

## Documents

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**Lean Manufacturing and Six Sigma Principles Implementation in the Industry: Case Study**  
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#### Abstract

Meeting customer satisfaction is significant for manufacturers to support their company's competitiveness. Different lean tools can enhance manufacturing firm's capability in the severe competence market. However, integrating lean practices with the six-sigma approach will increase productivity and reduce waste. This research aims to improve the Process Cycle Efficiency (PCE) of the pre-stressed spun concrete pole production at a Private Company. The define-measure-analyze-improve-control (DMAIC) methodology and value stream map (VSM) were used to minimize waste and improve the process. The results show that the highest waste was in work in progress (WIP) inventory. The analysis showed that the manufacturer's push system is not proper for the specific product under investigation. One of the significant outputs of the research is by suggesting using a pull system. Finally, using the Lean Six Sigma approach by DMAIC methodology positively impacts the pole's PCE. The results show a significant improvement when using the lean six sigma approach. © 2023, The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd.

#### Author Keywords

Lean manufacturing; Six sigma; VSM

#### Index Keywords

Agile manufacturing systems, Customer satisfaction, Poles, Process monitoring, Six sigma, Work simplification; Control methodology, Customers' satisfaction, Cycle efficiency, Industry case studies, Lean Six Sigma, Process cycles, Six sigma approaches, Six sigma principles, Six-Sigma, Value stream maps; Lean production

#### References

- Bourini, I.F., Al Hazza, M.H.F., Taha, A.H.  
**Investigation of effect of machine layout on productivity and utilization level: What if simulation approach**  
(2018) *Int J Eng Mater Manuf*, 3 (1), pp. 32-40.
- Näslund, D.  
**Lean, six sigma and lean sigma: Fads or real process improvement methods**  
(2008) *Bus Process Manag J*, 14 (3), pp. 269-287.
- Andersson, R., Eriksson, H., Torstensson, H.  
**Similarities and differences between TQM, six sigma and lean**  
(2006) *TQM Mag*, 18 (3), pp. 282-296.
- Nonthaleerak, P., Hendry, L.C.  
**Six sigma: Literature review and key future research areas**  
(2006) *Int J Six Sigma and Compet Adv*, 2 (2), pp. 105-161.
- Munro, R.A., Ramu, G., Zrymiak, D.J.  
**The certified six sigma green belt handbook**  
(2015) *ASQ Quality Press*, 48 (12), p. 77.

- Besterfield, D.H.  
(2013) *Quality Improvement*,  
Pearson Ninth Edition
- Schroeder, R.G., Linderman, K., Liedtke, C., Choo, A.S.  
**Six sigma: Definition and underlying theory**  
(2008) *J Oper Manag*, 26 (4), pp. 536-554.
- Antony, J., Banuelas, R.  
**Key ingredients for the effective implementation of six sigma program**  
(2002) *Meas Bus Excell*, 6 (4), pp. 20-27.
- Montgomery, D.C., Woodall, W.H.  
**An overview of six sigma**  
(2008) *Int Stat Rev*, 76 (3), pp. 329-346.
- Motwani, J., Kumar, A., Antony, J.  
**A business process change framework for examining the implementation of six sigma: A case study of Dow chemicals**  
(2004) *TQM Mag*, 16 (4), pp. 273-283.
- Prasanna, M., Vinodh, S.  
**Lean Six Sigma in SMEs: An exploration through literature review**  
(2013) *J Eng Design and Technol*, 11 (3), pp. 224-250.
- Karim, A., Arif-Uz-zaman, K.  
**A methodology for effective implementation of lean strategies and its performance evaluation in manufacturing organizations**  
(2013) *Bus Process Manag J*, 19 (1), pp. 169-196.

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