

THE ESTIMATIONS ELEMENT OF LOGISTIC IN ADMINISTRATION OF RESERVES ON THE EXAMPLE OF STEELWORK

Received - Primljeno: 2002-05-20
Accepted - Prihvaćeno: 2002-09-04
Professional Paper - Strukovni rad

Material supply in metallurgy concerns to very wide range of assortment. The different cost of receiving and different meaning to the production and quality of finished product are connected with them. The considerable share of material cost and maintenance costs of reserves are only some problems which decide about essential role of supply. The application of logistic elements in strategy of supply can be the essential instrument of rationalization in the processes of material flow and administration of supply. In the work the areas of application of logistic in the range of supply on the example of steel work have been defined. The base to determine the purchases policy was detailed analysis of supply situation and estimation of the position of enterprise in the market and the choice of strategy of storage of supply.

Key words: *logistic, material supply, selective material management, supply market, inventory, steel work*

Utvrđivanje uloge logistike u administraciji rezervnih dijelova na primjeru jedne čeličane. Nabava materijala u metalurgiji odnosi se na vrlo široki asortiman. S time su povezane različite cijene nabave i različiti značaj materijala za proizvodnju kvalitetnih gotovih proizvoda. Značajan dio materijalnih troškova i troškova održavanja rezervnih dijelova samo su neki od problema koji odlučuju o bitnoj ulozi nabave. Primjena logističkih elemenata u strategiji nabave može biti odlučujući instrument za racionalizaciju procesa protoka materijala i upravljanje nabavom. U radu su definirana područja primjene za djelokrug nabave na primjeru čeličane. Osnova za utvrđivanje politike nabave je bila detaljna analiza tržišta nabave i utvrđivanja položaja poduzeća na tržištu, i izbor strategije skladištenja nabavljene robe.

Ključne riječi: *logistika, nabava materijala, selektivno upravljanje materijalom, inventura, čeličane*

LOGISTICS IN PROCUREMENT MANAGEMENT

The subject of interest of logistics is the physical flow of products and associated information accomplished by means of specific logistic processes (motion processes and storage processes). Due to the limited possibilities of enhancing the effectiveness within engineering and technology, the hitherto omitted sphere of flows should become the area of interest. The results of logistic studies may be of great practical importance also in metallurgical enterprises. Owing to a considerable effect of procurement and material management on all fields of an enterprise's activity, there is a need for paying attention to several possibilities resulting from the application of the logistic approach.

A basis for formulating the procurement policy in the enterprise under study was a detailed analysis of the pro-

urement situation. The transformation of logistics elements related mainly to the selective approach in the procurement process, the assessment of the enterprise's position on the market and the strategy of maintaining inventories.

SELECTIVE MATERIAL MANAGEMENT

Due to a considerable number of materials being the subject of the procurement of the steel making plant studied, and their different importance for production, it was necessary to make a division into particular material groups: batch materials, metallic additives, non-metallic additives, direct auxiliary materials, steel making equipment, and refractory materials.

A basis for maintaining the proper purchasing policy is the selection of material-range items in each of the above-mentioned groups, which are of strategic importance for the enterprise. This required several essential aspects to be taken into account, namely [2]:

E. Staniewska, W. Waszkielewicz, Faculty of Materials Processing Technologies and Applied Physics, Technical University of Częstochowa, Częstochowa, Poland

- percentage share in the overall costs of consumption,
- importance of a material for production,
- regularity of demand,
- risk associated with the purchase.

For the evaluation of the share of materials in the value of total consumption in the investigated metallurgical enterprise the ABC method was employed. This relies on a general principle that the majority of the total value of material consumption is made up by few materials. The performed analysis has confirmed this assumption:

- materials of Group A constitute 13.3 % of the material range in the investigated enterprise, with a value share of 81.2 %,
- 16.8 % of items were classified to Group B, which account for 14.5 % of the total value of materials,
- a decided majority of material items are materials of Group C, which constitute almost 70 % of 286 materials being the subject of procurement; however, their value share is only slightly above 4 %.

Thus, from the ABC analysis materials can be identified, to which more attention should be paid due to their considerable share in the turn over. On the other hand, a wide group of items exist, the approach to which is of a routine character, as they do not have a great effect on the material costs, and the outlays for detailed analyses of the procurement methods might exceed the resultant effects.

The above classification can be supplemented by considering the criterion of the importance of a material for production and product quality. Due to its small share in the total value of purchased goods, a specific material may be classified as a secondary one, while actually it requires particular attention to be paid, owing to its important role in the production process. On the other hand, however, changes in the production process or technology may occur, which will decide the importance and need of using some materials. Accounting for this fact may cause changes to the classification by the ABC method and introduce a new hierarchy of articles.

In the enterprise studied, of the materials being the subject of procurement materials indispensable for production account for as much as 52 % of the total figure, the number of desirable materials is small, while materials with a limited effect to the production process constitute only a trace number. Although the analysis did not result in very great changes in the hierarchy of materials, yet a broad group of materials can be clearly distinguished, which, despite being the subject of procurement in the period under study, are not being used in production at present. The number of these articles is considerable (106 items, or 37.7 % of the total number of materials). From among these items, materials can be separated, which constitute a test group, and materials not being used in pro-

duction, e.g. as a result of changes in the production process, technology or production facilities. The items of this range of materials were not the subject of further analysis.

Considerable possibilities of reducing the costs of maintaining inventories arise from the structure of demand. The evaluation of demand may form an instrument of decision-making support for procurement services within developing the rules of procurement, forming safety stock and defining forecasting methods. Materials having a great share in the value of total consumption, and the demand for which is regular in character, constitute as much as 33.7% of material-range items in the enterprise studied. This indicates the purposefulness of applying a procurement system synchronized with the production process, and forms a basis for carrying out analyses aimed at the determination of the possibility of introducing the Just-in-Time system or implementing modern methods of planning material needs, such as MRP czy MRP II.

For materials of a low value of consumption (Group C) and a low accuracy of forecast, the procurement programmed should allow for a higher level of safety stock (33.1 % of items).

An important criterion allowing the final identification of strategic materials was the risk associated with procurement, expressed by: availability (level of availability), the number of suppliers, the number of purchasers, a possibility of running production by oneself, the risk associated with material storage, a possibility of substitution, obstacles in transport, and the continuity or discontinuity of production of a particular materials at the manufacturer.

The assessment based on the internal effect (share in the value of total consumption and importance for production) and risk associated with purchasing enables one to distinguish four material classes and assign the proper strategic procedures to them, as shown in Figure 1.

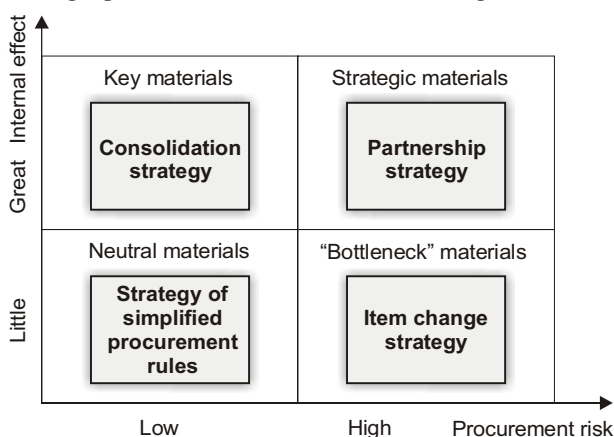


Figure 1. **Matrix of material procurement strategy**
Slika 1. **Matrica strategije nabave materijala**

The following results have been obtained in the enterprise under study:

- strategic materials comprise 22 items which make up 12.6 % of purchased materials,
- key materials constitute 28 % (49 items),
- 32 items, or 18.3 % are characterized as bottlenecks,
- the share of neutral, or secondary materials is as much as 41.1 % (72 items).

The value share of strategic materials purchased during the period under study is almost 70 %. Even a small reduction of outlays may in this case bring about considerable effects. Thus, there is a need for defining a procurement strategy appropriate for these materials, which will be based on particularly rigorous rules related to purchasing and maintaining stock.

A summary of decision-making directions and principles appropriate for particular groups is given in Table 1.

ANALYSIS OF THE SUPPLY MARKET

The analysis concerned mainly strategic materials identified at the classification stage and covered: market stability, import share, forming prices, opportunities and obstacles for new manufacturers and new, competitive customers to enter onto the market, production capabilities of business entities existing on the market.

The supply market of the enterprise under study, for the majority of materials, is characterized by considerable stability, in terms of both market situation and trends in prices. For few material-range items, market stability is limited and price fluctuations occurs. This is particularly true for metallized pellets, low-aluminium ferrosilicon, carburite and dolomite lime. The scrap market can be regarded as decidedly little stable. It is characterized by high variability of prices and a non-uniform demand showing a seasonal behavior. In spite of a large number of manufacturers, considerable competition occurs on the customer market. On the other hand, the share of imports is little, being 7 - 9 %. Due to the particular importance of scrap in the production process (steel scrap constitutes the basic charge material in the enterprise studied) and the complex character of the supplier market, all efforts must be focused on strengthening the Steelwork's position as a customer by, among other things, cooperation with suppliers on a strategic partnership basis.

On the basis of information of the import share, materials can be distinguished, which are purchased exclusively on foreign markets; these include: metallized pellets, low-aluminium ferrosilicon, sub-stream plates, casing tubes and \varnothing 14 and \varnothing 14.5 nozzles, with supplies of imported ferrosilicon accounting for 90%. This compels the enterprise to purchase larger material batches and engage greater resources, and limits the capability of reducing the stock.

An important issue related to the analysis of the Steelwork's procurement market is the number of manu-

Table 1. **Decision-making problems resulting from materials classification**

Tablica 1. **Problemi u donošenju odluka nastali zbog klasifikacije materijala**

Decision-making problems	Strategic materials	Key materials	"Bottleneck" materials	Neutral materials
Decision-making level	highest level of management	intermediary level of management	higher level of management	lowest level of management
Centre of gravity in management	supply chain	material (possibility of substitution)	procurement sources	purchasing process
Forecasting needs	long-term demand & supply forecasts	medium-term forecasts	short-term demand & supply development programm.	short-term demand forecasts
Market study	detailed market analyses and studies, good knowledge of competition and the formation of cost relationships in the industry	good short- and medium-term market data	very good collection of market data	very good market review
Procurement strategy	risk analysis	taking advantage of the privileged position, price and negotiation strategies	preparing situation remedy plans	general decision directives
Inventories	inventory control	minimization of stock	maintaining safety stock at all costs	optimization of stock volume, effective work-out of orders volume
Dealing with suppliers	long-term relations	selection of suppliers, purchases within trade agreements or on "ready markets"	contract-based insurance	purchases based on tenders or done on "ready markets"
Logistics	strict logistic control (purchasing process, inventories, suppliers)	optimization of orders volume	supplier control	stock optimization

facturers and their production capabilities. Limitations in this respect concern metallized pellets, low-aluminium ferrosilicon, dolomite lime and refractory materials, as well as steel making equipment. A detailed investigation into the market and active searching for new suppliers or substitutes are necessary in this case.

A procurement strategy appropriate to the specificity of a particular enterprise can be defined by carrying out the analysis of the position of the enterprise, its freedom and the capability of being active on respective markets [1]. Depending on the position of the enterprise as a purchaser on the supply markets, the Purchasing Department has different procedures available.

Within the analysis of the procurement market, the market power (negotiating power) of suppliers has been compared with the Steelwork's position based on the selected criteria (Table 2.).

Table 2. **Criteria for the assessment of the market power of suppliers and purchasers**

Tablica 2. **Kriteriji za procjenu tržišne vrijednosti dobavljača i kupca**

No.	Supplier market power	Steelwork (purchaser) market power
1.	Situation on the supplier market	Situation on the purchaser market
2.	Type of relations with purchasers	Type of relations with suppliers
3.	Attitude towards competition	Competition on the purchaser market
4.	Character of cooperation with purchasers	Character of cooperation with suppliers
5.	Technological flexibility	Technological stability
6.	Quality stability	Costs in the case of a missing delivery
7.	Financial fluidity	Financial fluidity
8.	Logistic situation (care about supplies)	Logistics

On the basis of the results of assessment considering the above-mentioned criteria, strategic materials are entered to the purchase portfolio matrix. The development of this matrix provides a possibility of comparing areas offering a chance of purchasing with potential risks that may occur. The proper assessment of the market position is a basis for the selection of appropriate forms of proceeding and motivation activities favorable to carrying out advantageous purchase transactions and obtaining the desirable conditions of deliveries.

In the enterprise studied, there are no material-range items and suppliers among the strategic materials, towards whom the domination effect could decidedly be used, which would enable the playing of an active role on the market.

For approximately 32 % of strategic materials, little purchasing risk occurs; this does not mean, however, any substantial effect arising from taking advantage of this situ-

ation, and in addition, too aggressive an attitude might entail the danger of a revenge taken by suppliers. In this situation, a group of suppliers can be distinguished, with whom cooperation should be continued on the current conditions; at the same time, a possibility of procurement on so called "ready markets" should not be precluded. It is recommended, however, to conduct price negotiations, and above all, to perform an analysis of the possibility of reducing the operative costs of supplies.

The position of a considerable majority (i. e. 15 items, or 68 %) of strategic materials in the purchase portfolio matrix indicates an overbalance of the negotiating power of suppliers, which makes the formulating of guidelines for purchasing difficult. This situation limits, or may even preclude price negotiations. Thus, the primary strategic objective should be striving to a change in the situation and improvement of the enterprise's own position on the market. This requires the determination of all possible factors likely to increase the negotiating power of the Steelwork. To pursue this goal, it could be appropriate to investigate the supply market, intensively search for new suppliers (e. g. by the exploration of the supply markets), look for the possibility of substitutions, secure the supplies by contracts, and cooperate on a strategic partnership basis.

STRATEGY OF MAINTAINING INVENTORIES

Inventory control constitutes an important element of an enterprise's strategy, particularly when logistic elements are intended to be emphasized in the company's policy. The great importance of stock in the logistic processes results from its strong influence on the profitability of the enterprise. Of the decision-making issues in inventory control, the following are of particular importance [3]:

- selection of items, whose stock should be maintained,
- defining batches to be ordered,
- defining the time of placing orders,
- defining the inventory control system.

When selecting the items, whose stock should be maintained, a basis for making decisions can be the results of materials classification. The share in the value of total consumption is of great importance. The reduction of the stock of materials with great influence on the financial result may produce measurable effects.

For inventories, the demand structure allowing the determination of materials for which the demand is regular is equally important, which is decisive to the high accuracy of forecast and the possibility of minimizing the inventories.

The effect of the material on the production process is another important element that enables the determination of the valuable ness of the inventories and paying particular attention to the material-range of primary importance for production.

When determining the valuable ness of the inventories, the final materials classification may prove useful, that is primarily the identification of strategic materials and "bottlenecks" requiring very detailed rules for defining the levels of safety stocks.

Inventory control in the conditions of uncertainty may rely on the specified models of stock-forming strategy, which define decision-making rules concerning the time and volume of orders sent to the suppliers in order to replenish the stock.

One of the basic logistic decisions was to establish the size of batch delivery. Despite a considerable value and the advisability of using formulas for calculating the optimum order volume (the determination of the optimal delivery batch constitutes the basic norm of conducting the purchasing policy and controlling inventories, which is used in different models of forming the stock level), establishing some cost components in the enterprise, such as the costs of creating and maintaining the stock, was quite troublesome due to record-keeping systems. Besides, some estimative calculations had to be made. All this discouraged the enterprise's employees to determine optimum delivery batches.

Of principal importance in the inventory-keeping policy is the selection of the proper method of predicting demand. A high accuracy of forecast, or small deviations of the actual demand from the prediction value, permits the reduction of safety stock.

In the case of those material-range items, for which the magnitude of consumption is characterized by high regularity and little changes in the trend, a prediction model based on exponential equalization had a considerable applicatory value.

The calculated differences between the actual demand for some materials and the values estimated on the basis of the classical linear trend, showed some regularity: positive values for spring-summer months and negative values for autumn-winter months. This formed a premise for inferring the occurrence of a seasonality phenomenon in the time series. The occurrence of seasonal fluctuations found

indicates the necessity of determining the indices of seasonality constituting the basic norm in procurement control and in application to predicting models that take this phenomenon into account.

SUMMARY

In the conditions of a market economy, the development of a management concept aimed at increasing a company's competitiveness on the market is essential for enterprises. An important element of the effective method of management seems to be the logistic orientation.

The assessment of the performance of procurement function in the enterprise studied suggests that the value of material consumption constitutes the principal component of the costs of activity of an enterprise, where almost always some possibilities of reducing the outlays exist.

The application of the logistic approach in the procurement sphere requires several factors influencing the optimization of management to be considered. Conducting selective material management that takes into account the share in the value of total consumption, the importance of a material for production, the regularity of demand, or material availability on the market constitutes the basic element of improvement in the flow process. The assessment of a company's position on the market is decisive to the negotiating power favourable to carrying out advantageous purchasing transactions and achieving desirable delivery conditions. The application of proper solutions, based on logistic principles, in the procurement sphere contributes to the optimization of the flow of material streams and to the reduction of inventory levels.

REFERENCES

- [1] P. Kraljic: Procurement management in the place of purchasing, (W:) Harvard manager, (1995), 1, (orig. in German)
- [2] H. Ch. Pfohl: Logistic systems, Biblioteka Logistyka, Poznań 1998, (orig. in Polish)
- [3] Z. Sarjusz - Wolski: Inventories controlling in enterprise, PWE, Warszawa 2000, (orig. in Polish)