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Dust in lacquer, evidence of deviation of process in production lines for spray painting

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Abstract

This paper concerns work carried with a view to reduce defect occurrence rate in the spray painting lines of MDF (medium density fibre cluster-medium density fibreboard) parts of a multinational mobile manufacturing. The determination of the causes for the excessive rejection values is elusive for the multiplicity of factors and parameters involved and the dispersion of application times, not always sufficiently or properly documented. A process analysis methodology was applied to diagnose possible causes of defect occurrences. Considering that the highest defect rate concerned impurities, data collected over a six months' period was analysed using SPSS to find the correlation between parameters, to find optimal limits of some parameters and evidence of their influence. Kaizen-Lean actions were discussed and implemented conducing to an effective reduction of the existing impurities defect rate, which decreased ninefold related with initial work values.

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Keywords: defects, dust in lacquer, quality, spray line, paint, production.

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1. Introduction

This project was carried out in spray paint lines. In the painting of MDF (Medium Density Fibre Density - Medium Density Fibreboard) parts the rejection values lead to a significant loss of productivity, with impact on internal performance and consequent financial reflection on cost to the final customer.

The lines with the highest occurrence of defects are spray painting lines for the complexity process makes the pieces susceptible to the appearance of imperfections. The determination of the causes for the excessive rejection values is elusive for the multiplicity of factors and parameters involved and the dispersion of application times, not always sufficiently or properly documented.

This project had as main goal the defects rate reduction, particularly in spray painting lines, hence, the main tools of Lean Production have been considered. Thus it will be necessary to determine and deepen the knowledge of the causes of the occurrence of defects in the parts, regarding the spray paint and provide the introduction of corrective actions in the productive process, leading to improved quality and productivity. For this project, emphasis will be given to the study of the most critical spray paint defect by a previous Pareto's analysis, the impurities defect, and all process variables at the root of this defect, showing this as a possible anomaly in the productive process. The remain of this paper is organized as follows: section 2 presents the literature review, section 3 presents the used methodology, section 4 presents the case studied and the methodology applied to do the data collection and its analysis, section 5 presents the case study results. Section 6 presents the main conclusions, limitations and future work.

2. Literature review

Lean Production became widely used in the last two decades of the last century, fostered by globalisation and the increase of competition, that require organizations to seek new production strategies to reduce their costs and increase competitiveness. Production processes innovation will add more value to products/services from the customer's point of view. Considering these factors in the same production system and adding an immediate reduction of detected wastage (defects, transport, among others), a better organizational model capable of responding to the company problems emerges [1]. Lean Thinking seeks to do more with less, i.e. looking to produce, at the right time, the right quantities of the right products, using less equipment, less time, less space, less human and material resources [2]. In short, Lean production can be defined as "doing more with less" [3]. In addition, 5S are a methodology which aims the storage activities systematization, organization and cleanliness of workplaces in order to keep a work environment conducive to the development of industrial activities. Mondan [4] also states that it is a methodology that seeks to change the way of thinking and acting of people involved in the organization. Kaizen is a Japanese word which means continuous improvement – "Kai" means change, and "Zen" means better [5], and it is usually implemented jointly with Lean. Total Productive Maintenance (TPM) emerged at the same time when it became necessary to obtain greater equipment efficiency when just corrective maintenance was done, i.e. maintenance tasks were performed only in case of equipment failure [6]. According to Ohno [7] the machine value is not determined by years of service but by the income power that remains. It is a set of strategies to train and develop all staff members of the organization to take care of the equipment as if it were their personal property. The great goal is to decrease and even eliminate corrective maintenance and encourage the use of the equipment to perform autonomous maintenance operations, ensuring that the production system works efficiently with minimal possible stops [8]. The OEE (Overall Equipment Efficiency) index has been increasingly used in the industry and is a key component in both TPM and Lean Maintenance. Its use allows companies to monitor and improve the efficiency of various production processes. This index is a much more comprehensive performance measurement of production aspects, focusing not only on the equipment availability and performance, but also losses in efficiency that result from rework and non-compliant products. According to [9] the OEE methodology lists three factors of utmost importance: quality, availability and performance. Another important concept is the SMED (Single Minute Exchange of Die), that seeks to reduce the tools exchange times when carrying out a change of production activity to less than ten minutes, i.e. the time between the last part produced in the previous batch and the first part produced in the next lot. This time interval is also called setup time [10].