Improving Profitability with Continuous Improvement

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IMPROVING PROFITABILITY WITH CONTINUOUS IMPROVEMENT

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OBJECTIVE

Manufacturing companies are facing a number of challenges when it comes to prioritizing and implementing continuous improvements efforts (Laurean, 2012). The aim of this paper is to overcome this problem by applying the Profitability Improvement Analysis (PIA), by identifying key areas that would bring the biggest gain for the company, and later by applying Lean Six Sigma (LSS) to improve those areas. The case study in the company for the production of light metal packaging presented the success of the application of both methods and the impact on profitability-where by implementing a LSS project in high impact area profitability increased from 12% to 14.5%.

METHODOLOGY

Research was done by comparing PIA and LSS methodology in goals and in phases of implementation by methods of analysis and synthesis, deduction and induction. To test complementarity of both methodologies also a case study was done in one manufacturing company that produces aluminum packaging.

RESULTS

In first analysis of goals of PIA and LSS, we can conclude that both methodologies enable companies to focus on both efficiency and effectiveness. PIA, enabling company management to make strategies towards price increase, cost reduction and inventory reduction (Levi-Jakšić, 1994) and LSS with continuously improving end to end processes and focusing in same areas-cost reduction, quality/price and inventory.

The case study in the company for the production of light metal packaging presented the success of the application of both methods. As a first step in PIA a basic sensitivity analysis was done, and area of Material has been chosen for factorial analysis. Factorial analysis was done to determine which materials exactly have the biggest impact, and also to determine more realistic targets of improvement (Table 1)

	Aluminum	Over varnish	Colors
Target	-5%	-14.70%	-9%
Increase of profitability:	0.8%	1.1%	0.6%

Table 1 Factorial analysis

Over varnish has been chosen as area for improvement and LSS has been applied and DMAIC (Schildmeijer, 2015) cycle.

In the Define phase a problem statement and voice of customer was defined as well as the main Y and improvement target.

In Measure phase a Measurement system analysis was done to prove reliability and reproducibility of the measurement system. Results shows measurement system variation to be below 2% (Figure 1) which is indicating a trustworthy measurement system. Also, a process Capability was calculated to be Cpk= 0.98 (Figure 2) indicating that process has low capability- and 150 000 out of 1M cans are out of specification limits and defective.
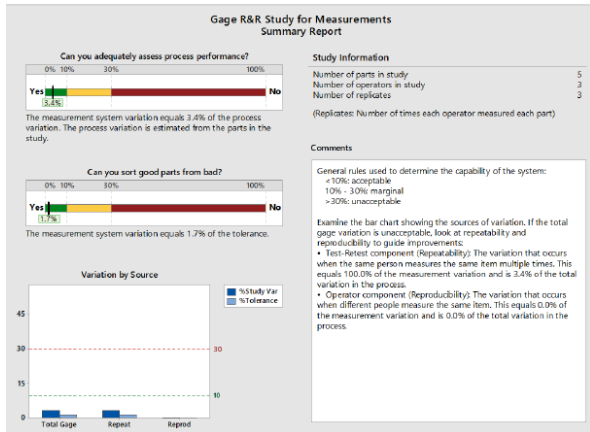

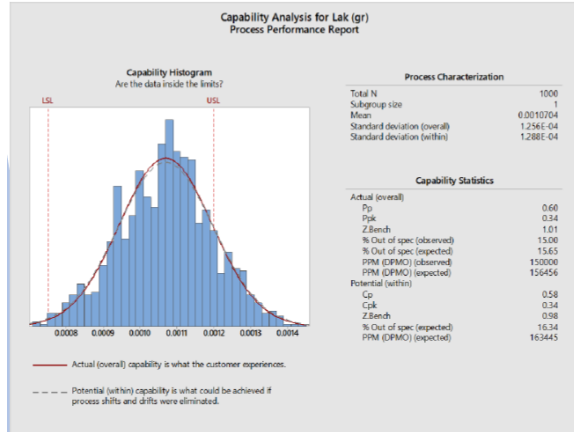**Figure 1 Gage R&R study**

Figure 2 Process Capability

In the Improve phase, a Potential Failure Mode and Effect Analysis (Rowlands, 2005) was done and as a output main causes of variation of Over varnish. A hypothesis test – Multiple regression Figure 3 was done to validate these factors. An 89% of variation is explained with next three factors: Time of stirring the mixture, amount of water; knife distance. Using the Multiple regression model and equation a set of recommended values for these factors was calculate Figure 4. as shown.
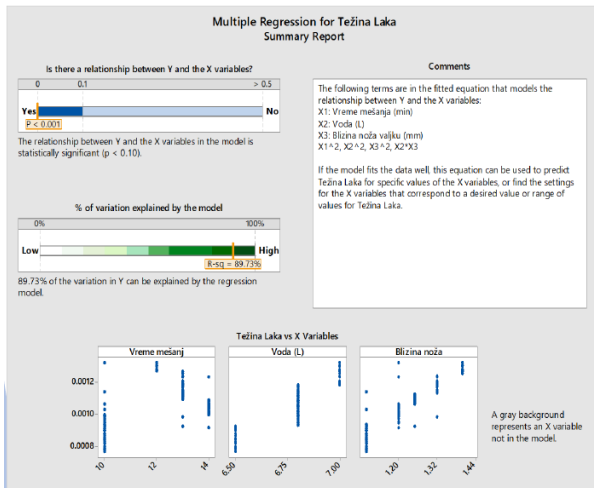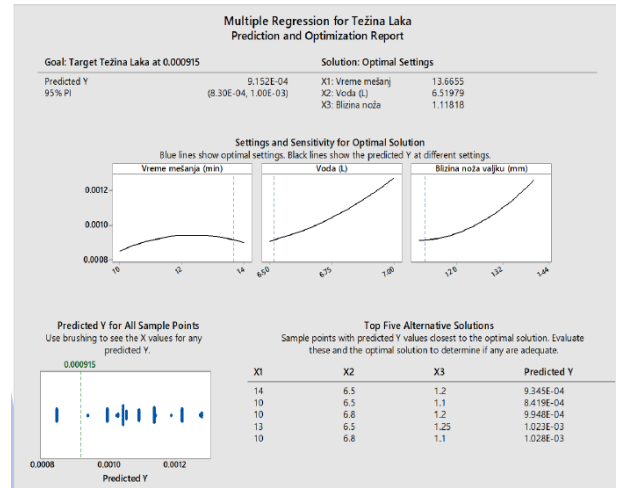

Figure 3 Multiple regression

Figure 4 Optimizing factors

Team of the company came up with list of improvements which was prioritized and next improvements were implemented:

1. Flow meter for precise measurement of amount of water
2. Timer which will enable precise measurement time of stirring the mixture
3. Mechanical improvements of the knives that will mistake-proof the distance setting after knife cleaning, so there will be only one option for distance of the knives.

After implementing these improvements Process Capability improved to 1.43 and over varnish reduction was significant- from 1.1kg per 1M cans to 0.8kg per 1M cans.

An Control plan was created with specification limits and control mechanisms in order to maintain this improvement.

CONCLUSION

An impact to Profitability was calculated in order to validate this case study: it increased from 12% to 13.1% which shows a direct impact to profitability. This shows that both methodologies work together towards the same goal, and can bring a significant improvement in manufacturing environment.

Main conclusions are that PIA and LSS:

1. Can make an impact to lowering inventory and material expenses
2. Both methodologies are effective and efficient
3. Both methodologies can enable a company to use resources better and focus on areas that have the biggest impact to the profitability and company.

Keywords: *Lean Six Sigma, PIA, manufacturing, SymOrg2022*

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