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Design procedure to develop dashboards aimed at improving the performance of productive equipment and processes

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Abstract

This paper presents a design procedure to develop dashboards to support and improve the performance of productive equipment and processes, to implement at the shop floor level. The procedure can be applied by other industries with the same objective, giving its simplicity and comprehensiveness. The dashboard to be designed allows an interactive performance management involving employees of several hierarchy levels where production activities take place. The procedure was implemented in the context of a pilot company and in general it was successful.

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Keywords: Continuous Improvement, Dashboard, Kaizen, Kobetsu Kaizen; Total Productive Maintenance, Visual Management.

1. Introduction

The technological evolution, the changes in customers and other stakeholders' requirements in economic, political, social and environmental systems challenge industries to keeping up those changes and remain with high levels of quality. A key element that helps organizations embrace these challenges is the adoption of continuous improvement in their daily routines, with the involvement of all employees. Kaizen is globally used by organizations that have as objective a dynamic change for better [1]. It encompasses a number of techniques, tools and methodologies that have been developed over time, for the implementation of continuous improvement, including

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Total Productive Maintenance (TPM). TPM is a maintenance management methodology and its main activities are organized in eight pillars [2]. The pillar of the TPM referred as "improvements in equipment and processes" is often referred as *kobetsu* kaizen and covers all activities that maximize the effectiveness of equipment, processes and organization by eliminating waste and enabling performance improvement [3]. Under this pillar, the Overall Equipment Effectiveness (OEE) indicator is emphasized. Several tools to analyze losses and to track the improvement process, such as the seven basic quality tools also are valued. The sharing of information through visual management, allows everyone to contribute to improvements in the production processes and equipment. To achieve this information sharing in a company, dashboards may be used. This is a visual element that can help to [4]: communicate the current status and progress achieved, address common concerns that everyone can see, use everyone's creativity to solve common concerns, promote teamwork and recognizing the achieved results. Taking into account the current demands of organizations, kaizen, more specifically the TPM methodology and its *kobetsu* kaizen pillar, as well as visual management, in particular dashboards, is a good contribution to the increment of performance in production processes and equipment.

This paper presents a procedure to develop dashboards aimed at improving the performance of productive equipment and processes, to be implemented at the shop floor level. The procedure is an adaptation of the traditional product development process and can be applied by other industries with the same objective, giving its simplicity and comprehensiveness. It is intended that the designed dashboard allows an interactive performance management that promotes the involvement of employees in performance of productive equipment and processes. To this end, the dashboard to be designed and associated activities involves several methodologies and tools for continuous improvement, particularly, Kaizen, TPM and Visual Management. The paper is structured as follows: in section 2 a brief review of the literature is presented; section 3 presents the design procedure; section 4 presents the procedure application in a pilot company. Finally, in section 5 the conclusions and suggestions for future work are presented.

2. Literature Review

2.1. Methodologies and tools for continuous improvement

The importance and evolution of continuous improvement is reflected in the existence of several approaches, including kaizen. Overall, this approach is based on "involving everyone, everywhere, to make changes for the better, every day" [1]. *Gemba* is a Japanese term that in the industrial sector means the place where the products are manufactured [1]. The improvement movement should come from both, management to *Gemba* and from *Gemba* to management, since there are numerous opportunities to make the company successful [5]. Miller et al. [6] identify three main types of kaizen, depending on the cycle of activity and its purpose: kaizen project; kaizen support and daily kaizen. The kaizen project encompasses the activities of temporary teams working on kaizen events, introduction of new products, among other projects. Its main purpose is to achieve rapid performance improvement and financial results. The kaizen support includes strategy development, planning, training and recognition, and such management activities that are necessary to guide the success of kaizen. Its purpose is to lead collaborators to achieve the results through the daily kaizen. The daily kaizen includes small cycle of activities improvement, including suggestions, teams based on frontline problem solving and maintenance of standards [6]. One of the main methodologies to obtain a successful kaizen strategy is TPM [7]. Nakajima [2] defines TPM as "an innovative approach to maintenance that optimizes equipment effectiveness, eliminates malfunctions, and promotes autonomous maintenance by operators through day-to-day activities involving the total workforce". The *kobetsu* kaizen pillar, aims to eliminate all types of losses, and their identification and quantification are relevant factors [3]. Ahuja and Khamba [8] identify several activities associated with this pillar, such as: identification and elimination of losses related to equipment, labor and raw material; calculate and set targets for the OEE and promote its improvement; work the structure of loss and mitigation of losses. Nakajima [2] refers to OEE as "a bottom-up approach where an integrated workforce strives to achieve overall equipment effectiveness by eliminating" six large losses." Although there are variations in the OEE calculation, there are three factors that compose it [5]: availability, performance and quality. According to Suzaki [4] several tools can support problem solving. These range from common sense and creativity, to the seven basic tools identified by Ishikawa [9, 10]. In the various methodologies and tools associated with continuous improvement, the existence of small groups of improvement activities at the