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Design of a 10-digit inventory codification system for a tube and pipe manufacturing company in Zimbabwe

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Abstract

Lack of proper inventory control usually leads to high stock-outs resulting in 'firefighting'. This paper looks at the engineering and technical services required to maintain smooth production with the aim of developing an inventory control system for the efficient utilization of resources. A work study was carried out at a tube and pipe manufacturing company in Zimbabwe followed by an analysis outlining the operations, limitations and process flows. An inventory audit provided some insights on the company's inventory control status. A 10-digit inventory codification system was designed based on 7 rules for generic application and capability for 'make or buy' decisions on spare parts. A cost benefit analysis revealed that although the project would initially be costly, a reduction in inventory can be realized through removal of slow moving and obsolete stock, realizing some annual savings in the long run, coupled with an improvement in record keeping and accountability.

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1. Introduction

With the rapid changes in technology globally, the importance of inventory control and management systems is steadily increasing with the resultant effect filtering through to small scale manufacturing companies [1]. Although the scope for inventory control has been limited to production, there has been a paradigm shift for using it in engineering management and technical services that support production. The engineering and technical services function is normally taken as a business unit whose thrust is to provide services to the production department. The ultimate objective of engineering control and management function is for the company to realize good profits through the maintenance and design of plant equipment at low cost. The control and management of inventory is critical to the smooth functioning of the plant [2]. Generally, companies with no proper systems in place for controlling inventory, risk a number of problems such as high capital investments for inventory, losses due to inventory deterioration, stock-outs resulting in crisis management, difficulties in tracking inventories and high maintenance costs which may ultimately affect their output [3]. The case study company manufactures steel tubes and pipes of various sizes as well as other related steel products using different methods and techniques depending on the required sizes and profiles. Various machine tools such as presses, welders and extruders are used to produce the steel tubes and pipes and these machines are maintained by the engineering and technical services department of the company. It was within this context that the engineering and technical services department occasionally have to order spares and parts for the machine tools to ensure continuous and smooth production. Quite a significant stock of the inventory at the company was in finished goods, an indication that it was not exactly what the customer wanted and cannot be changed to meet customer demands, hence the need for inventory profiling.

At the onset of the research, a work study of the tube and pipe manufacturing plant was carried out based in the plant but with frequent visits to the technical and engineering services to establish the relationship and how inventory was being managed and controlled in the provision of services to production. There was no material or spare parts planning before maintenance was carried out resulting in stock-outs. This was usually evident when the company was on planned shutdown maintenance. The machine history cards did not explain exactly where the part repaired or replaced was located and it was thus difficult to extrapolate data, let alone synthesize it. It was also difficult to analyse the behavior of the machines over long periods of time. There was evidently no proper description of the machines in terms of their serial numbers, manufacturer and other accessories. Changes done on machinery and equipment were also not recorded. The work study was followed by an analysis of the information and how the lack of proper inventory control resulted in problems similar to the ones highlighted above. It therefore became imperative to look further and assist the company to address the risks and costs involved in the absence of such an effective system and institute a proper management and control system that to manage inventories and define formal links between the inventory decisions and the company's strategic goals. In view of these challenges, the aim of the research was to develop an inventory control and management system for the engineering management and technical services function that would ensure the effective and efficient utilization and resource allocation of the inventory.

2. Background to inventory control

2.1. Introduction

Inventory is the core consideration of modern operation innovations and thus central to the operations of a business in that it comprises the stocks and goods for use in the operations [4], i.e. to support production (raw materials, work in process and machine spares), to support repair and maintenance or simply as finished goods or products for sale [5, 6]. In this paper, focus was mainly on those items that were required to support activities offered by the engineering and technical services department for repair, replenishment and maintenance of production machinery in the manufacture of the tubes and pipes or related products. Managing these spares is a science that involves maintaining a database of stocked goods for use in the various sections of the production plant or supply chain occurring before the scheduled production of the various sizes and shapes of the tubes and pipes. These have to be regularly checked and monitored and in the process the inventory must be controlled to ensure that the company does not hold unnecessary stocks or delay in procuring required stocks. Inventory control is thus often employed in logistics and supply chain management and the associated techniques and systems necessary for managing the inventory [7].