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Lean Manufacturing: Improvement Actions to Increase Performance in a Textile Manufacturing Company Based in Guaymas, Sonora

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Abstract: ***Small and medium enterprises (SME's) represent 97% of the totality of enterprises in Mexico; nevertheless, they are the organizations with the most problems nowadays, due to the fact that they do not have the necessary support. There are several challenges faced by Mexican SME's, mainly because they usually lack efficient planning, organization and administrative systems, and their own technologies to manage and develop productive activities. Based on the aforementioned, and with previous authorization from a sports uniforms textile manufacturing company, an intervention to their workspace was undertaken with the conviction of implementing better practices in the manufacturing process. Throughout the study, information regarding product specifications and their manufacturing processes was collected in order to create a current and future value stream mapping, where time cycles and value indicators were identified for each of the activities. Afterwards, wastes were identified in order to implement line balancing, continuous flow, and 5S, all in relation to a kaizen event. Thus, it was possible to achieve elimination of wastes, continuous flow, and provide stability to stakeholders.***

Keywords: manufacturing, wastes, kaizen, stability

1. Introduction

Hernández, 2010, has stated that small and medium enterprises (SME's) are the most elocuent enterprise network characterization in any developed or undeveloped country. These are commonly conceived in different ways, but in the end most authors agree that it is a live organism; and independently of its size, it integrates all the aspects of a traditional enterprise. According to INEGI data, there are nearly 2 million 844 thousand enterprise units, of which SME's comprise 97%; in addition, they represent 79% of employement sources, generating income equal to 23% of the Gross Domestic Product (GDP).

In the state of Sonora, out of 10 enterprises, only 2 survive; 43% of failure causes are due to administrative problems, lack of knowledge regarding information systems, and/or lack of infrastructure. In addition to the above, and according to Kauffman (2004), they usually lack efficient planning, organization, administration and control systems, as well as their own technologies to create and develop productive activities.

According to Echegaray (2012.), there are several challenges encountered by SME's, among which are challenges and unmet needs that become latent support opportunities to foster competitive development for them. Continuous improvement calls for constant improvement (Jiménez, 2011) and seeks the creation of an organized system to achieve continuous change in all enterprise activities that lead to an increase in their total quality (Lefcovich, 2004). The secret to success relies on the flexibility and creativity of change processes (Spear, 2000), the description of a way to eliminate the generated waste (Womack, 2007), and the conceptualization of the productive process, from its raw material or purchase order, to the final product to satisfy the end customer (Villaseñor, 2007). Within this context, it is essential to implement actions that allow continuous improvement in organization processes. Such is the case of a textile manufacturing company that produces sports uniforms, and is based in Guaymas, Sonora, of which intervention results will be shown.

2. Method

The following are the steps to follow in the study:

- Identify waste in the process: the sequence that follows the process of making uniforms was observed, the requirements were listed and the waste was quantified.
- Prepare a map of the future state of the process under study: Here is a flow chart with the process which includes aspects of indicators, processing time, lead time and the actions to be taken to achieve the values indicated therein.
- Implement improvement actions (Kaizen): This is where the actions corresponding to the capacity analysis, the redistribution of the area through manufacturing cells, the establishment of continuous flow and others to combat waste in the process are disclosed.

3. Results

The process encompasses three areas: fabric cutting, production and packaging. It starts off by cutting the fabric; sleeves are then sewn onto the T-shirts; pockets are made and attached; elastic bands are placed onto the fabric and embroidered. Letters and numbers are simultaneously designed and cut out. Once the T-shirt is ready, both letters and numbers are ironed onto the fabric, and it is sent to finished product final inspection.

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Product specifications are established by the client and include: fabric convergence with the correct tension, aligning zippers, elastic straps, strips on the sides, patches on the knees, reinforcement on edges, well-fastened buttons, and seams made of 5 or 6 stitches per inch and without prolonged bar tacking. For its delivery, each sports uniform is placed in a transparent bag with an identification tag for traceability.

The most significant identified wastes were: 225-meter trips within the plant (transportation), 36 obsolete raw material rolls (inventory), extra seams (process), 15-minute delays due to material coming from warehouse (waiting time), 2 to 6 pieces with defects (quality), and multiple unnecessary movements. In addition, a 4.4-day lead time and 67.2-minutes processing were detected.

Upon clarity on the current indicators and wastes, a future state map of the process under study was created, in which – besides providing a mapping of the process—the actions to be executed in order to reach the established objectives were depicted (see figure1).

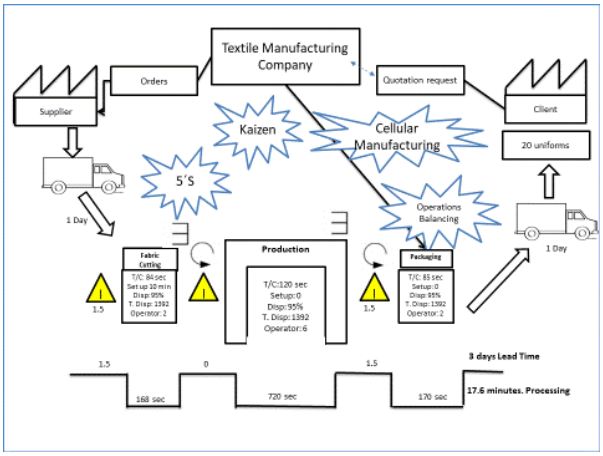
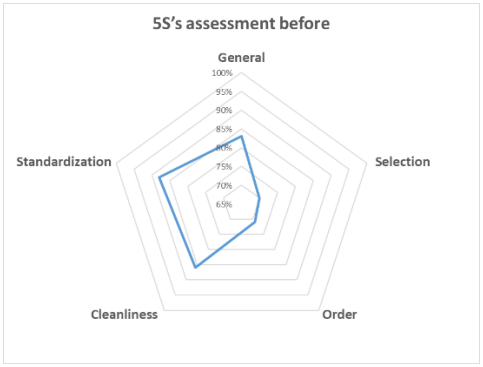


Figure 1: Textile manufacturing process future value stream mapping.

The figure shows the actions to be carried out in order to eliminate waste found in each stage of the process; it also projects a value goal for the lead time, which is 3 days and a processing time of 17.6 minutes. Among the implemented tools are:

Line Balancing. In the work area, there are 9 operators: 3 develop the t-shirt logo, 5 are at their sewing machines to embroider the garments, and 1 designs the uniform. The proposal suggests that the working positions be rearranged in such a way that they are not separated, allowing for the garment to be passed among the operators by only moving their hands (and not moving away from their working area).
Cellular Manufacturing. The machines were grouped under the criteria of adding value to the product, sequencing operations, and avoiding material transportation trips, resulting in the elimination of inventories in processes. The new manufacturing cell proved to be very effective both in time improvement and in diminishing transportation time, and in some cases, reducing work distractors. The cycle time was reduced to a 13-minute sports uniform production time which led to an increase in productivity.

5's. The use of this tool intends to provide work stability by maintaining order, cleanliness, and fostering work safety. As a part of it, a program assessment was developed before and after its implementation (see figure 2).



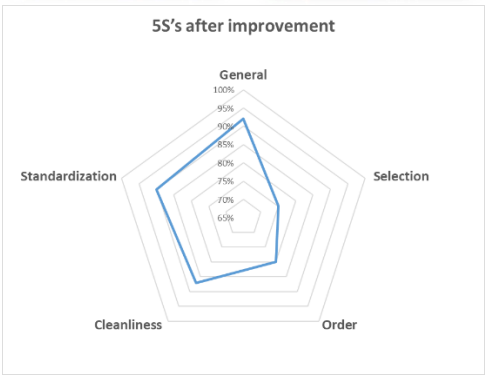


Table 1: Improvement actions using the 5s philosophy

Manufacturing Cells.
In addition to applying the abovementioned philosophy, a change in work stations took place in such a way that the production area lay out was set in a "U" form to create a continuous flow with no interruptions, avoiding waste of time in transportation, reducing down time, and achieving a much more stable average time per uniform.

4. Conclusions

The use of lean manufacturing tools allows the elimination of waste in any productive process. By adding collaborative work strategies among all stakeholders in the process, results are immediately favorable, as was the case of the textile

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manufacturing company, where a greater sense of teamwork was observed, and which resulted in a more efficient and consistent operation. Resistance to change in some organizations avoid the implementation of manufacturing practices such as the ones pointed out here, leading to stagnation, waste of energy, losses, and consequently, non-compliance of indicators. Thus, it is important that small and medium enterprises adopt the Lean philosophy for their own economic benefit and that of their personnel.

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