PROCUREMENT PROCESS IN POWER ENERGY ENTERPRISE

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ABSTRACT: The supply and procurement processes are extremely important for proper functioning of power plants, especially for continuous production process because any breaks have negative effects on the costs linked to idle time.

Key words: supply management, procurement process

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Introduction

Progressing specialization within each logistics stages, particularly in last years, has led to separation of so called supply marketing. This activity concerns preparation and decision-making in terms of supply of suitable materials, raw materials, semi-finished goods etc. Supply marketing is a well-thought-out group of decisions and activities within companies and it determines its policy and strategy in terms of material supply and, which is followed with the selection of most favourable sources available in the market and forms of supply of each assortment.

Process of supply includes:

1. department for preparation of orders and contacts with suppliers, i.e. supply marketing and procurement department;
2. suppliers;
3. transport agencies;
4. warehouse units for transit supplies;
5. own warehousing.

Process of procurement is composed of three characteristic subprocesses: ordering, supply and transport as well as warehousing.

Information and physical processes are of a big importance to procurement logistics, as in other its phases. Information processes are connected with all the activities concerning finding and collecting information and its transformation which leads to determination of the material requirements in a company (material assortment, quantity, quality requirements, lead times etc.) as well as supply execution. Information necessary to proper planning of material requirements includes mainly: current production and sales plans for finished goods, catalogues of materials available in the market, price lists, folders, offers, any information from fairs and expositions etc.

Moreover, purchasing departments witness activities connected with information processes of procurement logistics, which, however, appear after physical delivery. They include, for instance, settlements due to the obtained deliveries or complaint procedures in relation to suppliers. Physical processes which occur in procurement logistics encompass e.g. influx of materials, raw materials all handling activities connected with the reception, internal transport and delivery storage.

Executer of information and decision processes in terms of procurement are procurement (supply) departments which, in most cases, are included in units of company management. Execution of physical processes of material flow is performed by transport and warehouse departments. Organization structure in this departments varies and it strongly depends on such

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factors as: company's size, complexity of assortment structure of used materials, nature of the market (availability of products) etc.

In terms of supply and transport processes, key component is obviously supply goods which are a subject of transaction. Due to different cases of taking over of ownership rights to product and thus various rules of cost calculation, a transaction of supply should be considered with relocation of supply goods from location of acquisition to location of storage.

Infrastructure of the whole process of supply should be seen mainly through responsibility or ownership rights. These include aspects important to management since they enable separation of owned and outside parts of the infrastructure. Own part of infrastructure is composed of:

1. Infrastructure of purchasing (procurement) department:

- rooms;
- permanent employees;
- office and communication equipment.

2. Transport infrastructure and external warehouses or reloading bases

- if they are an integral part of the company;

3. Warehousing infrastructure inside a company:

- warehouses;
- equipment for reloading operations, maintenance of stock and product handling operations;
- means of transport (internal) and communication equipment for warehouse maintenance.

Outside infrastructure will be interesting if there is a need of consideration of its parameters synchronizing cooperation with own infrastructure.

Process of supply in companies is a permanent process, whose beginning and end are a matter of convention, resulting from needs for planning, control and settlement. It is generally accepted that process of procurement can be analysed on a scale of calendar year since it is a common unit of time for planning and settlements in companies.

Source choice and delivery organisation

Initial activity during selection of source of supply is comparison of prospective suppliers. In order to do this, catalogues, price lists, advertisements, specialists fairs or commercial exhibitions are used. Moreover, information on suppliers can be found in special lists of manufacturers.[1]

During selection of a particular supplier various criteria are used while in order to reach minimal total costs of supply and holding the stock with simultaneous creation of real premises of undisturbed flow of logistics processes of procurement and production. Price of goods is found to be the most important cost component of transaction under condition that all quality requirements are met. Additionally, there is a necessity of handling the problems connected with offer price, offered terms of payment, lead time, reliability of deliveries, distances from suppliers, costs of transport etc. Procurement employees experience is of significant impact on the choice. One of the methods used during selection of suppliers is a point method. This method consists in:

- determination of fundamental criteria for assessment (features do not necessarily have to be measurable, the assessment can be made on the basis of point scale),
- determination of rules for rankings in relation to the criteria and features,
- implementation of weights in order to add more importance to some features,
- calculation of total number of points obtained by individual suppliers,
- making choice on supplier, aided by graphic representation on the basis of Excel software.

Most important criteria for selection of supplier include:

- Quality which represents particular requirements of user in relation to a given product, thus technical parameter, chemical or physical properties. Actual parameters of the product should be compared to the parameters required by users. In practice, quality of products is influenced by such characteristics as usage life time, easiness of repairs, requirements connected with maintenance, usability and reliability.

- Reliability, which defines ability of supplier to deliver a supply. This is a crucial factor necessary for scheduled execution of tasks by a company, which can not accept stoppage of production line due to shortage of materials, raw materials and parts, longer than expected. The supply require from their subcontractors supplies which are delivered timely and according to the order. In this case a shelf life or time of guarantee for the delivered materials may have direct impact on products manufactured by the company. Non-observance of the agreed rules for cooperation results in complaints, which mainly are a measure of reliability which is found to be an element of complex program of quality management.
- Potential – which defines technical, managerial and organizational skills, production control and manufacturing facilities at supplier. This factors indicate ability of the supplier to ensure required quantity and quality of materials in due time. Assessment of the supplier in this case does not only encompass physical capability to deliver materials to users but also ability to ensure required quality and quantity in a longer time.
- Financial standing – while making assessment of a supplier, another important criterion, except price, is a financial standing of a supplier. Instability of financial standing of supplier may cause disturbances in ensuring long-term, regular services.
- Location of a supplier – a very important factor which impacts on selection of supplier is geographical location. Costs of transport will obviously significantly impact the decision of whether to by from local supplier or from farther locations. Advantages of local suppliers may also include: opportunity to realize urgent emergency orders, keeping the agreed lead times or even shortening of them as a result of closer cooperation between the supplier and supply. All the above mentioned criteria are closely connected with the situation concerning company procurement. They also require commitment and knowledge related to the practice and experience of procurement specialists [3].

Material requirement determination methods

Fundamental reason for amassing of stock is a necessity of compensation for differences between supply streams and usage streams and necessity of levelling the results of random events. Stock is usually first or second position of assets in traditionally managed company. Its maintaining is connected with high costs incurred by the company, thus reduction in inventory may reduce costs of operation while increasing return on assets. In order to give a comprehensive view, it should be mentioned that expenditures on stock may increase added value by reduction of costs of production or transport or may influence increase in sales through better customer service. Thus consideration of both costs and potential benefits resulting from maintenance of the stock is necessary during making any relevant decisions, which should be preceded by a detailed analysis. This is possible to be achieved through integration of activities connected with logistics processes in a company, which enables to create one decision centre. This centre would focus all the functions connected with mainly planning of material requirements and monitoring of production processes by means of suitable computer system. The software should work at least in local network, ensuring one-off input of data and possibility of use of source data throughout all logistics phases and planning and report information which appear. System of planning of material need uses mainly data on sales and data which concern orders incoming to the company. The demand is assessed on the basis of prognoses based on time series of sales and before mentioned orders. Due to this data a company is able to prepare plan of distribution, on the basis of which a plan of procurement can be formed. Timing and assortment schedule, which determines the material requirements of production, enables placing material orders which guarantee supplying of the company in due time in all necessary materials, raw materials, parts, subassemblies etc. Number of supply materials will result from purchasing policy accepted by the company in relation to a particular material. Models of control of stock determine what, when, and in which quantities should be supply and they enable to

control the level of supply so that it does not increase easily without improvement in customer service or cost reduction.

Solutions for stock control which are most frequently employed in the companies include:

- Just in Time (JIT) procurement (system offers goods exactly when a company needs them)
- Material Requirements Planning (MRP) – this encompasses planning of material requirements resulting from final production schedules
- MRP II – Manufacturing Resource Planning – this is a MRP system extended by remaining factors of production (workforce, production capacity, tooling)

JIT

JIT concept is a basis for operation of the systems managing the cycles of order execution and elimination of waste. It is an Americanized form of Kanban system, prepared by Japanese Toyota. Expression "just in time" suggest that stock should be available exactly when a company needs it – not sooner, not later.[2] Many JIT system emphasizes short, regular cycles of order execution; fast response is here of a particular importance for the decisions on inventory. Efficient implementation of the concept may influence significant reduction in inventory of parts, materials, production in progress and finished goods. Moreover, JIT is based mainly on quality of manufactured products and subassemblies and also on efficient and precise logistics system in material management and distribution.

Fundamental assumptions of JIT include: zero inventory, short cycles of order execution, small, often replenished quantities of each goods, high quality and zero defects. JIT used by the Japanese is not only a system of inventory management but also a comprehensive quality culture, partnership cooperation with suppliers and employees teams. Application of JIT enables improvement in customer service and reduction of unit cost. JIT system is demand-sensitive, similarly to a traditional, reactive system of economical size of order or system of constant size of order. The difference consists in the fact that the JIT system tends to shortening and stabilisation of the cycles of order execution and minimization or total elimination of inventory levels. Through this approach a company makes savings and can focus on improvement in reactivity and flexibility of its system.

Companies which employ JIT must consider reliability and flexibility of manufacturing processes. Due to the fact that the system do not require supply of parts and subassemblies in due time and place, depending on accuracy of demand prognoses. An important element is also a proper timing in system operation, effective and reliable communication and high quality transport services.

MRP

MRP system enables calculation of net demand on individual items of stock, determination of their distribution in time and determination of proper quantities which enable to cover them on the basis of main production schedule, demand, inventory and production structure using logically related procedures, decision-making rules and registers.

Main goals of MRP system include: ensuring suitable quantity of materials, parts and products for planned production and for deliveries for customers, maintaining possibly lowest inventory, production planning, schedules of deliveries and supply. The activities which aim to achieve these goals start from determination of the quantity of final products expected by customers and the time after which they can get to these customers. Next, on the basis of final goods demand schedule, the components demand is calculated.

MRP can be used for supporting the whole system of material supplies, mainly in case if demand for parts and materials depends on the demand for final products. It is also commonly thought that although JIT systems based on the pull strategy are more sensitive to change in market

situation than push strategies, including MRP, the situation is sometimes opposite. However, as each solution, MRP system has some pros and cons. Advantages of this system include:

- tendency to maintain safety stock on a reasonable level and to minimize or eliminate inventory, if possible.
- Determination of the problems and possible disturbances within supply chain before they appear and taking necessary correction steps.
- Preparation of production schedules on the basis of actual and predicted demand on final products.
- Coordination of activities connected with ordering of materials in all locations of logistics system.
- Usefulness in case of production in batches or intermittent production or during assembly processes.

Disadvantages of the system include:

- Implementation of the solutions requires application of fast computers, and in case of already functioning system, implementation of changes can sometimes be hard.
- Both order costs and costs of transport may rise with reduction of inventory and with tendency to create a more coordinated system, in which lower quantities of products are ordered, delivered when necessary.
- These systems are usually not as sensitive to short-period fluctuation of demand as are the methods based on ordering point concept (do not, however, require maintaining high inventories).
- They frequently become too complex and sometimes do not work according to expectations.

MRP II

Planning based on MRP II, except of planning of material requirements known from MRP, enables a company additional integration of financial planning with basic logistics activities. It also enables prognoses of probable results of implementation of logistics, production, marketing or financial strategies. This helps company to determine the most proper methods of product relocation and to employ suitable strategies. MRP II is used for planning and managing all resources with organization, whereas this method slightly goes beyond ordinary control of stock or production and it can be applied in all planner functions within the organization. The benefits resulting from implementation of MRP II include improved customers service as a result of reduction in shortages or depletion of stock, higher sensitivity to demand, reduction in inventory costs and frequency of stoppages in production line and improvement in flexibility of planning.

Modelling of safety stock – determination of ordering point and costs of shortage

Inventory management is an important element for company's operation.[4] Stock becomes a buffer between input and output of distribution channel. Such buffers appear if timely and quantitative structure of flow of goods at the input is different than the flow at the output.

Stock performs in warehouse management the following functions:

– reduction in costs of supply, production and transport through quantity discounts at suppliers, reduction in unit costs of production for bigger production batches, more favourable terms of transport due to bigger amount of cargo,

– compensation for differences between supply and demand, e.g. seasonal demand for consumer goods during feast days, seasonal demand on agricultural goods,

– selection, e.g. creation of higher inventory due to expected increase in price for these goods or possibility of deficiency of a given goods,

– protection from insecurity.

Theory of programming and its practical use was of enormous interest among the

economists at the turn of the fifties and sixties. And, although the theory of programming is not a part of economics, it actually is an auxiliary science which is applied both in economics and other domains of theoretical and practical investigations. It can be treated as a part of general science on reasonable operation.

In economics, the most frequently used rule is a principle of economical management. This principle is used if, using given expenditures, a maximal level of set goal is achieved. The principle of economical management is also called a principle of best effect or principle of highest efficiency. The method of use of resources, according to the principle of economical management is called an optimal method of their use. Programming is a mathematical theory of the principle of economical management.

Problem of inventory may be analysed in conditions of certainty or uncertainty. Uncertainty conditions are determined by:

- demand for raw materials, which may vary throughout the whole duration of a plan,
- unknown time of stock replenishment (supply of another batch of stock),
- difference between quantity of ordered and delivered goods,
- lack of conformance between inventory levels registered by the warehouse management and actual level of inventory in the warehouse (stocktaking differences).

Since warehouses are supplied by various suppliers, a risk connected with lead time may appear. All types of risks may appear simultaneously, thus proper inventory management policy is desired in each company. Such a policy is set on the process of decision-making on proper inventory management. It tends to minimization of costs through setting suitable time for placing orders and suitable delivery batch size. Suitable time for placing an order can be determined through:

1. definition of a fixed time of ordering
2. definition of 'warning' level of stock s, at which an order should be placed (fixed ordering point).

Problem of batch size in a delivery can be solved through:

1. ordering in each delivery the same batch of products Q
2. defining a maximal level of stocks S and ordering in each delivery the same amount of goods in order to increase its level in the warehouse to S units.

Depending on the fact whether inventory will be controlled continuously or periodically there can be:

1. principle of (s, Q) replenishment of stock: periodical cycle of ordering of fixed amount of goods,
2. principle of (r, s) replenishment of stock: fixed cycle of orders, varied delivery size,
3. principle of (s, S) replenishment of stock: periodical cycle of ordering, varied delivery size,

Due to popularity of principle of (s, Q), this principle will be described in detail.

Principle of (s, Q) replenishment of stock is characterized by the following decision rule:

Always if available inventory reaches s level of units, the order is placed at the Q level of units.

Available inventory level means total of goods currently in warehouse reduced by the amount of goods which, due to faults, was found to be defective.

Using principle of (s, Q) assumes that demand Y for given goods throughout the whole duration of a plan and in each moment of this period is a random variable with known probability distribution. If expected consumption of goods in a given period is determined by a random event, an auxiliary stock should be kept for covering possible consumption of goods, called a safety stock or a reserve.

Orders according to the principle of (s, Q) are executed in case of reduction in inventory to the level of ordering point. Thus a method of ordering point is mentioned. Ordering point is

updated so that the level of inventory can be covered during time to next delivery to the warehouse

Inventory management generates many situations where decisions on level of stock must be made. Suitable level of inventory should be amassed at the beginning of a certain previously defined period in the case when demand for this goods is subject to random fluctuations. Such goods include:

- raw materials, if fluctuations concern consumption of this materials on production purposes,
- finished goods to be sold, if fluctuation concern demand on these goods.

Raw materials supply production processes, therefore they cause their efficiency. Maintaining the inventory of finished goods influences formation of suitable customer service level. Proper stock management is thus a determinant of success in a company.

Avoiding the situation of excessive inventory or deficiency of stock in relation to the demand for the goods in the related period, which is impossible to be predicted, is a main goal.

Random variable is a demand for goods in a given period, marked in this work as Y. This variable is a continuous random variable; for its distribution a distribution function can be found $F(y) = P(Y \leq y)$ on the basis of previous experience. Decision variable is an inventory for goods, which is a total of average demand for goods (μ) and reserves (r) necessary to cover possible consumption of goods. Since average demand is constant, the reserves level can also be treated as decision variable.

During tackling the problem of optimal stock size, numerous criteria of optimality can be used. A criterion of optimality may be e.g.:

- determination of p risk coefficient, which determines probability of product deficiency,
- minimization of loss which will appear in the case of deficiency or excess of stock.

Creation of the procurement system which involves multi-assortment Wholesaler as a sole supplier would solve not only previously named problems but would also result in:

1. obtaining lower supply price due to ordering of large amount of goods and materials,
2. reduction in costs of supply in the whole company due to significant reduction in relations between individual power plants and their suppliers, frequently the same ones,
3. reduction in costs of warehousing due to creation of central warehousing and reduction of floor area in local warehouses,
4. reduction in cost of frozen assets due to reduction in inventory.

Significantly important is an issue of reduction of different components of logistics costs, including costs of supply, warehousing and frozen capital, which is undoubtedly possible to be achieved in case of reduction of many logistics processes components, which currently takes place in each unit within the company. Centralization of this activities gives opportunity of reduction of the amount of activities performed by procurement services in each power plant. Such a solution is convergent with tendencies which appear in logistics systems in companies which operate worldwide.

It is generally accepted that bigger entities should own a centralized logistics structure throughout the whole organization. The easiest process to be performed, which attempts to achieve this, is a centralization of procurement functions. The Wholesaler will actually take over the task of execution of procurement processes for the whole company, despite the fact that it will be a separate entity.

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