THE IMPLEMENTATION OF THE INNOVATIVE PRODUCTION PLANNING IN VSMPO-AVISMA CORPORATION: PROBLEMS AND PERSPECTIVES

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Abstract

The authors of the paper study the experience of implementing the first phase of the innovative production planning in VSMPO-AVISMA Corporation (Russia), which is one of the world's largest producer of titanium with the workforce of about 20 thousand employees. The company is known for its complete production cycle, which ranges from the processing of raw materials up to the supply of the finished production with the high degree of mechanical processing to the market of 50 countries. The researchers analyse the number of problems, which arise within the planning process at VSMPO-AVISMA. Examined are the data on the degree and uniformity of work capacity, smoothness of production flow, the duration of production lead time and the accuracy of enterprise order implementation. The first phase of VSMPO-AVISMA innovative production planning is said to be aimed at improving the quality of customer service and operational efficiency. The authors propose to improve the process of production planning and dwell upon the necessity of transition from discrete (monthly) to continuous planning based on customers' orders. The researchers define the key performance indicators, which should form the basis of the motivation system in the process of implementation of the innovative production planning.

Key words: innovative production planning; quality of customer service; production efficiency
JEL Code: L61, O21, O32

Introduction

Growing competition in the market, increased customer requirements and globalization make the enterprises become more attentive to the needs of their customers and to faster improve the quality of customer service. Well-known research companies predict that over the next few years customer satisfaction will become a major competitive advantage (Marquardt et al, 2017).

The world's leading titanium producer and the main supplier for such global aircraft manufacturers as AIRBUS and BOEING, VSMPO-AVISMA Corporation decided not to ignore the growing needs of its customers and to implement a project aimed at improving the transparency of the order fulfillment process and at improving production efficiency (official website of the company). The

corporation plans to achieve these goals with the help of introduction of an innovative production planning system and cooperation with the consulting company LOGIS (official website of the company). Over the past few years, the new generation production planning model has been successfully tested in the Czech company Trinecke Zelezarny and American company Timken Steel (official websites of the companies). In both cases, the results of the projects surpassed all expectations and inspired Russian producers of titanium products.

1 Theoretical aspects of innovation planning system implementation

Over the past decades, the methodology, principles and tools of production planning changed many times. So, the introduction of TQM (Total Quality Management) led to the individualization of customer requirements and development of a client-oriented business philosophy. Later, it also resulted in the requirements to shorten the duration of the production cycle and in the requirements related to low stock levels, reliability in meeting the delivery deadlines, and also to the flexibility of production (Sergeev, 2014).

The middle of the last century was marked by the implementation of material requirements planning systems, first MRPI (Material Requirements Planning) - the system of the first generation, and a little later, in the 70s, the MRPII system –the system based on information processing technology. In the 1990s, the concepts of Lean Production, Just-in-Time, Supply Chain Management, etc. were developed. One of the tasks of these systems was to form a distribution network, capable to guarantee on time delivery of the required goods to the right place at the minimum level of expenses (Voronin & Korolev, 2014).

APS (Advanced Production Planning) production planning systems are well known all over the world. These technologies include computer software and hardware that allow the company to change the processes of planning, scheduling, forecasting and distribution, and to interact with the customer and suppliers (Jiang et al, 2017). There are a number of studies of the production planning process for metallurgical enterprises. For example, some researchers study the problems of the balanced use of production capacities (Lenort et al, 2014).The issues of optimal technological process planning with various constraints are in the sphere of interests of others (Relich et al, 2014). Nevertheless, real life proves that standard APS technologies do not lead to the expected results and can even worsen the current situation (Konvichka & Solodovnikov, 2015). At present, companies use more advanced APS systems of the new generation (also known as APSII), which work within the complex planning environment and are, therefore, used to achieve the most ambitious strategic goals of the largest industrial companies.

2 Problems of the existing planning system in VSMPO-AVISMA Corporation

The process of planning and execution of an order in VSMPO-AVISMA has several stages, presented in Fig. 1.

Fig. 1: The main stages of the order planning and execution process in VSMPO-AVISMA

It was found out that some improvements are possible at each stage and that there are reserves for efficiency growth. Changes are mostly required at the last two stages. Thus, the analyses of the production planning stage revealed that the Corporation huge stocks and a long production cycle. More detailed calculation of the production cycle is given in Table 1.

Tab. 1: Indicators of the production cycle of the Corporation for 2013-2015.

Indicators	2013	2014	2015
1. Revenues (thousand rubles)	46131329	54776368	72660167
2.The cost of sales (thousand rubles)	28689468	31268505	36238591
3. Inventories, total (thousand rubles)	21672004	20517934	21672004
3.1. Raw and other materials	9889867	10315430	11515306
3.2. Work in progress	7115836	7075046	5882435
3.3. Finished goods	3148912	3108812	4188527
4. Ratio of turnover of raw and other materials	2.9	3.0	3.1
5. Factor of turnover of work in progress	6.5	7.7	12.3
6. Coefficient of finished products turnover	14.6	17.6	17.3
7. Period of raw and other materials turnover (days)	124	120	116
8. Period of turnover of work in progress (days)	55	47	29
9. Turnover period of finished products (days)	25	20	21
10. Production cycle	**204**	**187**	**166**

Source: Accounting Statements from the official VSMPO-AVISMA website

It can be seen that the volume of the production cycle was reduced from 204 to 166 days for the period from 2013 to 2015. This indicates that the company's management is making efforts and implementing measures to increase production efficiency. But, at the same time, the "best

practices" of metallurgical enterprises (having such technological cycle and implementing an innovative planning system using the LOGIS method) prove that it is possible to reduce the production cycle to 70 days.

Analysis of the level and uniformity of equipment loading has shown that the average load at the enterprise is 60-70%, in case of some critical resources it reaches 95%. For example, the loading of the press in the Producing Authority 21 is only 40%. Besides, in some cases there is no reliable data for planning the loading of equipment.

Cyclograms are a graphical representation of a production plan (or production schedule). The Corporation has the experience of making cyclograms, though it was revealed that the cyclograms are not sufficiently associated with the production plan, and there is no automation of the process of making the cyclograms for all the producing authorities of the enterprise. Among the other shortcomings identified at all stages of the planning and execution process in VSMPO-AVISMA are such as:

• a high proportion of manual labor;

• the difficulty of finding the required information, because the basic information is presented only in paper form;

• lag of data on actual balances of materials and work in progress;

• impossibility to evaluate the consequences of decisions made for different producing authorities;

• discreteness of planning;

• detailed planning only at the level of marketable products (problems with the planning of semi-finished products).

Thus, it has been revealed that the enterprise does not have a common planning methodology and there is sufficient potential for the introduction of an innovative system of production planning.

3 Introduction of the first stage of innovative production planning at the enterprise

In 2016, the management of VSMPO-AVISMA decided to launch an innovative production planning system. During the period from2014 to2016 the management of the company and the specialists from LOGIS prepared the project documentation and identified the main stages of the system implementation.

The purpose of the first stage of implementation of this system is to improve the quality of customer service and production efficiency. It should be noted that this goal is sufficiently global and can be formulated with various amendments for subsequent stages of innovation planning.

The stage of implementation of the new planning system involves about 100 people of VSMPO-AVISMA personnel; they are managers and specialists in the field of technology, computer technology, computer graphics, economics, etc.

More specific tasks of the first stage of innovation planning are aimed at the improvement of two basic processes:

1. The process of selecting material for a specific order.
2. The process of power balancing.

Titanium production in the Corporation is partly an experimental production, which means that there is no universal technology and there is need to adjust the available production capacities for a specific order, multivariance and alternative. About 20% of all products of the enterprise are non-serial (non-standard) products, which complicates the production of a balanced production plan (production schedule).

In general, the basic ways of improving the production planning methodology of VSMPO-AVISMA Corporation are presented in Table 2.

Tab.2. The basic ways of improving the technique of industrial planning in Corporation

Ways of Improvement	Detailed Description
1. Transition from discrete to continuous planning	Planning based on monthly plans is replaced by order-based planning (order planning)
2. The need for the solution of basic planning issues (before the start of the production process)	- Preliminary material planning - Timely capacity balancing
3. Transparency of the plan	Clear understanding of the consequences of the changes made for different participants in the process (workshops, services)
4. Effective change of the plan in case of external condition change	If necessary, the production plan can be changed on a daily basis.
5.Consistent source of information available for all stakeholders	All the participants of the production planning have access to the unique information system (all changes are made regularly).

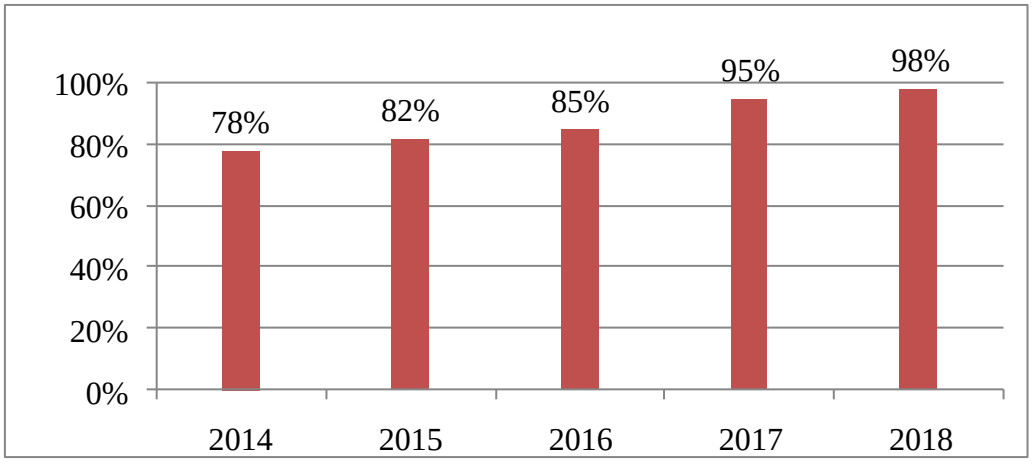
6.A uniform approach to the planning of marketable products and semi-finished products	Drawing up a single plan for production orders, which considers both marketable products and semi-finished products

In addition, before the introduction of an innovative planning system, there were no specific dates for the fulfillment of production orders; at the present time there is a specific date for the beginning of the order's fulfillment and the fixed date of its completion.

When developing a production plan, one is to consider time limit, technological and human resources. The ideal plan for a metallurgical company should provide a minimum number of detained orders. In general, the discipline of shipments at VSMPO-AVISMA before the introduction of the project was 70-80% (the number of orders completed on or before the deadline). For the key customers, such as BOEING, the shipping discipline reached 97%. But there was also a number of strategic products, which discipline of shipments reached only 50-60%.

Figure 2 shows the actual and target indicators for the "just in time" shipment of commodity products (in accordance with the development strategy of VSMPO-AVISMA Corporation).

Fig. 2: The share of commercial production of VSMPO-AVISMA Corporation, shipped to the consumer "just in time"



It is possible to reach this target indicator in case if all the participants of the innovation planning system are efficient and well-coordinated. And, first of all, these are people (human resources), who require a special approach from the management of the Corporation and need support with the help of various motivation tools. If earlier the most important task of the planning process was to achieve maximum production volumes, the main current priority is to achieve customer satisfaction. The new motivation system in the Corporation is only beginning to be developed, it remains to study the best practices of colleagues implementing Lean (Grant &

Hallam, 2016) and a similar system of innovative planning. But, at the same time, it is clear that the following key indicators will be included in the formation of motivation tools:

1. The accuracy of the order execution (proximity to the date of products shipment).

2. The amount of stocks (minimization of stocks of raw materials, finished products and work in progress to their optimum level).

3. The level of equipment loading (maximizing the load level for the production of a balanced production schedule).

These indicators can be considered in more detail and be tied to the participants of the planning only after obtaining concrete results of the first stage of the innovation process; they may also include the questions of further research of the authors'.

Conclusion

In order to improve the quality of customer service and operational efficiency, VSMPO-AVISMA, the largest metallurgical corporation, has decided to introduce innovative production planning based on APS systems of the new generation.

The researchers managed to identify the problems of the existing planning system. The long production cycle of commodity products, a high proportion of manual labor and the absence of a unified planning methodology for all divisions of the company turned to come first on the list. The researchers formulated the main directions for the improvement of the methods of production planning, specified the target indicators for shipment "just in time" to 98% by the end of 2018. The authors of the paper identified the areas for further research on the introduction of innovative planning. These spheres are mainly associated with the formation of tools for motivation and further improvement of the production efficiency of the Corporation.

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