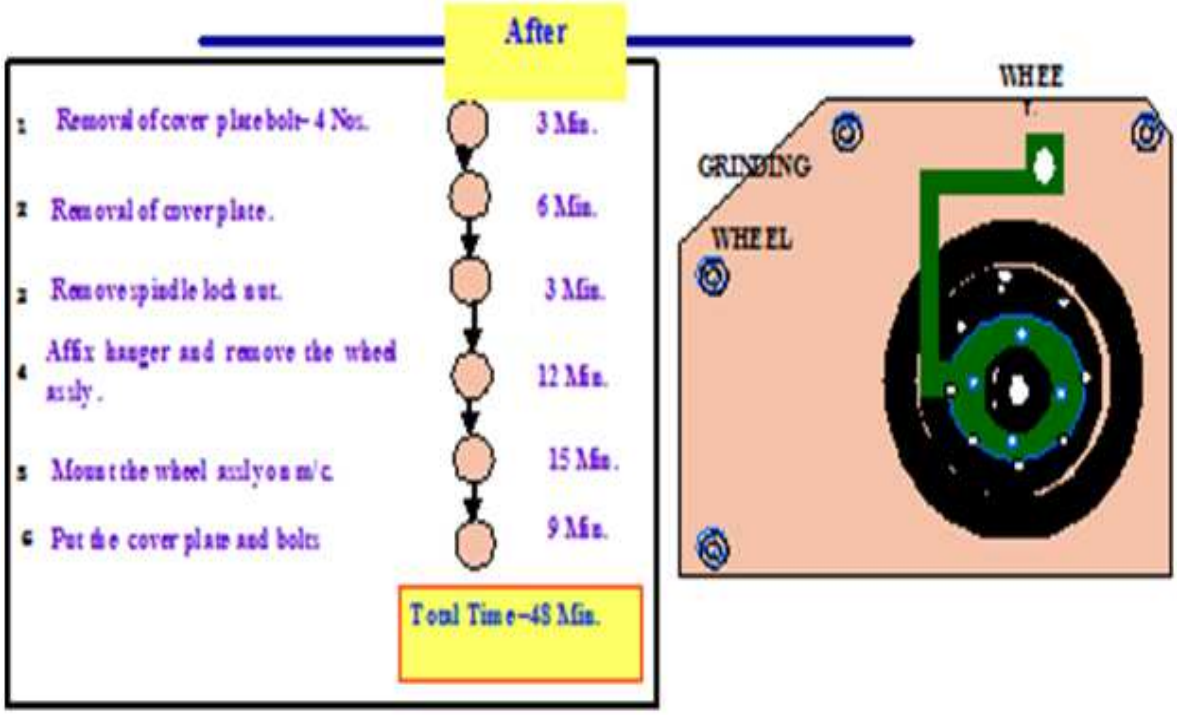

Figure 8: Revised Activities Flow Chart

RESULTS

Grinding Wheel Change Time Reduction

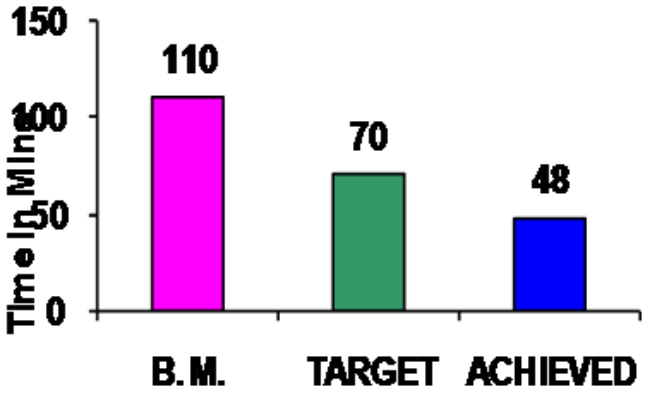

Figure 9: Bar Chart Showing Time Reduction

BENEFITS

Production increased by 2790 numbers /month.

Employee morale increased.

Tool change time reduced by 62 minutes /occurrence.

SAVINGS

Time saved/machine= 62 minutes.

No of machines = 15 numbers (on 3 lines).

Total time saved/month = 930 minutes.

Total production increased = 2790 numbers.

Cost / component = Rs.30.50

Total cost saved / month =Rs. 85095.

Total cost saved / year = Rs. 1,02,1140.

CONCLUSIONS

Six sigma is a very powerful new tool to quality improvement, which implies entirely new way to run the business. One must remember that technical expertise alone cannot yield results without the working environment and top management support. Engineering industries have to aspire for it relentlessly. The case study undertaken here has shown that results obtained by using **Six Sigma** are wonderful. Due to these results, an organization enjoys position well on top of its competitors.

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