PHYSICAL RESOURCES PRIORITIZATION

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In the context of highly competitive environment, enterprises are looking for a way to increase productivity while reducing financial expenses. This situation leads to the fact that manufacturers affect the level of product quality by reducing it for costs reasons. The purpose of this article is to consider an alternative way to save financial resources without compromising the product quality by prioritizing commodities and materials. Thus, we have used a set of methods relevant to the subject matter: abstract-logical, analytical and economic-statistical methods. We have also generalized the experience of domestic and foreign researchers. Oil and Gas Company was considered as an example. Thus, economic benefit in the amount of RUB 4.016.45 million is achieved by accounting for physical resources by priority. The article also provides the examples of a new way to maintain documentation on a priority basis.

KEYWORDS
Commodities and Materials, Stock, Oil and Gas Enterprises, Procurement Activity, Cost Efficiency.

1. INTRODUCTION

Goods and services markets growth and globalization processes have led to an increase in the level of competition [1-6]. Accordingly, enterprises are interested in increasing productivity at low costs. Project management success largely depends on commodities and materials (C&M) management [7-9]. The latter includes a whole block of current assets, without which there is no production. They are classified as follows [10-12]:

- raw materials and supplies;
- spare parts;
- semi-finished products stocked in warehouses;
- purchased and finished products;
- construction materials;
- fuel and lubricants;
- recycling wastes and useful residues;
- other tools;
- containers.

As a rule, stocks are used as a base in processing material into a finished product [12]. The problem of planning and distributing physical resources is that entrepreneurs often try to save money when it comes to purchasing certain materials. This leads to a decrease in product quality [2].

Maneuvering financial resources is one of the alternative ways to save them depending on the arisen problem [13]. On the one hand, this method allows responding to existing accuracy, on the other hand, the company loses the ability to make long-term plans. This problem is especially pressing for oil and gas enterprises where long-stored resources with no demand lead to an increase in procurement costs [14]. Thus, there is a need to reduce financial production costs without qualitative and quantitative losses. In this regard, the purpose of this article is to consider the possibility of prioritizing commodities and materials.

2. METHOD

Theoretical and methodological basis of the research involves the theory of sustainable enterprise development management under a variety of management forms and economic development integration processes, as well as works of leading domestic and foreign experts. We have used abstract-logical, analytical, economic-statistical and computational-constructive methods, as well as methods of dialectic cognition and a system approach.

3. DATA, ANALYSIS, AND RESULTS

An enterprise has to manage the categories of purchased C&M by listing in order to maximize the value and minimize risks. Each list is characterized by its own C&M procurement process and corresponding number of inspections (coordination and approval) made for appropriate decision-making. Lists are reviewed annually, or as necessary [12].

C&M and services are divided into lists based on the following criteria:

1. Criticality – combination of characteristics and risks related to a particular category of C&M/services. They are selected according to the following parameters:
   - impact on production;
   - impact on quality;
   - impact on HSSE;
   - impact on the enterprise’s image.
Criticality is determined expertly with a scoring system for each parameter of the category and by comparing total estimates measured for all categories.

2. Chance to gain additional value through an efficient C&M/services procurement. Let’s consider the degree of oil and gas C&M impact (Table 1).

List 1 contains C&M and services which bear the greatest risks for the enterprise at the stages of manufacture and procurement. This category has also the greatest value potential that an effective procurement process can bring. It is the most critical category with the largest number of check-outs.

List 2 contains basically the affordable (but still costly) C&M and services, corresponding level of risks and other factors.

List 3 contains less costly C&M and services that do not have a critical impact on production.

Prioritized categories of purchased C&M and services are determined based on two parameters: expected amount of money spend for each category and criticality of each category. Priority waves are identified by comparing all categories of C&M and services with each other. Thus, first wave categories (pipes, CMD&A, drilling equipment, specially made equipment, reagents) require enterprise’s closer attention in terms of procurement management. Besides, there should be procurement strategies designed for these categories (Figure 1).

### Table 1: C&M categories affecting the enterprise activity

| C&M category               | Effect on reliability (0-10 points) | Effect on production costs (0-10 points) | Effect on quality (0-10 points) | Effect on OHS and security (0-10 points) | Effect on the Environment (0-10 points) | Effect on enterprise’s image (0-10 points) | Total |
|---------------------------|-------------------------------------|-----------------------------------------|---------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|-------|
| Pipes                     | 10                                  | 7                                       | 8                               | 8                                      | 5                                      | 7                                      | 45    |
| Reagents                  | 4                                   | 4                                       | 5                               | 6                                      | 4                                      | 3                                      | 36    |
| Auxiliary materials       | 2                                   | 3                                       | 2                               | 3                                      | 2                                      | 3                                      | 15    |
| Metal and section isolation valves | 5                       | 3                                       | 4                               | 2                                      | 2                                      | 2                                      | 18    |
| Drilling equipment        | 7                                   | 6                                       | 5                               | 4                                      | 3                                      | 4                                      | 29    |
| Electrical equipment      |                                     |                                         |                                 |                                        |                                        |                                        | 23    |
| Auxiliary equipment       |                                     |                                         |                                 |                                        |                                        |                                        | 15    |
| Specially made equipment  | 6                                   | 5                                       | 6                               | 5                                      | 4                                      | 6                                      | 32    |
| Spare parts               | 4                                   | 3                                       | 3                               | 3                                      | 3                                      | 3                                      | 19    |
| CMD&A                     | 6                                   | 3                                       | 6                               | 4                                      | 3                                      | 6                                      | 28    |
| Chemistry                 | 5                                   | 4                                       | 3                               | 2                                      | 2                                      | 2                                      | 19    |
| Service utility materials | 2                                   | 1                                       | 2                               | 2                                      | 2                                      | 1                                      | 10    |
Purchased C&M/services category effective management allows achieving sustainable cost savings in the amount of 5-40% for a particular category.

Declared material and technical resources are been proposed to be standardized in order to rationalize the purchased C&M. In the best case, unclear product description can lead to a loss of time; in the worst case, it can lead to serious financial consequences and cause a supply failure, conflicts, deprive the opportunity to improve the quality of a product or a service.

Table 2 shows that the intersection of a declared material and technical resources nomenclature is not the same for all shops (94% of it is unique).

Table 2: Nomenclature intersection for PTR specified in List 1 and used in different shops of the oil and gas enterprise

| Number of shops that have declared PTR | Number of stock items, | Amount of money, | % of total sum | Comments |
|---------------------------------------|------------------------|------------------|---------------|----------|
|                                       | pcs.                   | %                | thousand      |          |
| 1                                     | 887                    | 94               | 7003.27       | 79.43    | Pipes, transformers |
| 2                                     | 54                     | 5.73             | 1422.58       | 19.52    | Pumps 1ESPDP5-25-1750 |
| 3                                     | 1                      | 0.135            | 3.93          | 0.04     | Methanol |
| 4                                     | 1                      | 0.135            | 89.62         | 1.01     | Methanol |

Procurement Plan for 2016

1 Procurement Plan for 1Q 2016

|                             |                      |                  |               |          |
|-----------------------------|----------------------|------------------|---------------|----------|
|                             | pcs.                 | %                | thousand      |          |
| 1                           | 1276                 | 93.48            | 4823.36       | 94.85    | Sucker rod pump.SRP-19-8000 (RUB 31 MIO) |
|                             |                      |                  |               |          | Submersible Motor Cable CPPAF-120 3*16 |
|                             |                      |                  |               |          | (RUB 63 MIO) |
|                             |                      |                  |               |          | Weldless hot-worked |
|                             |                      |                  |               |          | Pipe-8732 325*8962S (RUB 42 MIO) |

2 Procurement Plan for 2015

3 Purchases made in 1-3Q 2015

|                             |                      |                  |               |          |
|-----------------------------|----------------------|------------------|---------------|----------|
|                             | pcs.                 | %                | thousand      | %        |
| 1                           | 3096                 | 92.36            | 11926.25      | 78       | Tubing joints and casing pipes (RUB 2178.34 MIO) Methanol and other reagents (RUB 164.58 MIO) |
| 2                           | 188                  | 5.6              | 2671.3        | 17       | Submersible Motor Cable CPPAF-120 3*16 |
|                             |                      |                  |               |          | (RUB 212 MIO), SRP (RUB 87 MIO), casing |
|                             |                      |                  |               |          | pipes (82 million rubles) |
| 3                           | 55                   | 1.64             | 70428         | 4.6      | Pumps 1ESPDP5-25-1750 (RUB 14 MIO), |
|                             |                      |                  |               |          | transformer TMPN-100-3/125 (RUB 10 MIO) |
| 4                           | 13                   | 0.4              | 3815.5        | 0.25     |                      |
Technical review of the problem can reduce the nomenclatural diversity between the shops of the enterprise. This will allow increasing the number of negotiable subjects and reducing the resources purchase price.

List 1 contains material and technical resources declared simultaneously by four shops in 1-4Q 2015 (Table 3).

### Table 3: Nomenclature declared simultaneously by four shops

| Resource name                                      | Number of purchased resources | Total value. RUB thousand |
|----------------------------------------------------|------------------------------|----------------------------|
| 18013219 Pumps 1 ESPDP5-25-1750                    | 73 pcs                       | 14 772.17                  |
| 18005187 Transformer TMPN-100/-1.25                | 129 pcs                      | 10 723.83                  |
| 14032390 Weldless hot-worked pipe-8732 159x820     | 92 tons                      | 3 300.58                   |
| 14032449 Weldless hot-worked pipe-8732 89x10 20    | 81 tons                      | 2 285.74                   |
| 14032381 Weldless hot-worked pipe-8732 114x6 20    | 35 tons                      | 1 211.87                   |
| 14032452 Weldless hot-worked pipe-8732 89x6 20     | 19 tons                      | 805.17                     |
| 14032385 Weldless hot-worked pipe-8732 159x6 20    | 15 tons                      | 543.57                     |
| 14007487 Class A Cement                            | 624 tons                     | 1 761.55                   |
| 14018617 Sucker rod pump. SRP-22-1500               | 1795 pcs                     | 1 689.10                   |
| 14004633 Branch-17375 90 gram 114x10 20            | 1175 pcs                     | 511.93                     |
| 14021544 Branch-17375 90 gram 114x8 20             | 831 pcs                      | 291.75                     |
| 14004645 Branch-17375 90 gram 114x6 20             | 356 pcs                      | 94.97                      |
| 14101239 Salt pellets                               | 7900 kg                      | 158.81                     |

The largest value share of items with demand (81%) is attributed to 5 categories of material and technical resources, 4 of which are characterized by significant purchase regularity (Table 4).

### Table 4: Categories of material and technical resources attributed with the largest cost share of annual demand (81%)

| Category name                          | Total value. RUB thousand | Value share | Value group | CV | Group by purchase regularity |
|----------------------------------------|---------------------------|-------------|-------------|----|-------------------------------|
| Casing pipes                           | 4 261.73                  | 48.31%      | A           | 0.21 | X                             |
| Tubing joints                          | 1 130.70                  | 12.81%      | A           | 0.17 | X                             |
| Oil and gas production chemicals       | 709.23                    | 8.04%       | A           | 0.72 | Z                             |
| Drilling chemicals                     | 589.43                    | 6.68%       | A           | 0.21 | X                             |
| Other mortars, dry mix                 | 488.52                    | 5.53%       | A           | 0.12 | X                             |

The largest value share of items with demand (80.5%) is attributed to 22 (out of 650) categories of material and technical resources. Only 4 of them are characterized by significant purchase regularity within the quarter (Table 5).
Table 5: Categories of material and technical resources (22) attributed with the largest cost share of quarter demand (80.5%)

| List No. | Category name                          | Total value, RUB thousand | Value share | Value group | CV | Group by purchase regularity |
|----------|----------------------------------------|---------------------------|-------------|-------------|----|------------------------------|
| 1        | Casing pipes                           | 934.31                    | 15.56       | A           | 0.38 | Y                            |
| 1        | Steel pipes                            | 786.56                    | 13.1        | A           | 1.02 | Z                            |
| 1        | Tubing joints                          | 719.40                    | 11.98       | A           | 0.12 | X                            |
| 1        | Oil and gas production chemicals       | 491.61                    | 8.18        | A           | 1.38 | Z                            |
| 1        | Insulated pipes                        | 267.21                    | 4.45        | A           | 0.61 | Y                            |
| 1        | Other mortars, dry mix                 | 179.48                    | 2.98        | A           | 0.12 | X                            |
| 1        | Oil field and standard cables          | 167.50                    | 2.78        | A           | 0.32 | Y                            |
| 1        | Drilling chemicals                     | 145.01                    | 2.43        | A           | 0.12 | X                            |
| 1        | Group metering units                   | 138.34                    | 2.3         | A           | 1.36 | Z                            |
| 1        | ESP pumps                              | 123.66                    | 2.05        | A           | 0.26 | Y                            |
| 1        | Modular group and modular cluster pumping stations | 115.00               | 1.91        | A           | 1.41 | Z                            |
| 2        | Steel valves                           | 104.47                    | 1.75        | A           | 0.74 | Z                            |
| 1        | Compressor equipment                   | 99.28                     | 1.65        | A           | 0.94 | Z                            |
| 1        | Spare parts for gas turbine power plants | 90.87                   | 1.5         | A           | 1.41 | Z                            |
| 1        | Packaged transformer substations       | 82.01                     | 1.37        | A           | 1.3  | Z                            |
| 1        | ESP motors                             | 72.84                     | 1.21        | A           | 0.15 | X                            |
| 1        | ESP motor control stations             | 71.19                     | 1.19        | A           | 0.08 | X                            |
| 1        | Oil type power transformers            | 55.90                     | 0.93        | A           | 1.39 | Z                            |
| 2        | Mechanical cleaning filters            | 54.93                     | 0.91        | A           | 1.34 | Z                            |
| 1        | Pump rods without centralizers         | 51.91                     | 0.86        | A           | 0.34 | Y                            |
| 1        | Central pump stations                  | 44.06                     | 0.74        | A           | 0.36 | Y                            |
| 1        | Other oilfield equipment               | 37.38                     | 0.62        | A           | 1.23 | Z                            |

Significant level of procurement efficiency can be maintained by monitoring and controlling the process of purchasing a small number of nomenclature material and technical resources. Storage expenses can be reduced at the stage of regular delivery scheduling.

Table 6 presents data on annual demand for material and technical resources in 2016. Based on them, there was prepared a report presenting the summarized information about the planned purchases provided by all shops.

Table 6: Annual demand for material and technical resources in 2016, RUB thousand

| Inventory item                     | 1Q   | 2Q   | 3Q   | 4Q   | Total     |
|------------------------------------|------|------|------|------|-----------|
| Magnetic drum                      | 176.47 | 205.78 | 477.49 | 673.88 | 1 533.62 |
| Mobile compressor station          | 935.89 | 966.67 | 951.89 | 903.33 | 3 757.78 |
| Mobile-crown high masts            | 641.06 | 294.06 | 294.10 | 230.57 | 1 459.80 |
| Stationary-crown high masts        | 133.32 | 280.42 | 211.01 | 63.91  | 841.71   |
| Equipment not included in the construction estimate | 939.57 | 580.65 | 485.41 | 423.86 | 2 429.49 |
| Total                              | 2 826.31 | 2 327.58 | 2 419.9 | 2 295.55 | 9 869.34 |

Table 7 presents the annual delivery planning results for 2016 based on the reduced nomenclature diversity of material and technical resources between the shops of the enterprise, and increased number of negotiable subjects.
Table 7: Material and technical resources declared in 2016

| Inventory item                  | List 1                                      | List 2                                      | List 3                                      | Total value | Total items |
|---------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|-------------|-------------|
|                                 | Value (RUB MIO) | Number of querying items | Value (RUB MIO) | Number of querying items | Value (RUB MIO) | Number of querying items |                     |             |             |
| Magnetic drum                   | 1 167.63      | 184                          | 70.71          | 32                          | 17.05         | 40                          | 1255.39           | 256         |
| Mobile compressor station       | 1 190.58      | 215                          | 107.03         | 312                         | 23.86         | 73                          | 1321.47           | 600         |
| Mobile-crown high masts         | 764.24        | 1 924.00                     | 399.36         | 1669.00                     | 113.19        | 12745.00                    | 1 276.79          | 31 363      |
| Stocked high masts              | 649.58        | 252                          | 71.71          | 219                         | 0.2           | 10                          | 721.48            | 481         |
| Equipment not included in the   | 1 313.04      | 1 100.00                     | 108.84         | 365                         | 8.95          | 29                          | 1 430.83          | 1 494       |
| construction estimate           |               |                              |                |                             |               |                             |                    |             |
| Grand total                     | 5 085.06      | 3 675.00                     | 757.64         | 17622.00                    | 163.25        | 12897.00                    | 6005.95           | 34 194      |
| Share in total value/items (%)  | 84.67          | 10.75                        | 12.61          | 51.54                       | 2.72          | 37.72                       | 100               | 100         |
| Number of resources (pcs)       | 1 365          | 6 063                        | 3 979          |                             |               |                             | 11 407            |             |
| Share in total resources volume (%)| 11.97          | 53.15                        | 34.88          |                             |               |                             | 100               |             |

Table 8: Economic benefit derived from rationalized nomenclature of C&M

| Inventory item                  | Procurement costs before standardization | Procurement costs after standardization | Economic benefit |
|---------------------------------|------------------------------------------|----------------------------------------|-------------------|
| Magnetic drum                   | 1 533.62                                 | 1 255.39                              | 278.23            |
| Mobile compressor station       | 3 757.78                                 | 1 321.47                              | 2436.31           |
| Mobile-crown high masts         | 1 459.80                                 | 1 276.79                              | 183.01            |
| Stationary-crown high masts     | 841.71                                   | 721.48                                 | 120.23            |
| Equipment not included in the   | 2 429.49                                 | 1 430.83                              | 998.66            |
| construction estimate           |                                           |                                        |                   |
| Total                           | 10 022.4                                 | 6 005.95                              | 4016.45           |

Thus, economic benefit will amount to RUB 4.016.45 million after optimizing material supply.

4. DISCUSSION

We have analyzed the supplies, commodity stock, long-stocked resources of the oil and gas enterprise with no demand and found out that procurement activity require closer attention in order to optimize the material supply. There was a need in diagnosing procurement activity in order to compare it with the existing procurement process.

In this case, one has to fill out a feedback form that contains 225 questions grouped by enterprise directions and questionnaires specially designed for:

- management team;
- purchasing Specialists;
- responsible customers;
- human Resources Specialists;
- IT technicians.
Comparative analysis allowed us to identify the following positive aspects:

1. There is a package of initiatives focused on improving procurement activity [7];
2. There is a vision, objectives and a procurement strategy coordinated with the general strategy of the enterprise [2, 15].

We have allocated areas that require attention:
1. organization’s goal is defined, but formally is not repeated into the procurement sphere. Hence, procurement goals and objectives are not agreed among the senior managers;
2. current system of key performance indicators is under development. High-level procurement KPI are not detailed, not tied to the processes or the motivation system;
3. approach to company’s purchasing management has not been compared with those existing in other companies (best practice) until now. This situation does not allow determining whether the existing initiatives are appropriate or not.

5. CONCLUSION

Thus, physical resources prioritization can significantly save financial resources without without compromising the product quality. The proposed method also allows using an alternative way of maintaining accounting and reporting documentation, drafted in order of priority. This method can be used both at large and small enterprises, including oil and gas ones.

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