

Review of Implementation of Lean Manufacturing in Cement Industry

Chirag Joshi¹ P. S. Puranik²

¹P.G. Student ²Professor

^{1,2}Department of Mechanical Engineering

¹Gujarat Technological University, India ²Atmiya Institute of Technology & Science, India

Abstract— Implementation of lean helps many organizations to improve their productivity and efficiency; on the other hand number of organizations has failed to benefit from lean philosophy. The case of not achieving the expected results of implementing lean is not because of limitation of lean to specific organizations type; but it is the misconception of lean philosophy. The lean thinking was first implied in the automobile companies and it widely spreads within the all types of industries; however the today's challenge is to implement the lean philosophy within continuous manufacturing industries and different organizations regardless to the type and size of the organization. This has motivated me to apply lean philosophy to the continuous industry i.e. cement industry. The cement industry is an example of the continuous industry sector and it will be used to convey that the lean philosophy is applicable to all deferent organization types. There are many problems the cement industry facing in today's cut throat competition; one of the major challenges is the capability of the cement industry to adopt techniques by which the overall improvement can be achieved. The need for improving the productivity of the cement production line is to reduce the downtime rates, and satisfy high demands of consumers. This research has aimed that the lean philosophy is beneficial to cement industry once the organization aims, and objectives are clarified and communicated through all levels of the organization. Furthermore barriers and obstacles should be removed by changing the organizational culture, and empowering the people to be involved in identifying and problem solving process.

Key words: Lean, Cement Industry, lean philosophy

I. INTRODUCTION

The manufacturing's philosophy has witnessed fundamental changes since the elimination of low production to be replaced by mass production system. New era has started when lean manufacturing philosophy is introduced. The idea of lean production was originated at Toyota Company in 1950s. The main aim of lean philosophy is to give less effort but achieve more through eliminating or minimizing non-value added activities and wastes within the system. Organizations are under pressure to reduce their customer lead-time, cost and cycle time, and increase their productivity and quality. Many organizations have realized the need to adopt the lean philosophy instead of the traditional mass production concepts in order to stay competitive in cut-throat competition and survive in the recent recession and global rivalry situation.

This research will attempt to show that the lean methodology is not only limited to only special type of organizations, but it can be applied successfully to all organization types as long as the right transition path is applied effectively. The research here will study and develop standard steps which can be used as guidelines in implementation of lean methodology within different types

of organizations. The situation of not achieving the expectation of high machine utilization and production rates and trouble free operation processes within the cement production line has motivated me carry such type of research by which the cement production line will be improved and enhanced.

The research aims will be accomplished through achieving the following objectives:

- Understanding the cement manufacturing process.
- Identifying different types of interrelationships between the variables which associated with the production line and their effects on the performance parameters.
- Validating the obtained results

II. LITERATURE REVIEW

D.T. Matt, E. Rauch [1] This paper analysis in a first step the role and potential of small enterprises – especially in Italy – and shows then a preliminary study of the suitability of existing lean methods for the application in this type of organization. The research was combined with an industrial case study in a small enterprise to analyze the difficulties in the implementation stage and to identify the critical success factors. The results of this preliminary study should illustrate the existing hidden potential in small enterprises as well as a selection of suitable methods for productivity improvements. This research will be the base for a further and more detailed research project.

Nor Azian Abdul Rahman, Sariwati Mohd Sharif, Mashitah Mohamed Esa [2] The Kanban system is one of the manufacturing strategies for lean production with minimal inventory and reduced costs. However, the Kanban system is not being implemented widely by manufacturing companies in Malaysia. Thus, the objectives of this case study are 1) to determine how does the Kanban system works effectively in multinational organization; and 2) to identify factors hindering Malaysian small and medium enterprises (SME) from implementing Kanban. Findings of the study suggest that top management commitment, vendor participation, inventory management and quality improvement are important for Kanban deployment and towards lean manufacturing.

Adem Atmaca, Recep Yumrutas [3] in this study, the effects of refractory bricks and formation of anast layer on the specific energy consumption of a rotary kiln are investigated. Thermodynamic analysis of the kiln is performed to achieve effective and efficient energy management scheme. Actual data, which are taken from a cement plant located in Turkey, are used in numerical calculation to obtain energy balance for the system. The formation of anast layer and the use of high quality magnesia spinel and high alumina refractory bricks provide 7.27% reduction in energy consumption to a saving of 271.78 MJ per ton of clinker production.

Adnan Hj. Bakri, Abdul Rahman Abdul Rahim,

Noordin Mohd. Yusof, Ramli Ahmad [4] This paper aims to have a brief study on the literature related to the application of TPM in the manufacturing industry. Effort was made to discuss the published research related to TPM and lean production. This literature review-based research revealed an important research gap, i.e. the need of a comprehensive integration between these two methodologies. Most of the researches available investigate these initiatives separately, rather than addressing on the significant role of TPM as one of the main thrust. The beneficial outcome from TPM methodology is quite hindered and unexposed in some literatures related to lean production. The outcomes from this review is hope justify the needs of further research in the area of TPM integration with lean production.

Teerasak Khanchanapong, Daniel Prajogob, n, Amrik S. Sohal, Brian K. Cooper, Andy C.L. Yeung, T.C.E. Cheng [5] This study investigates the unique and complementary effects of manufacturing technologies and lean practices on operational performance of manufacturing firms. Using data collected from 186 manufacturing plants in Thailand, we found that both manufacturing technologies and lean practices have unique effects on a range of operational performance dimensions, including quality, lead-time, flexibility, and cost. More importantly, however, we also found that both organizational resources have complementary effects on those operational performance dimensions. Based on the research findings, we offer theoretical and practical insights which support the importance of building strong manufacturing technologies and lean practices that maximize operational performance.

Fawaz A. Abdulmalek, Jayant Rajgopal [6] The "lean" approach has been applied more frequently in discrete manufacturing than in the continuous/process sector, mainly because of several perceived barriers in the latter environment that have caused managers to be reluctant to make the required commitment. This paper describes a case where lean principles were adapted for the process sector for application at a large integrated steel mill. Value stream mapping was the main tool used to identify the opportunities for various lean techniques. Paper also describe a simulation model that was developed to contrast the "before" and "after" scenarios in detail, in order to illustrate to managers potential benefits such as reduced production lead-time and lower work-in-process inventory.

Ozgun Ekincioglu, Asli Pelin Gurgun, Yasin Engin, Muhittin Tarhan, Sezgi Kumbaracibasi [7] In particular, cement production has a huge impact on the environment because of releasing high amount of CO₂ during production process. This paper aims to express the sustainability of building materials in Turkish construction industry through analyzing cement production of a Turkish cement industry where alternative fuels, raw materials, by-products and energy efficient methods are used for sustainable development.

Ahmad, M.F., Zakuan, N., Jusoh, A. and Takala, J. [8] The purpose of this paper is to propose relationship between TQM practices and business performance with mediators of Statistical Process Control (SPC), Lean Production (LP) and Total Productive Maintenance (TPM) based on extensive review of the literature. The main contribution of this paper is to identify the relationships among TQM, TPM, SPC and Lean Production practices as a

conceptual model. This proposed conceptual model will help the academicians and industry players to have better understanding on the relationship between the practices and step by step implementation to improve business performance.

A. M. Grabiec [9] This paper presents some result of studies on cement matrix composites exposed to corrosion action of sodium sulphate, acetic acid and frost. The qualitative X-ray analysis, differential thermal analysis and scanning electron microscopy were applied for investigating the hydration process, cement phase composition, microstructure and morphology of cement based systems modified with super plasticizers.

M. Schneider, M. Romer, M. Tschudin, H. Bolio [10] Cement will remain the key material to satisfy global housing and modern infrastructure needs. As a consequence, the cement industry worldwide is facing growing challenges in conserving material and energy resources, as well as reducing its CO₂ emission. New materials might be able to play a role as cement constitutes in the future.

Yufei Yang, Jingchuan Xue, Qifei Huang [11] To clarify the solidification mechanism of heavy metals in cement clinker during the cement kiln co-processing of hazardous wastes, cement clinker samples were produced. Cd and Ni species formed in the cement system during study. Cd combines mainly with CaO, C₄AF₃ and C₃S⁴ while Ni mainly combines with Mg in the form of a new Ni-Mg compound.

S. Donatello, M. Tyrer, C.R. Cheeseman [12] In this paper possible solutions to the poor moisture resistance of MDF cements are examined critically and alternatives to PVA-CAC described. MDF cement technology has the potential to produce more sustainable materials that can compete with ceramics, plastic and metals in a range of applications and key research issue that need to be addressed if MDF cements are to become commercially viable are highlighted.

III. CONCLUSION

From review of above literature we can conclude the following points:

- Lean manufacturing is not only beneficial to large and medium scale industries but also beneficial to small scale enterprise.
- The company must develop standard operating procedures for all processes involved in production line by improving the existing policy in order to make production process more efficient.
- The quality and refractory used inside the kiln affect the performance of the rotary kiln significantly.
- Understanding of the bonding between the polymer and cement phase will allow new polymer types to be incorporated with increased confidence.

The objective for my PG dissertation is to implement Lean manufacturing to cement industry and improve the productivity of the same.

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