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IMPROVEMENT OF THE SYSTEM OF WORKING WITH SUPPLIERS AT ENTERPRISES OF THE POWER ENGINEERING SECTOR

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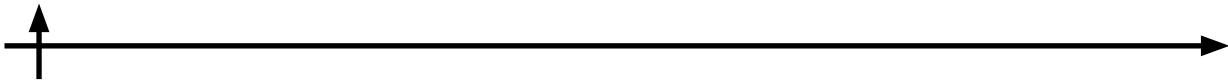
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Abstract. Building a successful procurement cycle is not only related to the internal needs of the organization, but also to the external environment of the enterprise. Ensuring the internal needs of the enterprise in procurement directly depends on correctly selected suppliers that would meet the necessary procurement criteria and the stated requirements for purchased materials. This article considers the process of improving the system of work with suppliers at the enterprises of power machine-building complex. In the course of the research the main classifications of suppliers were considered and typical problems in the organization of interaction with them were revealed. Based on the obtained data, the most effective algorithm for selecting suppliers has been developed, and a set of measures to improve their activities in cooperation with enterprises of the power engineering sector has been proposed.

Keywords: power engineering company, suppliers, procurement, procurement, strategic materials, procurement processes

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СОВЕРШЕНСТВОВАНИЕ СИСТЕМЫ РАБОТЫ С ПОСТАВЩИКАМИ НА ПРЕДПРИЯТИЯХ ЭНЕРГОМАШИНОСТРОИТЕЛЬНОГО СЕКТОРА

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Аннотация. Построение успешного закупочного цикла связано не только с внутренними потребностями организации, но и с внешней средой предприятия. Обеспечение внутренних потребностей предприятия в закупках напрямую зависит от верно выбранных поставщиков, которые отвечали бы необходимым критериям закупок и заявленным требованиям к закупаемым материалам. В данной статье рассматривается процесс совершенствования системы работы с поставщиками на предприятиях энергомашиностроительного комплекса. В ходе исследования были рассмотрены основные классификации поставщиков, а также выявлены типичные проблемы в организации взаимодействия с ними. На основании полученных данных был разработан наиболее эффективный алгоритм отбора поставщиков, а также предложен комплекс мер по совершенствованию их деятельности при сотрудничестве с предприятиями энергомашиностроительного сектора.

Ключевые слова: энергомашиностроительная компания, поставщики, закупки, стратегические материалы, процессы закупочной деятельности

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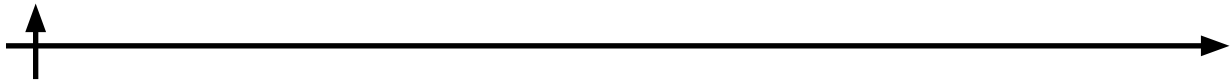
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Introduction

The procurement management process is not only a tool of procurement logistics, one of the activities of the company, but also a significant aspect for the realization of the enterprise's activities, especially if the company is a manufacturer. First of all, effectively built mechanisms of management of purchased items allow to ensure uninterrupted operation of the production cycle by purchasing on favorable conditions for the enterprise, requiring prompt and high-quality deliveries. Secondly, saving on purchases, ensuring guaranteed and uninterrupted supplies directly affects the final financial results of the company's activity.

A wide choice of potential suppliers of components increases the relevance of the problem of selecting those suppliers who would be able to ensure reliability and quality of the procurement process with the greatest effect. The limited choice of suppliers, on the other hand, requires a thorough search for reliable suppliers (Ivashov, 2015).

At the moment, selecting a supplier only on the basis of optimal prices is not enough for successful procurement management. It is necessary to expand the scope of supplier performance evaluation, improve interaction with suppliers in order to achieve optimal and mutually beneficial conditions. It is also necessary to apply its supplier management mechanisms based on the performance evaluation of the materials purchased from them. If the method of working



with suppliers and the materials purchased is not correct or not sufficiently correct, difficulties may arise in the procurement process, which affects the overall functioning of the enterprise.

Materials and Methods

The methodological basis of this research rests on collection and analysis of information, comparison, description, classification and generalization. Procurement activities were thoroughly analyzed by the authors on the basis of significant research papers by A. M. Gadzhinsky, D. A. Ivanov, E. S. Yudnikova, E. I. Arashkevich, V. M. Makarov, G. M. Greiz, P. Kralich, B. A. Anikin, O. S. Zhuravleva, etc.

Results and Discussion

Today, there are a large number of suppliers, so the main task is to choose a supplier that will be a reliable partner for the company and the best option for procurement.

There are different classifications of suppliers. One of the classifications, depending on the materials supplied, distinguishes suppliers of non-critical, basic, problematic and strategic materials. This classification of suppliers is based on the Kraljic matrix, where the main classification parameters are the impact on profit and supply risk (Gadzhinsky, 2017).

These suppliers also have their own procurement management and supplier relationship strategies:

1. basic materials. The category of basic materials is considered to be one of the most profitable for the company. The probability of supply disruption is low, and the number of suppliers is sufficient to find a replacement. In this variant the strategy of interaction with suppliers is manifested in tenders and market bidding in order to minimize procurement costs and select the most preferable supplier among their large number.

2. Strategic Materials. This type of materials has a high value and is critical for the functioning of the enterprise due to the lack of substitutes. Close relationships must be built in the interaction with suppliers. The relationship focuses on long-term cooperation and strategic alliances. Early stage suppliers are preferentially selected and involved.

3. non-critical materials. This category is procured in order to ensure the effective functioning of the enterprise. According to the matrix, these goods are not in short supply, their supply is always up-to-date and does not cause difficulties in purchasing. Accordingly, the strategy of work with suppliers is aimed at reducing the time and costs of logistics processes.

4. Problem materials. These goods have insignificant impact on the company, however, when purchasing materials whose production is limited due to the uniqueness of the technologies used, the risk of supply is high. Suppliers of these materials have more power and influence than the customer. For this reason, it is recommended to contract volume insurance and to implement an inventory management system by the supplier. Additionally, it is important to build up additional inventories.

The correct choice of suppliers directly affects the customer value of the goods produced or sold. At the moment, identifying a supplier only on the basis of optimal prices is no longer sufficient for successful procurement management.

Strategic sourcing, which is a process of finding, testing and involving suppliers of goods, is introduced into the sphere of interests of top management, for the reason that saving on purchases, ensuring guaranteed and uninterrupted supplies directly affects the final financial results of the company.

Considering the stages of procurement activities, including the steps to select the optimal and satisfying the needs of the enterprise supplier, the main points of the sub-process of supplier identification can be presented in the form of the following algorithm presented in Figure 1.

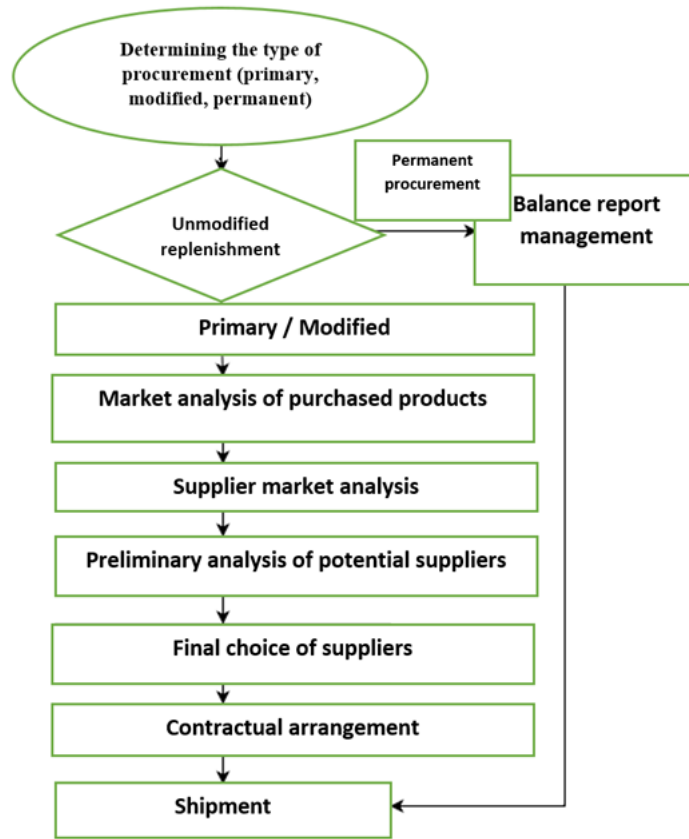
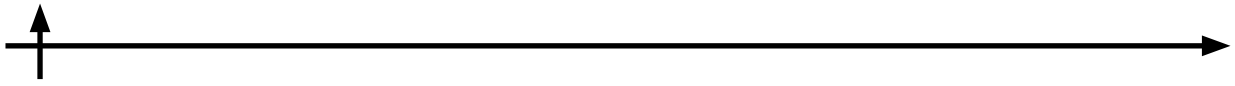


Fig. 1. Supplier selection algorithm

At the stages of preliminary evaluation of potential suppliers and final selection of suppliers, rating and expert evaluation methods are applied.

When applying the rating evaluation method, the criteria for evaluating suppliers in accordance with the objectives of the enterprise are identified. Then each evaluation indicator is assigned its own weight depending on its importance. It can be calculated by the method of expert evaluation.

For peer review, a group of experts is assembled and then their competence is assessed. For this purpose, managers assess the competencies of experts and calculate a square matrix of assessments K_{ij} given by the i -th expert j -u according to formula 1:

$$k_i = \frac{\sum_{j=1}^n K_{ij}}{\sum_{j=1}^n \sum_{i=1}^n K_{ij}}, j = 1, 2, \dots, n \quad (1)$$

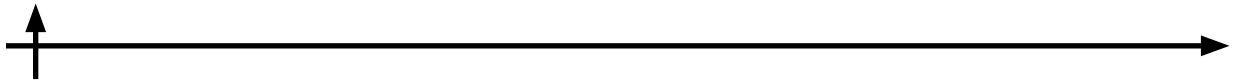
where k_i – expert competence ratio;

$\sum_{j=1}^n K_{ij}$ – overall score of the j th ($j=1, 2, \dots, n$) expert, obtained by the sum of all experts giving estimates ($i=1, 2, \dots, n$);

$\sum_{j=1}^n \sum_{i=1}^n K_{ij}$ – sum of total assessments of evaluated experts ($j=1, 2, \dots, n$);

n – number of experts.

At the next step, a list of criteria for evaluating suppliers is formed. Experts evaluate the factors of supplier selection, resulting in the formation of a matrix of dimension $n \times m$, where the factors' significance coefficients are calculated according to formula 2:



$$f_j = \frac{\sum_{i=1}^n F_{ij} k_i}{\sum_{j=1}^m \sum_{i=1}^n F_{ij} k_i}, j = 1, 2, \dots, m \quad (2)$$

where f_j – share coefficient of significance of the supplier evaluation criterion;

m – number of evaluated factors;

k_i – expert competence ratio;

$\sum_{i=1}^n F_{ij} k_i$ – the sum of the products of the expert's competence coefficient and the assessment given by all experts ($i=1, 2, \dots, n$) j th factor;

$\sum_{j=1}^m \sum_{i=1}^n F_{ij} k_i$ – the sum of the products of the expert's competence coefficient and the assessment given by all experts ($i=1, 2, \dots, n$) by all factors ($j=1, 2, \dots, m$).

When calculating the coefficients of significance of factors, it is also necessary to observe the following condition presented in formula 3:

$$\sum_{j=1}^m f_j = 1 \quad (3)$$

where $\sum_{j=1}^m f_j$ – sum of weight coefficients of significance of supplier evaluation factors ($j=1, 2, \dots, m$).

After defining the supplier evaluation list with assigned importance weights, experts evaluate each supplier on a 100-point scale for each evaluation indicator.

The following criteria are used as frequently used evaluation indicators and the corresponding score calculation settings are applied to them.

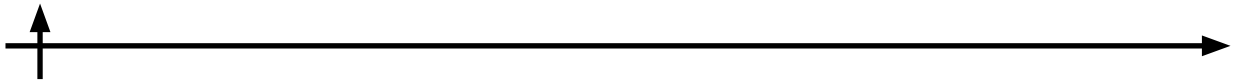
Based on the calculation of weighted scores, the final score of the supplier is determined, which takes values from 0 to 100 points, and the supplier is assigned to one of the categories: acceptable (from 60 to 100 points), conditionally acceptable (from 40 to 59) and unacceptable (from 0 to 39).

Finding and selecting the right supplier is one of the most important sub-processes of procurement activities. Keeping the sequence of determining the right supplier, taking into account the research, both marketing and commercial, minimizes the negative consequences of working with suppliers, and therefore reduces downtime in subsequent sub-processes of procurement activities and other activities at the enterprise (Demin, 2015).

In accordance with the needs of the company and the application of the Kraljic matrix, a certain supplier management is built and mutually beneficial cooperation is developed. By classifying suppliers and ranking them based on their strategic importance for the company, it is possible to optimize procurement costs by reducing the number of non-critical suppliers or directing efforts to find strategically important suppliers. Having determined the requirements for suppliers, having studied their activities, it is necessary to evaluate them according to the list of importance criteria. This step will allow a more accurate selection of suppliers (Mishchenko, 2011).

Thus, working with suppliers is of key importance for effective procurement management and the overall running of the company. Decisions made at this stage directly affect subsequent operations in the procurement process. With the right decision, there are no difficulties and risks in the sub-processes of order formation and order fulfillment control, which means the successful implementation of the complete procurement process.

In its turn, efficient execution of the procurement process optimizes further processes at the production enterprise, eliminating the risks of production and sales downtime in case of unsuccessful supplier selection and subsequent difficulties.



For the greatest representativeness of the above statement, let us consider the main principles and stages of work with suppliers at the enterprise of JSC Power Machines.

Work with suppliers at the enterprise is formed according to the category strategy in accordance with the standards approved by JSC Power Machines (hereinafter - STO): "Procedure for Procurement Activities" and "Procedure for Supplier Audits".

The general areas of work with suppliers can be summarized as the following activities:

1. Carrying out competitive purchases in order to find new suppliers;
2. Carrying out purchases from a single source;
3. Simplified procurement with invitations to participate;
4. evaluation of new suppliers;
5. Quarterly evaluation of existing suppliers;
6. Supplier audits.

As any commercial organization, JSC Power Machines selects suppliers on the basis of competitive procurement. According to the Federal Law "On Procurement of Goods, Works, Services by Certain Types of Legal Entities" dated 18.07.2011 N 223-FZ competitive purchases are carried out (Shumaev, 2016):

1) by bidding through:

- tender: open, in electronic form, closed;
- auction: open, in electronic form, closed;
- request for quotations: in electronic form, closed;
- request for proposals: in electronic form, closed;

2) by other means meeting the following requirements:

- information about the competitive procurement is communicated through a unified information system or by sending invitations to participate in a closed competitive procurement;
- competition between participants of competitive procurement is provided (Makarov, 2008).

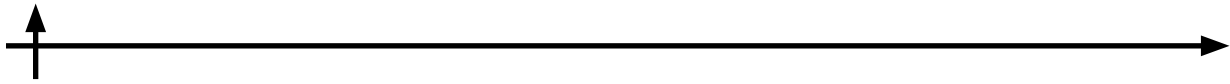
1. Competitive procurement. This type of procurement is conducted on electronic trading platforms (ETP), including ETP NEP-Fabrikant, where inventory is procured, and ETP TEK-Torg, where procurements for the provision of necessary services and works are placed for companies of the fuel and energy complex of the Russian Federation and companies with state participation, including JSC Power Machines (Buzukova, 2015).

Upon receipt by the Procurement Directorate of route-material specifications (hereinafter - MMC) or technical specifications containing the most complete information about the planned for purchase of the goods and materials, its nomenclature number, including the regulatory document under which the goods and materials are purchased, a request (application) for the purchase of certain goods and materials is formed on the ETP, specifying the name of the item, lot category, delivery volume, number of lots and terms of procurement. It is also possible to specify the project under which the products are purchased (Grekul, 2012).

To participate in the tender, suppliers with whom work has been done before, suppliers recommended or decided by the Applicant are invited. Further, suppliers interested in participation submit a technical and commercial proposal (hereinafter - TKP) for consideration. During the review of the TQP a re-bidding takes place - a part of procurement activities to improve the conditions of interaction between the two parties: the customer and the bidder (Greiz).

After the review and selection of the supplier, a protocol for selecting the winner of the electronic tender is formed, after which it is submitted to the Procurement Department, where contractual relations with suppliers are concluded. After the contract is concluded, the delivery is monitored until its completion and settlement with suppliers.

2. Procurement from a single source. According to this type of procurement is carried out from one company producing unique products or having a normative document, which belongs



only to the selected company for the production of goods and materials. In accordance with the selected supplier, the design bureau draws up a conclusion, according to which the procurement of materials and equipment is carried out from a single supplier without going out to bidding with competitive procurement, since taking into account the specification of the purchased products, analogues are not considered (Ivanov, 2009).

3. Simplified procurement. This type of procurement is a purchase of up to 500 thousand rubles. In this procedure, no bids are placed on ETP. The manager of the procurement department sends a request to suppliers and receives at least three TKP from suppliers. After that, the supplier is selected and the protocol for selecting the winner is formed. Also in this situation it is possible to carry out procurement from a single source.

4. Evaluation of new suppliers is carried out according to the questionnaire filled in by the supplier. A familiarization audit is also conducted.

5. Evaluation of existing suppliers. After contractual relations with a new supplier are formalized, each supplier is entered into a database, where all suppliers are controlled according to certain parameters and assigned their ratings. Among the most important evaluation criteria are: term, price, quality. In the first place the term of delivery is determined taking into account the current situation on the market of imported components, the price and quality are equally evaluated (Anikin, 2013; Ilin, 2022).

6. Audit of suppliers is carried out in accordance with STO "Procedure for audits of suppliers". Audits may be conducted in accordance with the annual audit plan, unscheduled, on-site or desk audits. The group of auditors is formed by the Director of the Quality Directorate with the invitation of technical experts and appointment of the person responsible for the audit - the head of the audit. The result of the audit is formed in the audit report, which presents an objective assessment of the supplier.

Analyzing the formats of supplier selection at the enterprise under consideration, it can be noted that the process of supplier selection complies with the legislation of the Russian Federation, namely the Federal Law "On the procurement of goods, works, services by certain types of legal entities" from 18.07.2011 N 223-FZ. Thus, the work with suppliers complies with the competitive and equitable principles of participation in tenders.

Realization of ABC-analysis in this enterprise is a reasonable measure, as the main purpose of ABC-analysis in procurement logistics is to reduce the value of stocks (Kralich, nd.).

There are 14 categories in the assortment of purchased by the enterprise, each of which is divided into its subcategories.

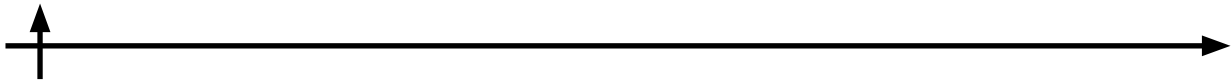
Accordingly, for each subcategory it is necessary to carry out an appropriate analysis due to the fact that the purchased goods are diverse and require separate attention to each item.

The idea of ABC-analysis is to select the most significant objects of the assortment from the whole set of homogeneous objects from the point of view of the purpose of the analysis.

Since in Section 3 we considered the procurement activities for the purchase of materials of Category No. 3 "Metal Rolled Products", ABC-analysis will be conducted in the context of purchased commodities of this category.

Category #3 includes the following subcategories of procured commodities:

- flat rolled products,
- long products,
- packaged rolled products,
- tubular rolled products,
- rolled non-ferrous metals,
- precious metals.



The algorithm of work on ABC-analysis is proposed to be carried out in the following order:

Step 1: Formulation of the analysis objective. Depending on the purpose of the analysis: reduction of the inventory value, reduction of the number of movements in the warehouse, reduction of thefts of material assets, - there will be chosen their own criteria of the analysis, on the basis of which the categories of inventory will be ranked and their management will be built. Therefore, at the beginning it is necessary to designate the purpose of the analysis.

In our case, the purpose of the analysis is to reduce the size of inventories, namely, low-maintenance inventories (LMOs).

Step 2: Identification of analyzed objects of ABC-analysis. In order to reduce the amount of stocks not only the items of the purchased nomenclature can be analyzed, but also the sources of their occurrence, for example, suppliers. In this case of analysis attention is paid to the work with suppliers in order to reduce the goods in the warehouses received from this supplier.

In this research, the objects of study are nomenclature items of Category #3 "Metal Rolled Products" received from the respective suppliers.

Step 3: Determination of the feature on the basis of which the classification of management objects is carried out. Setting the goal of reducing the stock in the warehouse, it is necessary to classify the assortment, which share takes the largest amount of cash. It is also necessary to analyze the turnover of these items for the time period that it is in the warehouse. And the third important criterion is the volume of ordered commodities. The categories obtained during the analysis will reflect the items as multi-day inventories, which are expensive to maintain (Ivashov, 2015).

This three-factor analysis: by the cost of purchased goods, turnover and volume of deliveries (purchases) will give a full-fledged analysis of inventory, which will identify items, orders for which should be taken under strict control, as well as to build a scheme of work with suppliers whose goods fall into critical categories of purchases.

Step 4: Evaluation of objects according to the selected classification criterion. The results of each item in descending order are recorded by the allocated criterion.

Thus, by cost the assessment is formed by descending value of each item; by turnover - by descending volume used per day; by delivery volume - by descending size of deliveries.

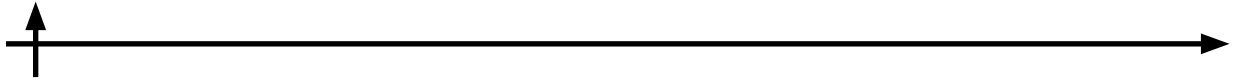
Step 5: Grouping of management objects in descending order of the feature value. Next, the shares of realization of each item in the total result of the criterion in descending order are calculated for the allocated criterion. Then for each item the share of realization in the total realization calculated by cumulative total is calculated.

Step 6: Construction of ABC curve. After the calculated shares by cumulative total it is necessary to build the ABC curve, where on the OX axis the shares of the position in the total nomenclature list are put off, and on the OY axis - the share of realization of the position expressed by cumulative total. Since a total of 50 items of commodities are analyzed, each point (the position of commodities in the nomenclature) on the axis OX is put off in increments of 2%, since the total sum is equal to 100%.

Step 7: Division of the set of objects into three groups: group A, group B, group C. The usual division of groups in ABC-analysis is based on Pareto's law, where 20% of investments give 80% of the result, which in most cases is not suitable for the division of nomenclature items.

Conclusion

The problem of supplier selection and evaluation is one of the most important in procurement, which can be seen in the decomposition of this process, where the selection and evaluation of suppliers occupy a crucial place. Every organization should improve its competitiveness and reduce the costs of procurement activities, which will be helped by selecting the most



appropriate supplier evaluation and selection system. In order to successfully select the most appropriate selection system, it is necessary to rely on the rating method as well as the method of expert evaluations. Based on the proposed algorithm for selection and evaluation of suppliers, it is possible to visualize the functionality of procurement activities, to define the role of the supplier in procurement logistics, to describe the stages of procurement, as well as the tools used at each stage.

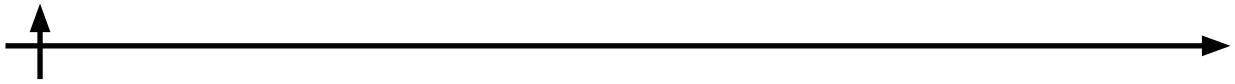
Further research in the field of supplier selection at the enterprises of power machine-building complex is recommended from the point of view of adapting the method of ABC-analysis, expert-rating assessments, as well as building a decision tree.

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