Standardization and optimization of an automotive components production line

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Abstract

Supported by the concepts and definitions of Standard Work methodology, which underpins Lean Thinking philosophy and Kaizen, the study described in this article was developed at a company in the automotive sector, more specifically directed at a production line manufacturing components for air-conditioning systems. The main objectives were to standardize operations, decrease or eliminate the number of activities those are not generating added-value, enhance productivity and associate continuous improvement actions to the processes at hand in order to eliminate waste. After the implementation of a few simple changes - the standardization of operations, adjustments and allocations of workstations – one was able to tailor the production objectives and cycle times to the line’s capacity. The productivity and efficiency of both machines and workers was also increased. Due to the elimination of waste and generation of value, from the customer’s perspective, one was able to raise the OEE (Overall Equipment Effectiveness) general average by 16%, from 70% to 86%.

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1. Introduction

The heightened growth of globalization over the last years has clearly intensified the competitive nature of companies worldwide [1]. In this context, and in order to maintain their position in the market, industries in the
automotive sector have sought alternative measures so as to ensure a position of prominence regarding the competition, and thus gain greater customer share [2]. Within this framework, companies have to consider greater investment in resources as a priority if they wish to enhance competitiveness in such an important business sector [3]. The factors that must be addressed include: greater capacity, innovation in procedures, quality, delivery times and qualified manpower. This set of parameters, as well as a need for rapid delivery of goods to the consumer, tends to influence the requirements of market demand [4]. In this industrial context, it is thus imperative to implement methods whose will boost available capacity, increase the daily production lines productivity, as well as contribute to the greater efficiency of machines and their operators [5]. One of the techniques which are commonly used to address these issues is Standard Work methodology, which forms the basis of the philosophies of Lean Thinking and Kaizen [6, 7]. The study described in this article was undertaken at a company focused on the production of car air-conditioning systems. The main objectives were to standardize operations, increase the number of value-adding activities, enhance productivity and associate continuous improvement actions to the processes involved so that waste can be eliminated. The study consists of five sections. The introduction of the characteristics pertaining to the automotive component sector is defined in section 1. A review of literature, presented in section 2, is related to the description of the concepts inherent to the methodologies of Standard Work, Lean Thinking, Kaizen and OEE. Section 3 deals with the methodology used in the development and application of the study. Section 4 presents the found problems, as well as the proposals for improvements and the results obtained through the implementation of the suggested plans. Finally, section 5 consists of the conclusions and describes how the study contributed favorably to operations at this automotive sector company.

2. Literature review

The expression “Lean Thinking” is described as an extension of the Toyota Production System [8]. This tool associates practices of constant improvement to the process, by eliminating waste from activities whose are considered by the customer to possess no added value [9]. In a more generalized context, the aim of implementing this methodology in the everyday companies’ activities is addressing problems in a quick and efficient manner. However, all the employees should be involved in implementing activities, exchanging information, as well as rapidly identifying problems on the line [10]. In order to support decision-making in the organizations’ production environments, some Lean-Thinking principles were created. These are based on the elimination of waste and on the definition of the “value” concept, as determined by the customer, establishing whose are the most important activities [11]. It is thus possible to organize the system so that it only manufactures what was ordered by the customer, which sidesteps the issue of great quantities of raw material in stock [1]. There is, furthermore, an awareness of the perfection concept, the search for constant improvement in the system, so that the waste that hampers the operation of lines in the productive area must be eliminated [9]. Finally, in addition to these parameters, one can include the importance of standardizing activities; to do so, the worker is required to apply the most suitable method for the execution of the operation at hand [12]. Although this concept is not new, Lean tools have been subjected to profound adaptations in order to meet the real companies’ contexts. As a result, new definitions have emerged to address environmental and ecological responsibilities, which have been included in industrial culture and thus meet the real market, as well as the values those customers consider to be a priority [13]. In this context, and in their search for the achievement of better results, many companies are incorporating Lean tools in their practices as a means to manage processes more suitably [4]. In order to do so, production systems must be evaluated during the process of continuous improvement. This is done through the use of kaizen, a philosophy which implies boosting organizational efficiency and carrying out improvements whose are quick, simple and cost effective [14]. Its purpose is to translate improvement into a benefit by identifying bottlenecks and waste in the system. The most important factors include analyzing the real impact of the change that the applications may cause on the process. These might include issues such as how to motivate workers to implement suggestions, and ways to promote new proposals for the improvement of the environment in context [15]. Another tool in the productive context is the methodology of standard work, which aims to standardize the sequence and execution of activities at each workstation. This ensures that procedures are carried out in the same way, regardless of the employee involved [6]. However, before this can be undertaken, the line must be balanced: operations at each workstation must be distributed to ensure balanced times of availability and smooth productive flow, thus meeting required demand [16].
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