





























## 6. Conclusion

The research work proves that by using the lean tools production lead time is reduced in manufacturing of EX 70 excavator bucket. Thus, the productivity in the fabrication stations have been improved. Total time taken in welding station was reduced from 90 mins to 80 mins per bucket, total time taken in Lug alignment inspection was reduced from 18 mins to 13 mins per bucket and total time taken in painting station was reduced from 45 mins to 40 mins per bucket thus, total cycle time of 538 minutes to manufacture a Ex 70 excavator bucket is reduced to 518 minutes per bucket. The ergonomic condition of worker and manpower utilization is also improved after implementation of proposed process. The productivity can further be improved by continuous process improvement and according to the product requirements. The total cost savings due to productivity improvement is about \$ 81,912 per year. This work can still be further improved through continuous improvement by improving the process.

## 7. Reference

- Saravana kumar.M, Allen Jeffrey.J, Mohan Raj.S, Production Lead Time Reduction in a Hydraulic Machine Manufacturing Industry by Applying Lean Techniques, AJER, Volume-6, Issue-1, pp-365-373 (Picture Source)
- Koskela, L. 1992. Application of the New Production Philosophy to Construction. Technical Report # 72. Center for Integrated Facility Engineering. Department of Civil Engineering. Stanford University. 75
- Koskela, L. 1993. Lean Production in Construction. The 10th International Symposium on Automation and Robotics in Construction (ISARC), Houston, Texas, U.S.A., 24 - 26 May, 1993. Elsevier. Pp. 47 - 54.
- Koskela, Lauri & Sharpe, Ron. 1994. Flow process analysis in construction. The 11th International Symposium on Automation and Robotics in Construction (ISARC), Brighton, U.K., 24 - 26 May, 1994. Elsevier. Pp. 281 - 287.
- Monden, Yasuhiro. 1994. Toyota Production System. Second Edition. Chapman & Hall, London. 423
- Ronen, B. 1992. The complete kit concept. Int. J. Prod. Res., Vol. 30, No. 10, 2457 - 2466.
- Koskela, Lauri. 1992. Process Improvement and Automation in Construction: Opposing or Complementing Approaches? The 9th International Symposium on Automation and Robotics in Construction, 3 -5 June 1992, Tokyo. Proceedings. Pp. 105-112
- Abdulmaleka, F. and J. Rajgopalb. "Analyzing the benefits of lean manufacturing and value stream mapping via simulation: A process sector case study." International Journal of Production Economics 2007; 107(1): 223-236.
- Alfnes, E., C. C. Rostad, et al. Flexibility Requirements in the Food Industry and How to meet them. 4th International Conference on Chain Management in Agribusiness and the Food industries. Wageningne, The Netherlands. 2000;
- Alvarez, R., R. Calvo, et al. "Redesigning an assembly line through lean manufacturing tools." International Journal of Advanced Manufacturing Technology 2009; 43: 949-958.
- Ballis, J. P. Managing Flow: Achieving Lean in the New Millennium to the Gold. Dallas, Brown Brooks. 2001;

## Biography

**Santosh Gudagunti** is studying Master of Science in Industrial Engineering at Lawrence Technological University, Southfield, Michigan, United States. He has completed Bachelors in Mechanical Engineering from Shri Dharmasthala Manjunatheshwara College of Engineering and Technology Dharwad, Karnataka, India. Mr. Gudagunti is serving as the President of IEOM Student Chapter at Lawrence Technological University, Southfield, Michigan since September 2017. His Field of interest in research are Quality, Simulation, Productivity and Operations Research.

**Dr. Ahad Ali** is an Associate Professor, and Director of Master of Engineering in Manufacturing Systems and Master of Science in Industrial Engineering in the A. Leon Linton Department of Mechanical Engineering at the Lawrence Technological University, Michigan, USA. He earned B.S. in Mechanical Engineering from Khulna University of Engineering and Technology, Bangladesh, Masters in Systems and Engineering Management from Nanyang Technological University, Singapore and PhD in Industrial Engineering from University of Wisconsin-Milwaukee. He has published journal and conference papers. Dr Ali has completed research projects with Chrysler, Ford, New Center Stamping, Whelan Co., Progressive Metal Manufacturing Company, Whitlam Label Company, DTE Energy, Delphi Automotive System, GE Medical Systems, Harley-Davidson Motor Company, International Truck and Engine Corporation (ITEC), National/Panasonic Electronics, and Rockwell Automation. His research interests include manufacturing, simulation, optimization, reliability, scheduling, manufacturing, and lean. He is member of IIE, INFORMS, SME and IEEE.