THE USE OF THE CONCEPT OF VENDOR MANAGEMENT INVENTORY IN MANAGEMENT OF SPARE PARTS STOCK

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Due to the characteristics of spare parts inventory, which distinguish it from regular stock, its management is, most of all, costly. On the one hand, the need to keep the production continuity causes the storage of a lot of components generating high costs of their maintenance. On the other hand, the lack of spare parts can generate high costs of machine downtime. These issues determine the aim of paper, which is the theoretical and practical analysis and evaluation of the possibility of spare parts inventory management based on the concept of Vendor Management Inventory, simultaneously using the basic assumptions of its implementation.

Keywords: Vendor Management Inventory, Inventory, Spare parts, ABC analysis.

Introduction

Logistics chain management is associated with the process of collecting various types of inventories of goods. The modern concept of logistics chain management, among others, aims at the cooperation of elements to reduce inventories in the whole chain, where the planning of stocks takes place on the basis of sharing all the information resulting from the observation of the processes of flow [1].

In the development of the production process, a particular role is played by the planning of inventories of materials and raw materials [8], without which it is not possible to develop production processes. An efficiently run supply material warehouse allows for a reduction in costs of storage and purchase of materials, simultaneously satisfying the emerging needs of production. The accurately established structure of supply inventories should be determined on the basis of the planned production orders, however, the more developed planning techniques the less the probability of stocks “piling up”. To maintain the rhythm of production, the enterprise collects inventories of materials among which there are also spare parts for machinery and equipment [7,10]. The main need for their storage results from the willingness to reduce machine downtime and the associated high costs of downtime.

The Concept of VMI in Supply Management

Many companies still face the challenge of storing large stocks in the warehouse, generating excessive costs of maintenance and obsolescence of stocks [9]. An effective analysis of the demand may be an important tool to assess the impact of decisions related to spare parts inventories [2]. In a situation when the enterprise:
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- does not dispose of appropriate tools for the planning of inventories of materials and raw materials,
- prefers to focus on other areas of its activity,
- aims at a reduction in costs associated with storage of inventories,
- has a limited storage space,

it may take the initiative of transferring procurement processes to external companies.

A helpful solution to reduce the costs of inventory and inventory management is the concept of Vendor Management Inventory (VMI). It consists in “transferring responsibility for the operational inventory management to the supplier, in accordance with the arrangements, adopted by both parties (the recipient and the supplier), regulating the obligations of both parties” [3].

In the approach of VMI, the supplier, on the basis of the information on the demand of the client, is the one who decides on when and in what amount the materials will be supplied to the recipient, while simultaneously providing the availability of resources [12]. Transferring the necessary data usually takes place electronically or via EDI, by means of which the supplier obtains the necessary data concerning the size of the planned production, sales forecasts or required materials and raw materials. Therefore, the size and type of the order does not result from the initiative of the company but the supplier [4]. Ultimately, this allows for proper management of the manufacturer’s inventory in a way enabling each party to satisfy their own interests and needs.

The concept of VMI is not suitable to use for each type of inventory, therefore, before the company makes a decision to use the services of the service provider in the field of inventory management [11], above all, it should analyze the structure of inventories, in this case, spare parts. This will allow to divide stocks into specific groups and identify only those which, from the point of view of the manufacturer, should be more preferably placed under the supplier’s protection. The appropriate allocation of resources is important since its consequences are apparent both in the financial situation of the supplier and the client and in relation to regulating mutual needs. On account of the characteristics which distinguish spare parts inventory from other inventories, the principles of the use of VMI may slightly differ from its traditional form.

The ABC Analysis

In the using of concept VMI it can help one of the most common and simplest tools to specify the structure of inventory is the ABC analysis, which divides resources into three groups: A, B and C according to the selected criteria. Generally, these criteria are the value of generated revenues, rotation or degree of wear and tear [5]. In case of spare parts of technological equipment, these criteria will be determined by slightly different conditions and requirements. For the purposes of the analysis of spare parts inventory which can be stored with the supplier, it is necessary to consider, most of all, the frequency of pickups of spare parts, their value and type. Below, there is presented the assessment of the structure of spare parts inventory on the basis of the practical case of a large company from the automotive industry regarding VMI.

Case Study

The analyzed warehouse consists of a few thousands of items which, for the purposes of the ABC analysis, have been divided by the areas:

- automation,
- hydraulics,
- electrical engineering,
- electronics,
- mechanics,
pneumatics,
* others.

The aim of the study is to indicate the area of spare parts which are mostly restored during the annual period and generate the highest costs of maintenance. The obtained results may constitute the starting point for identification of the group of spare parts which can be managed by the supplier. The values of individual criteria are included in Table 1.

<table>
<thead>
<tr>
<th>Stock groups</th>
<th>Number of items</th>
<th>Cost of maintenance (PLN)</th>
<th>Frequency of pickups (times a year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation</td>
<td>875</td>
<td>385237.89</td>
<td>0.220</td>
</tr>
<tr>
<td>Electronics</td>
<td>2633</td>
<td>50907.99</td>
<td>0.029</td>
</tr>
<tr>
<td>Electrical engineering</td>
<td>7484</td>
<td>224540.60</td>
<td>0.128</td>
</tr>
<tr>
<td>Hydraulics</td>
<td>12254</td>
<td>341286.24</td>
<td>0.195</td>
</tr>
<tr>
<td>Mechanics</td>
<td>27517</td>
<td>901586.45</td>
<td>0.514</td>
</tr>
<tr>
<td>Pneumatics</td>
<td>846</td>
<td>131476.09</td>
<td>0.075</td>
</tr>
<tr>
<td>Others</td>
<td>9097</td>
<td>234387.18</td>
<td>0.134</td>
</tr>
</tbody>
</table>

*Source: Author’s own study*

For each criterion there has been conducted subsequently the one-criterion ABC analysis, the results of which are presented in Table 2.

<table>
<thead>
<tr>
<th>Stock groups in alphabetical order</th>
<th>Division by costs of pickups</th>
<th>Division by frequency of pickups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation</td>
<td>Mechanics A</td>
<td>Mechanics A</td>
</tr>
<tr>
<td>Electronics</td>
<td>Automation A</td>
<td>Automation A</td>
</tr>
<tr>
<td>Electrical engineering</td>
<td>Hydraulics A</td>
<td>Hydraulics A</td>
</tr>
<tr>
<td>Hydraulics</td>
<td>Others B</td>
<td>Others B</td>
</tr>
<tr>
<td>Mechanics</td>
<td>Electrical engineering B</td>
<td>Electrical engineering B</td>
</tr>
<tr>
<td>Pneumatics</td>
<td>Pneumatics C</td>
<td>Pneumatics C</td>
</tr>
<tr>
<td>Others</td>
<td>Electronics C</td>
<td>Electronics C</td>
</tr>
</tbody>
</table>

*Source: Author’s own study*

The results of the one-criterion ABC analysis indicated that, at the same time, for the areas of mechanics, automation and hydraulics, both the costs and frequency of pickups were the highest. These spare parts constitute the A group which, in total, amounts to about 40% of the stock and generates about 80% of costs and frequency of all pickups. They are mostly restored and simultaneously they do not
freeze funds for too long. This is also confirmed by the utility function calculated for the tested criteria. This function allows to sum up the values of the individual criteria for specific stock groups and take decisions on the most favorable group of goods. The results are presented in Figure 1.

![Utility function for specific stock groups](image)

**Figure 1.** The utility function for specific stock groups  
*Source: Author’s own study*

The obtained results confirm the accuracy of stock groups which are characterized by both the highest frequency and costs of pickups. On the basis of the conducted analyses, it is observed that the concept of VMI can be used only in the case of the group of spare parts labelled as A (including hydraulic, automatic and mechanical parts) of systematic wear, for which the future demand can be determined easily. At the same time, due to high costs of their purchase, it is worth storing them at the warehouse of the supplier, thereby reducing costs of inventory maintenance in the own warehouse.

**The Course and Consequences of the Implementation of VMI**

In addition to indicating the group of spare parts that can be given to be managed by the supplier, an essential stage is the process of selecting the supplier itself, which, in the case of spare parts inventory, is mostly conditioned by the ability to adapt to fluctuations in demand and an efficient flow of information on the planned repairs and renovations. Moreover, to make sure whether the concept of VMI can be implemented in a specific case, the following issues need to be taken into consideration:

- identifying all key suppliers, with whom the relationship is essential for both parties,
- considering, together with the selected suppliers, the opportunities for cooperation based on the principle of VMI; specifying technical and organizational possibilities of implementation, possible constraints, formal and informal requirements of the mutual relationship, conditions of the contract and procedures of conduct in case of overstock,
- initial identifying the supplier, as a possible candidate for cooperation on the principle of VMI; analyzing their motivation, potential and external factors concerning, among others, the location.
- implementing the principle of VMI in accordance with the pace of the enterprise development.

Ultimately, the decision on the implementation of VMI allows to reduce the level of spare parts inventory and generate savings resulting from the capital frozen in stocks. On the other hand, the cooperation between the supplier and the recipient, established in the framework of the concept, allows for continuous restocking, depending on the needs - just-in-time. The benefits from the application of
VMI may be generated for as long as the ratio of the costs of the supplier’s order for the buyer and the ratio of transferring costs of the supplier to the buyer is possible and profitable [6].

Conclusions

In the industrial activity, an important role in maintaining the continuity of production is played by effective planning of stocks of materials and raw materials, among which an important position is occupied by spare parts for production equipment. The efficiently managed warehouse of supply materials allows for a reduction in costs of storage and purchase of materials, thereby satisfying the occurring needs of the producer. One of the ways to provide the continuity of work of machinery and equipment, simultaneously enabling reduction in costs associated with the maintenance of spare parts inventory, is the use of the concept of supply management by the supplier (VMI). The application of the concept of VMI usually refers to the elements in the supply chain between which there is constant cooperation, the level of sales is rather high and regular and the conditions of contracts are negotiated. Spare parts, due to a different nature with regard to other materials, reduce the application of this concept.

The analyzed practical case allows for the observation that, in spite of the fact that spare parts inventory management constitutes a serious challenge in the relationship using VMI, it is still possible. The appropriate determination of the inventory structure, i.e. using a simple ABC analysis, allows for the division of stocks by the identified criteria so as to specify the proper direction of conduct in relation to the maintenance of stocks in combination with the decision on the transfer of inventory management to the supplier.

References