

Inventory analysis and efficiency improvements at ThyssenKrupp Marine Systems (TKMS) in Karlskrona.

About the company

Ever since King Charles XI founded Karlskrona in 1679, there has been a shipyard in the same area as it is located today. The shipyard was earlier known as Kockums but since 2005, it is a part of the German ThyssenKrupp Group and is since then called ThyssenKrupp Marine Systems AB, abbreviated TKMS. TKMS is a part of the section Industrial Solutions together with the German shipyards Howaldtswerke-Deutsche Werft AG and Blohm + Voss Naval. TKMS stands for world class marine high technology and their vision is to provide the world with marine solutions for coastal waters. In Sweden, the company has approximately 750 employees at three locations; Malmö, Muskö and Karlskrona.

Background

The warehouse in Karlskrona has for some time struggled with a declining inventory turnover rate and an increasing capital tied up. Currently, the turnover rate is about one (1) time per year and the capital tied up approximately 17 million Swedish krona for the material that is referred to stock materials. This material mainly consists of consumables and supplies that are used in daily operations. This thesis only takes the stock material into consideration.

Identified problem areas

To some extent, the problems depend on a lower utilization rate at the company, but there are also problems in the warehouse and inventory management. For example, there is no systematic approach to how and when materials shall be purchased and the company also treats all articles the same way, independent of how much capital they tie up. Mentioned aspects lead to an inefficient and a very costly inventory control. Another problem is the material planning system MARS that has been used at TKMS since 1997. There are bugs in MARS causing the purchasing process to be much more difficult and time consuming than necessary since the purchaser cannot be sure that the proposed purchasing quantities is correct. Another problem is the high expectations other employees have on the warehouse, many people expect that all necessary material always should be available. This creates unnecessary pressure on the warehouse staff since it is not economically feasible to live up to the expectations that mostly depend on ignorance and lack of understanding.

Purpose

The purpose of this thesis is to do a baseline analysis in TKMS warehouse in Karlskrona to evaluate the potential to increase inventory turnover rate to more than four times per year. This means that the capital tied up should be reduced from the current 17 million Swedish krona to about four million. There are also two secondary purposes where the first one is to propose new Key Performance Indicators, KPI:s if the current ones, *Turnover* and *Capital tied up* turns out to be stale. The second one is to investigate other companies' inventory turnover rate and benchmark it with TKMS to get an understanding of what a good value is in this type of business.

Solution

One part of the solution is an ABC-analysis based on three parameters; annual dollar volume, withdrawal rate and procurement lead time, which were the aspects considered to be of greatest importance for the company. From the annual dollar volume analysis, it turned out that of the 4 584 articles designated as stock material, only 2 919 had a consumption greater than zero during the selected control period, 2013-02 to 2014-01.

In the analysis of withdrawal rate and procurement lead time, the data collection had to be done manually since the department that had access to this information was overloaded with work at the time. Data was collected for approximately ten percent (459 articles) of the total number of items. 153 articles were therefore retrieved from each of the three classifications A, B and C in the annual dollar volume analysis and thus constituted as the base for the remaining two analyzes. Based on the analysis, the breakpoints for respectively class was identified and were then combined in two 3 x 3 matrices together with the annual dollar volume on both y-axis and withdrawal rate and procurement lead time on each x-axis. One critical and one not critical article were chosen from each field together with two additional items that were considered to be of especial interest. In total, there were 38 articles that should be analyzed deeper. The specifications of what characterizes a critical article were specified before the analysis together with an employee with extensive insight in the warehouse and the articles. The articles were also chosen based on their representativeness for as many of the remaining articles as possible.

Result and analysis

The results showed that only just over twelve percent of the articles represented 80% of the total annual dollar volume. From the ABC-analysis regarding procurement lead time, it appeared that a large amount of the articles, 43 %, had a short lead time of between zero to seven days. Regarding withdrawal rate, it was decided that articles with lowest rate would require the strictest control. For that reason, the diagram got a different look and it could be seen that a large number of articles had a low withdrawal rate. The analysis showed that about 64 % of the 459 articles had a withdrawal rate between one time per year up to one time per month.

A decision tree was constructed to specify which inventory control to be used for the different combinations of annual dollar volume, withdrawal rate, procurement lead time and criticality. The decision tree is supposed to be used in the continued work with classifying articles and the ordering strategies used are Order by Wilson, Fixed Order Quantity and the purely intuitive method Lot-for-Lot. Lot-for-Lot means that the article should not be kept in stock but only purchased when necessary. By comparing the current inventory control with the one proposed in the decision tree for the 38 articles the results were obtained. The parameters compared were inventory turnover rate, capital tied up and also the total cost where the cost per order was included. Since the cost per order is 1 500 Swedish krona, it had a big impact on the total cost if the item was purchased many times during the control period.

The results showed that theoretically, it is possible for the company to reduce the capital tied up in inventory with about 35 %, increase inventory turnover with more than 53 % as well as reducing the total costs by approximately 47 %. For several of the analyzed 38

articles, the theoretical capital tied up increased compared with the current since the articles required an increased safety stock to reach the determined service levels. However, the total cost decreased for the same articles due to a lower number of purchases with the proposed inventory control.

Benchmark

The benchmarking with companies in same or similar industry proved to be more difficult than expected. TKMS is relatively unique in their field of operations in Sweden and there are only a few industries that would be comparable. The searches conducted work abroad, and gave result for some Indian shipyards. Based on the results from the analysis along with the benchmarking, it cannot be considered a realistic goal in the current situation to reach a stock turnover of more than four times per year. The Indian shipyards all had a turnover rate of about one time per year, which therefore indicated that a higher turnover rate is not common in this type of industry.

Recommendations

The recommendations to the company are to apply a differentiated inventory control that is more suited to the different types of articles that are in stock. This work can be done based on the decision tree and the company is recommended to further develop this to be even more suited to the needs at the company. Because such a small proportion of the articles, only twelve percent, accounted for such a large portion of the total annual dollar volume, the recommendation to TKMS is to focus on these articles initially, since most money can be saved here. Since the order cost is as high as 1 500 Swedish krona, it is also of interest to ensure this figure. The reason for this is that it made a significant impact on the order quantities if this cost were varied and is thus of major importance in this context.

The company is also recommended to measure the actual procurement lead time, i.e. the time from when an order is placed until it is received, in order to have knowledge about how well the providers are performing in comparison with what they have promised. With more safe numbers, the inventory management can be further optimized which is of great importance for the company. Last but not least, TKMS is recommended to spread knowledge and information about the inventory control and management to increase understanding in this area and reduce the pressure on the warehouse staff.

Conclusion

The conclusion of this thesis is that experience and emotion have had a major impact on the inventory management previously. The Wilson-formula is currently used on 74 % of the articles in the warehouse, but based on the analysis it can be said that this does not reflect reality. The purchaser always has the opportunity to decide what quantities to be purchased, and since MARS often suggest incorrect quantities, the purchaser often bases the order quantities on earlier demand instead.

Another interesting aspect is the fact that 1 600 articles have not had any consumption during the control period. Since the result showed that there are also a large number of articles (64 %) that have had a withdrawal rate between one time per year up to one time per month, this means that the control principle Lot-for-Lot will be applied in many cases. By

reducing the number of articles kept in stock, both time and space will be available to put on articles of higher importance.

Since the total cost decreased for many articles even though tied up capital increased, it gives an indication that the company does not have a holistic view on the warehouse costs and instead sub optimizing the inventory control. By taking the order cost into account, there are major future improvements to make.

As previously mentioned, the goal of reaching an inventory turnover rate of more than four times per year are not considered to be realistic based on current conditions. It should though be noted that there is a big improvement potential and that the company can reach far with relatively simple means. Hopefully, this work will serve as a tool for the company to be used in the inventory control optimization. In conclusion, the thesis has given clear indications of major potential improvements in this area, but that the company must have the right will and resources to make it successful.