5S Method Implementation in Power Department ´s Warehouse of the Tren Urbano of Puerto Rico

Author: Ismael González Madera, PE, Master of Engineering Management Program

Advisor: Prof. Héctor J. Cruzado, PhD, PE, School of Management and Entrepreneurship

Abstract

The Tren Urbano of Puerto Rico has a lot of material, equipment and tools to make the maintenance works. Many of them are electrical and there is a Power Department to make them. This department has been having problems to maintain the warehouse organized due the high volume of materials, their continuous use, and little space. To have an effective organization in the warehouse, the 5S method was implemented with five phases: sort, set in order, shine, standardize, and sustain. In the first phase, the unnecessary materials, equipment, and tools were removed from the warehouse. During the second phase, the items that remained in the warehouse were arranged by use frequency and in a logical manner; and then were cleaned in the third phase. In the fourth, the first three phases were upheld with a checklist. In the last phase, training was continuously provided to maintain the habit. The organized warehouse improved time to find the materials, equipment, and tools; as well as avoid losing them. Also, no accidents and better results were obtained in electrical testing.

Introduction

The primary source for the operation of Tren Urbano of Puerto Rico is the electricity. This train requires efficient electrical system to maintain service and especially the safety of all users. Thus, maintenance is very important and complex. Tren Urbano has a lot of electrical material inventory, equipment, and tools in the warehouse of the Power Department to maintain the electrical system of the train in optimum operation. Using the 5S method, the company can organize the warehouse to make it a safer place by avoiding accidents and increasing the productivity. A 5S is a method that can perform a cleanup activity at the workplace to eliminate or reduce all the unnecessary inventory, equipment, and tools, and provide the space needed for electrical testing.

Using the method 5S, this project aims at the following:

- Reduce accidents to zero.
- Eliminate the unnecessary inventory, equipment, and tools.
- Improve time to find materials, equipment, and tools.
- Avoid losses of materials, equipment, and tools.
- Obtain better results in electrical testing.

Background

5S is a methodology for eliminating waste. It is a visually-oriented system of cleanliness and organization, an arrangement designed to facilitate greater productivity, safety and quality. It is a foundation for more responsible and disciplined behavior on the job. The central objective is to create a cleaner and safer work environment that promotes quality and efficiency. It will create habits for cleanliness and organization, making work more standardized and reducing errors. 5S is not a onetime event; it is a discipline [1].

The 5S Method is divided in the following five areas: Sort, Set in Order, Shine, Standardize and Sustain.

- Sort – The first 5-S tactic involves sorting through materials in the work area and removing items that are not necessary to perform the work [2]. The items that are removed are identified with a Red Tag (Picture 1). The Red-Tag strategy is a simple method for identifying unneeded items, evaluate their usefulness, and deal with them appropriately. The red tags include information regarding the item to be stored and keep a record.
- Set in Order – The articles that remain after completing the first phase need to be arranged in a logical and accessible manner. For the serious adherents to the 5S principles, this process starts with a floor plan. After removing the nonessentials from the lab area, many practitioners find they no longer need many of the racks and cabinets that were used to store these items [3]. Needed items are arranged so that they are easy to use and labeled so that they are easy to find and put away.
- Shine – The focus of this 5-S tactic is to improve the condition and appearance of the work space and inspect all items [2]. Maintain all this items in top condition so that when someone needs to use something, it is ready to be used.
- Standardize – The first three steps are corrective in nature, while the last two are preventive [3]. This step is not an activity, is the method you use to maintain the first 3S. The purpose is to prevent setbacks in the first 3S, to make them a daily habit, and to maintain them fully implemented.
- Sustain – Sustaining isn't just the last step of 5S. It's the true goal of continuous improvement, in which efficiency, integrity and diligence are integral to the people who are part of your team [3].

Picture 1. Red Tag

5S method is a systematic way to be inefficient, not work as a team and ensure you won ´t change your habits [4]. It is a system of creating and sustaining an organized workplace for the purpose of improving deficiency, productivity and employee morale [3].

The history of 5S goes back as far as the 16th Century and Venice shipbuilders. In an effort to streamline the assembly process, workers used quality process production to build ships in hours instead of days or weeks. From there, the 5S methodology was developed or what they called the Total Production System (TPS) after World War II by a Toyota engineer.

Problem

An unorganized storeroom full of unused items causes many problems and accidents. It is difficult to work in an area that does not have enough space for the equipment, and tools are not organized. When the employees were going to use the tools, they needed to start looking on several tool bags, wasting valuable time. Many tools had been lost due to the lack keeping inventory and order. To utilize specific equipment, many others had to be moved because they did not have space due to the large quantity of unnecessary equipment in the area. The results of this disorganization affected the maintenance schedule. Much maintenance was delayed, inefficient and the results of the electrical tests were deficient.

Analysis Approach

The warehouse has a heavy flow of personnel entering, exiting, looking for materials, leaving materials, and so on; making it difficult to keep it organized. Due to the complexity of maintaining the train, many tools and equipments are required. Picture 2 shows the disorganization in which the tools were kept. Picture 3 shows the discomfort of seeking any materials or equipments, which require adequate space for testing.

Picture 2. Tools Organized in Warehouse

Picture 3. Tools Organized in Warehouse

Methodology

Due to the need for an organized warehouse, the 5S method was implemented as follows:

- Sort – Remove all electrical inventories, equipments and tools from the warehouse that are not needed for maintenance of the electrical system. Use Red-Tag strategy which is a simple method for identifying unneeded items, evaluate their usefulness, and deal with them appropriately.
- Set in Order – Arrange needed electrical inventory, equipments and tools so that they are easy to use, and labeling them so that they are easy to find and put away. Decide the best location in the warehouse for each electrical inventory, equipment and tools according to their frequency of use, and store together equipment and tools that are used together.
- Shine – Clean and inspect all the equipments and tools to keep everything in top condition so that when someone needs to use something, it is ready to be used. Incorporate weekly systematic inspection procedures to the shine procedures.
- Standardize – Make a checklist where everyone must know their responsibilities and when, where, and how to do it. Integrate the first 3S duties into regular work duties.
- Sustain – Provide resources and continuous training to all employees making a habit of maintaining established procedures.

Results and Discussion

The project duration was 7 weeks. The first two phases were more durable, lasting two weeks with a total of 58% of the project time. The other three phases weeklong each, which account for 14% each.

The Table 1 shows when it began and when it ended each phase of the Project, as well as whether there was a problem with any of them. In the third phase, Shine, there were problems with the cleaning products which did not meet safety specifications of the company. These products were replaced by others that complied. In the other four phases there were no problems.

Table 1. Timeline & Comments

Description	Start	Finish	Comments
Sort	09/02/13	09/15/13	No problems
Set in Order	09/16/13	09/29/13	No problems
Shine	09/30/13	10/06/13	Problems with the cleanings products.
Standardize	10/07/13	10/13/13	No problems
Sustain	10/14/13	10/20/13	No problems

Picture 4 shows how the tools were organized in the shelving drawers. Currently they can be easily found and is easy to identify if there is any missing. Picture 5 shows the organization of the materials by usage frequency. Picture 6 shows how the specialized equipment was organized by providing sufficient space to be rapidly found and utilized.

Picture 4. Tools Organized in Warehouse

Picture 5. Materials Organized in Warehouse

Picture 6. Equipments Organized in Warehouse

Conclusions

While performing the method 5S, all unnecessary inventory, equipment and tools were removed from the storage providing more space and excellent organization. With an organized warehouse, the loss of materials, equipment, and tools were reduced. In addition, the time to find any item was improved. The maintenance to the substations is effective, given that electric tests conducted by external companies are reflecting excellent results. However, the most important accomplishment is that there has not been any accident.

In the future, the five phases of the method 5S will be performed three times a year. Periodically trainings will be offered to employees with some kind of recognition program to maintain employee motivation and make them feel proud of the achievements obtained.

References

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