

Rational Precious Metals Supply Schemes

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Abstract. Rapidly developing social progress and new conditions for the functioning of all economic entities put industrial enterprises in a special, rigid economic framework. In a tough competitive environment, you can survive and develop only by orienting your business activities to a logistic approach. The gold mining industry plays a key role in the global economy. This industry has a high asset value, large-scale production lines and large infrastructure. One of the main tasks of strategic planning of gold mining enterprises is the choice of a rational marketing system. Planning and selection of schemes for the supply of precious metals is an important condition for the effective functioning of the marketing activities of gold mining enterprises. For these purposes, the need for improving logistics flows and creating an information system for sales planning is growing. The article explores the planning and selection of precious metals supply schemes using the example of PJSC "Vysochaishy". Much attention paid to the construction of the company's logistics flows. The main problems in the supply chain of PJSC "Vysochaishy" are identify. The algorithm of the process of introducing a new supply chain planning system for Vysochaishy PJSC is considered, and an improved strategic planning process for PJSC "Vysochaishy" is present. A new scheme of operation of the transport and logistics system for the direction of logistics flows of PJSC "Vysochaishy" proposed.

1 Introduction

The success of the enterprise achieved only based on system optimization of a complex of processes for ensuring, production and marketing of products, that is, because of modern logistic processes for organizing the movement of material and information flows [1, 2, 3].

From the point of view of the theory of complex systems, the supply chain of a modern enterprise is difficult to manage the technical and economic system. In accordance with the management theory, management theory, cybernetic approach, a key element of the effective process of managing any system is the planning function [4, 5, 6].

The main goal of the planning process for the supply chain of a gold mining company is to provide accurate demand forecasts, optimize replenishment programs, create realistic production plans and create the ability to monitor commodity flows throughout the supply chain [7].

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2 Study methodology

The purpose of the publication is to analyze the scientific literature, the regulatory framework and the results of scientific research on the supply chain management of industrial enterprises. The following foreign and Russian scientists contributed to the study of this field: Arvis J.-F., Babin M., Bubnova G., Efimova O., Fan L., Gasparik J., Luptak V., Sokolov Y., Tolliver D. The study used the following methods: systematic approach, comparative analysis, retrospective analysis, analysis of official statistics; document analysis method.

An analysis of current practice of strategic development of gold mining enterprises indicates the absence of effective tools and methods for implementing managerial impacts that comprehensively take into account the priorities of economic growth and the particular incentives of industrial enterprises to introduce technological innovations and develop production processes. Thus, the purpose of this publication is to introduce the methodology of supply chain planning for PJSC "Vysochaishy".

3 Assessment and results

It is propose to consider planning and selection of precious metals supply schemes using the example of PJSC "Vysochaishy", a dynamically developing company with a high level of production efficiency, which is included in the TOP-10 of the leading gold mining enterprises in Russia. At the end of 2017, the Company produced 225 thousand ounces of gold. The company has a balanced portfolio of production and exploration licenses.

PJSC "Vysochaishy", in addition to the rest, has three key developed projects:

- Irkutsk project;
- Taryn project;
- Aldan project.

We are interested in building logistics flows in the company PJSC Vysochaishy. The main logistics flows are:

- material flows of the company, which includes finished products, ore, OV (own vehicles), VIC (vehicles of international companies), fuel, reagents, equipment, etc.
- financial flows, which include cash, cash transfers, loans, loans, receivables, electronic payments, etc.
- information flows (requests, messages, mail, invoices, invoices, delivery documents, delivery notes, customs declarations, etc.).

Figure 1 shows the supply chain of the company PJSC "Vysochaishy".

One of the most important links in the company's supply chain is logistics. To provide the enterprise with timely deliveries of material and technical resources (MTR), it is necessary to build an effective interaction of the company with external suppliers. After some procurement operations, all information is posted on the website, then the "Material and Technical System" (MTS) block is included in the work, which should inform all potential suppliers about the start of tender work on the procurement of materials and equipment. The most capital-intensive nomenclatures, such as oil products, equipment, and metal products, account for about 75% in monetary terms of the total volume of procurement of materials and equipment. The business units of PJSC "Vysochaishy" purchase the remaining 25% of materials independently. It is worth noting that the nomenclature of the most complex technological equipment, transport, etc. purchased abroad, and the company buys standard materials and equipment from Russian suppliers.

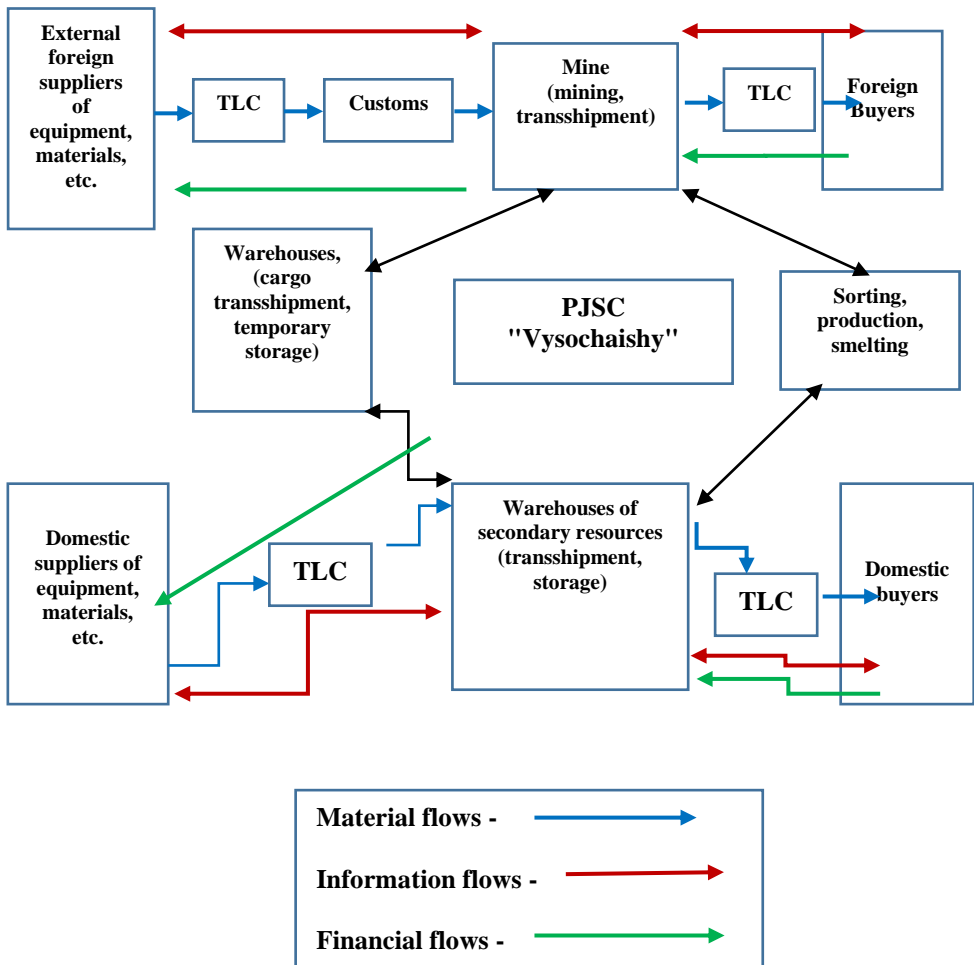


Fig. 1. Logistic flows of PJSC «Vysochaishy».

Due to the lack of systematization and planning in the procurement process of materials and equipment and materials, it is quite difficult to optimize the procurement plan of materials and materials and materials because several departments, having a low level of coordination among themselves, perform the procurement functions simultaneously. When purchasing materials and equipment, stocks in warehouses are not always take into account.

At present, PJSC "Vysochaishy" has a number of problems in supply planning, namely:

- lack of integration and cooperation of counterparties in the supply chain and lack of joint planning;
- interfunctional and interorganizational inconsistency;
- complex management structure and complex organizational structure;
- lack of centralized planning of transport and logistics activities of business units of PJSC "Vysochaishy".

Since the purpose of this publication is to introduce the methodology of supply chain planning for PJSC "Vysochaishy", it should be note that for the successful implementation of this goal, certain conditions must be meet:

1) the correct forecasting of prices, demand for products, sales of the company, where the price forecast is the determining moment and actually determines the company's revenue;

2) accurate forecasting of production and mining capacities of the company;

3) the conformity of the sales plan with the plan of the main activities of the company;

4) motivation of company employees.

The process of introducing a new planning system is complex and time-consuming, therefore it should be carry out with thorough preparation in several stages, consider them:

Stage 1 - Preparatory work:

1) the rationale for the implementation of the new planning system;

2) the creation of a design team;

3) training of the project team;

4) development of a plan for the modernization of the information-analytical system;

5) the formation of data packets.

Stage 2 - Implementation of strategic analysis and planning: prices and demand, exploration, production, production, logistics, financial.

Stage 3 - Implementation:

1) development of corporate policy for the integrated planning process;

2) implementation of the integrated planning process;

3) the implementation of the process of monitoring and evaluating effectiveness;

4) elimination of errors.

The whole procedure for introducing a new planning system should be complete in 12 months. The first phase should take 1-3 months, the second phase 3 months and the third phase from 5-7 months.

Consider in more detail the stage of creating a new planning system, shown in table 1.

Table 1 - the Strategic planning process of the company PJSC "Vysochaishy".

Planning stage	The content of the planning stage
The process of strategic analysis and the formation of a strategic development plan of PJSC "Vysochaishy"	- based on analytical information about the external and internal environment of the company, a forecast of prices and demand for products is carried out; - from the developed alternatives, the optimal variant of the functional strategy is selected; - development of a medium-term plan for 18-24 months.
Gold sales forecasting and demand planning process	- determination of the forecast of demand for the year. This stage is carry out with the involvement of third-party consulting and marketing agencies, large customers of the company, as well as company sales analytics for past periods.
R&D Planning	- development of new approaches in the field of exploration (for example, the development of new geological and mineralogical studies of primary ores.
Core business planning	- operational planning for exploration, mining and production of gold; - tactical planning for exploration, mining and production of gold.
Approval of Final Plans	- consolidation and approval of the sales and operations plan; - coordination of tactical and strategic levels of planning.

The result of this planning phase is a consolidated sales and operations plan, which includes the basic functional plans of PJSC "Vysochaishy", namely: price forecast and demand plan, exploration, production, production, R&D, logistics plan (logistics plan, transportation and storage support plan), financial plan.

According to the new scheme of operation of the transport and logistics system, the direction of logistics flows will be as follows PJSC "Vysochaishy":

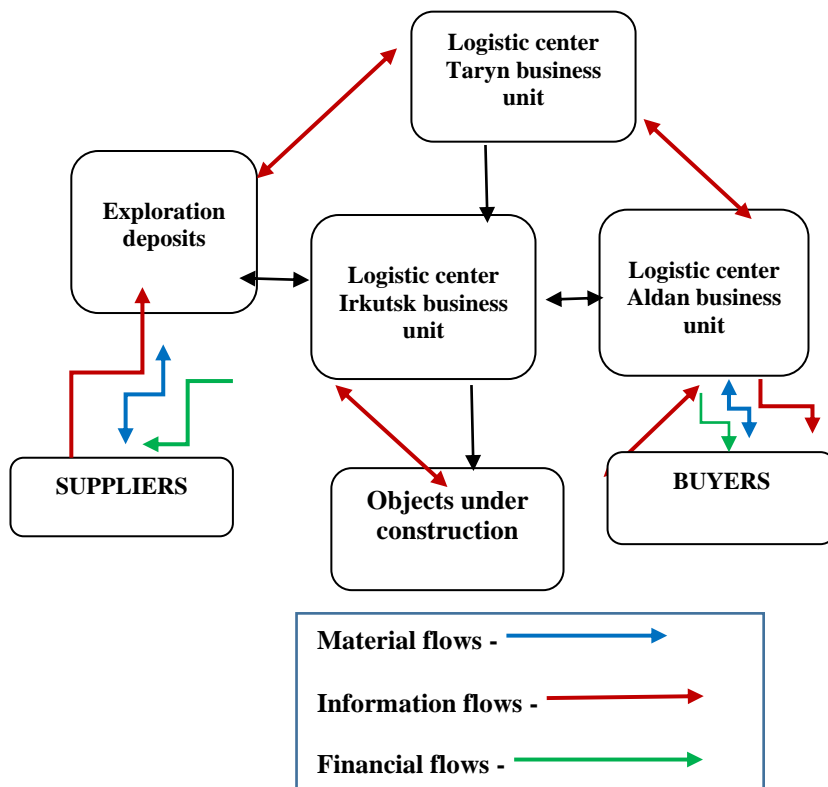


Fig. 2 - Logistic flows of PJSC «Vysochaishy» according to the new planning system

Planning and implementation of procurement / supply processes and control of supply chains in PJSC "Vysochaishy" is carry out through the S & OP-model system.

Given the specific features of the gold mining industry, the following suppliers present this information system on the market: SAP, Oracle, Manugistics Inc., JDA Software, Manhattan Associates, Tools Group. It should be note that all suppliers supply products that take into account industry specifics of gold mining companies. However, it should be note that companies must make their choices based primarily on the ability to integrate new information modules with existing systems, and of course take into account the pricing policy of product suppliers. The cost of one of the most suitable modules for PJSC "Vysochaishy" given in table 2:

Table 2 - Cost of implementing and supporting the S&OP module for PJSC "Vysochaishy"

Name modules	Price, rub.	Module maintenance cost per year per user, rub.	Number of users	Total (service cost x number of users)
Advanced Supply Chain Planning	1 168 500	68 400	42	4 041 300 (=68 400 x 42 + 1 168 500)
Strategic Network Optimization	1 254 000	85 500	36	4 332 000 (=85 500 x 36 + 1 254 000)
Total				8 373 300 (=4 041 300 + 4 332 000)

Thus, the total costs for the implementation and training of the S&OP module, allowing to plan and improve the effectiveness of the existing supply chains of PJSC "Vysochaishy", will amount to 11,973 thousand rubles.

The implementation of this module will allow PJSC "Vysochaishy" to achieve the following results:

- reduction of logistics costs;
- increase the turnover of materials and equipment;
- reducing the cost of transport and storage facilities;
- reduction of customs costs
- improving the accuracy of planning (forecast) from 18% to 25%;
- increase in sales revenue from 10% to 15%;
- reduction of delivery time: from 10% to 50%;
- reduction of stocks from 18% to 46%;
- increase productivity from 30% to 45%.

Among other things, to optimize the supply chain planning process for PJSC "Vysochaishy", the introduction of additional jobs at the central link of the company's logistics system in the Irkutsk business unit, project team, as well as training in using the S&OP module will be required. The costs of these activities are presented in table 3.

Table 3 - the Cost of training and implementation of additional staff PJSC "Vysochaishy"

Company employees	Training, thousand rubles / training package	Number of persons	Introduction of new employees (payroll per year), thousand rubles	Total (training for 1 person x number of people + payroll for the introduction of new employees)
Sales department	30	3		90 (=30x3)
Development Management Department	30	3		90 (=30x3)
CEOs of structural business units	30	3		90 (=30x3)
Head of Finance	30	3		90 (=30x3)
Head of Development	30	3		90 (=30x3)
Head of Exploration Department	30	3		90 (=30x3)
Head of Production and Production Department	30	3		90 (=30x3)
Logistics Manager	30	3		90 (=30x3)
Head of Planning	30	3		90 (=30x3)
PJSC staff	30	9	1080	1350 (=30 x 9+1080)
Logistics Department	30	12	1080	1440 (=30 x 9+1080)
Total		48		3 600

The following measures were recommended to solve such problems: the introduction of the S&OP demand and sales planning information module, which allows you to plan the organization's activities at each stage, streamline supply chain processes, optimize them, reduce losses / downtime, increase the efficiency of the company's activities, and create a centralized logistics center in the Irkutsk business unit of PJSC "Vysochaishy" to increase the efficiency of logistics chains.

4 Conclusions

Based on the study, such problems identified, as due to the lack of systematization in the procurement process of materials and equipment, it is quite difficult to systematize the procurement plan of materials and equipment, since the procurement function performed by several departments at the same time, having a low level of consistency among themselves. When purchasing materials and equipment, stocks in warehouses are not always take into account. Because of this, it turns out that some MTR reserves exceed real consumption, and part of the inventories becomes unclaimed and illiquid. At the same time, unclaimed and illiquid inventory items are not always quickly removed from storage facilities and open areas, but continue to be stored, thereby occupying a useful storage area for incoming materials and equipment. Other most commonly used types of materials and equipment purchased in insufficient quantities, which should cover the need.

To solve such problems in this article, the following measures are recommended: the introduction of the S&OP demand and sales planning information module, which allows you to plan the activities of the organization at each stage, streamline supply chain processes, optimize them, reduce losses / downtime, increase the efficiency of the company, and create Centralized logistics center in the Irkutsk business unit of PJSC Vysochaishy to improve the efficiency of logistics chains.

The implementation of the proposed measures will contribute to improving the qualitative and quantitative indicators of the activities of PJSC Vysochaishy: reducing the cost of material and technical supplies; increase the turnover of materials and equipment; reduce the cost of transport and storage facilities; reduction of customs costs; increasing the accuracy of planning; reduction in stocks; increase company productivity; reduce delivery time.

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