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PRODUCTION AMALGAMATION'S "BELARUSKALI" POTASH DELIVERY SYSTEM ANALYSIS FROM LOGISTIC POSITIONS

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Abstract. Belarus is one of the largest manufacturers of potash fertilizers. Geographical remoteness from commodity markets and absence of its own exit to sea require transshipment of production in foreign seaports. In this article, the author is analyzing, deriving from logistic considerations, according to which principles of such delivery system should be designed, what can be the criterion of its efficiency, how volumes of cargo transported through various channels influence self-organizing capacity of the system as a whole, and what is the synergetic effect on the logistic system. The questions of designing logistic systems considered in this article on the example of potash fertilizers are, in many respects, common to all Byelorussian exporters.

Keywords: Production Amalgamation "Belaruskali", potash delivery system, logistics, synergetics, logistic system, size of freight traffic.

1. Introduction

Republican unitary enterprise Production Amalgamation *Belaruskali* is included into the number of the world's largest manufacturers of potash fertilizers.

Most of *Belaruskali's* deliveries are carried out in the countries of Southeast Asia (China, India and Malaysia) and Latin America (Brazil). Distribution of export deliveries among consumption regions is shown in Fig 1. In total, potash is delivered into more than 60 countries of the world.

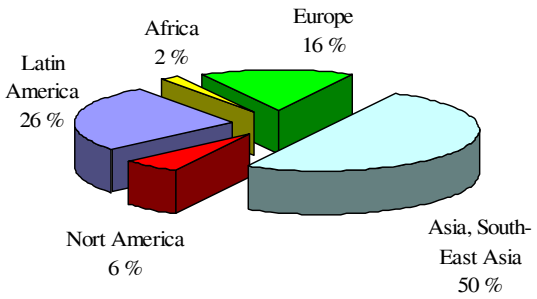

Fig 1. Distribution of Byelorussian potash export volumes among consumption regions (approximately)

Geographical remoteness from the basic consumers has caused the most of deliveries to be carried out by sea transport. Absence of Byelorussia's own exit to sea causes deliveries of mineral fertilizers through foreign ports. In these conditions, the share of a transport component in the final price of production for commodity markets is rather significant.

2. Logistic principles

Currently existing and probable systems of potash fertilizers delivery should be considered from positions of logistics. That means from system positions, while the maximum effect is achieved due to close integration of all parts of the logistic chain interested primarily in *Belaruskali's* production competitiveness increase. Major direction of the modern manufacture efficiency increasing does not consider minimization of charges on each of intermediate parts of its manufacture and delivery to the consumer, but reduction of expenses as a whole – from initial raw material, several stages of processing, end-product manufacturing, and its promotion on the market to the consumer. Thus, the reduction of charges is achieved only through synchronization of all parts of the chain. Due to that expenses are minimized and the output of production on higher competitive level is finally achieved.

The logistic approach to delivery system construction also means strict conformity of the enterprise marketing strategy and a system orientation to compliance with the foreign trade contract requirements. Marketing strategy of all world potash manufacturers is based on the following principles, allow-

ing to keep stable prices and raise sales volumes systematically:

- ensuring world market stability through strict conformity of export volumes to the current demand;
- maximum expansion of sales geography in order to smooth fluctuations of demand in separate regions;
- realization of full control over movement of the goods from the manufacturer up to the end user.

Formed delivery systems should also provide work reliability of the basic enterprise, which is the major demand. Organizational and technological decisions regarding the construction of delivery systems should not limit intensity of extraction, processing of raw material and output commodity shipment.

Based on logistic principles, *Belaruskali's* delivery system and its effectiveness analysis means orientation to total logistic effect estimation from the association of separate elements into a logistic system. Such logistic system is the system of potash fertilizers delivery in different ports, located in various sea pools and states. Maintenance of a high competition between ports (channels of logistic system) allows to play on reduction in expenses due to a favorable tactical situation. The choice of optimum amount of transshipment ports has direct influence on logistic system's stability against negative factors of technical, natural or social character.

3. Criterion function

Finally, creation of effective potash fertilizers delivery systems is targeted towards increasing net profit gains, which are formed due to application of progressive systems of delivery and sales. As practice shows, potash fertilizers are most often delivered on *CIF, FOB, DAF* or *EXW* (Incoterms 2000) conditions.

As a criterion function describing efficiency of logistic system, a margin of additional profit (a gain of net profit), which is achieved through sales of production on different conditions, may be used:

$$F = \Sigma M_j^{CIF} y_j Q^{CIF} + \Sigma M_i^{FOB} x_i Q^{FOB} + \Sigma M_k^{DAF} z_k Q^{DAF} + M^{EXW} Q^{EXW} \to \max, \quad (1)$$

where M_j^{CIF}, M_i^{FOB}, M_k^{DAF}, M^{EXW} – is the margin of additional profit by production deliveries on *CIF* conditions to *j*-th port of an unloading, on *FOB* conditions to *i*-th port of loading, on *DAF* conditions to k-th frontier point, and on *EXW* conditions, \$/ton, accordingly; y_j, x_i, z_k – is the share of freight traffic through j-th, i-th ports, k-th frontier point, in all volumes of production sold on *CIF*, *FOB*, *DAF* conditions, accordingly; Q^{CIF}, Q^{FOB}, Q^{DAF}, Q^{EXW} – are volumes of production sold on *CIF*, *FOB*, *DAF* or *EXW* conditions, accordingly, ton/year.

Transition to more complex delivery conditions with the purpose of a net profit gain, for example from *DAF* to *FOB* or from *FOB* to *CIF* is priority in Byelorussian foreign trade development. Requirements to delivery systems at such transition become more volumetric, more rigid and deserve separate research.

Currently, most of exported production (about 90 %) is delivered on *FOB* conditions. Thus, criterion function assumes the following:

$$F^{FOB} = Q^{FOB} \sum_{i=l}^{n} M_i^{FOB} x_i \to \max. \quad (2)$$

The criterion function has a number of restrictions regarding the amount of transshipment ports (channels of logistic system); maximum capacity of logistic system channels; amount of rail cars and their turn on a direction; allocation of constant and variable freight traffic; definition of minimum streams providing competitiveness of the channel; account of characteristics of terminals and transshipment ports, etc.

4. Freight volumes: not only a decision

The logistic effect is the effect of synergy observed in the design of the system from various elements, very different and functionally sufficiently independent. Thus, transition of the whole delivery system to the essentially new level is achieved due to the new properties of the whole system, which were not characteristic to its separate elements.

The synergetics pays attention to the things, which remain behind frameworks of consideration in traditional approaches. Unlike the traditional approach to development of algorithms and methods allowing operation of the system in the set of parameters, the synergetics studies self-organizing systems in the context of changes within managing parameters.

The most important managing parameter by consideration of *Belaruskali's* production delivery system is the size of freight traffic passed through every channel of logistic system and influencing its self-organizing capabilities.

The following schedule (Fig 2) reflects processes of additional profit margin change due to granting discounts to the tariff for transportation, transshipment, storage of cargo in i-th channel of logistic system.

Volumes of transported cargo in channels of logistic system do not merely represent the result of the distribution decision between transshipment ports. The volumes of production scheduled to transportation, transshipment and storage are the most powerful factors of influence on system channels, forming logistic system as a whole.

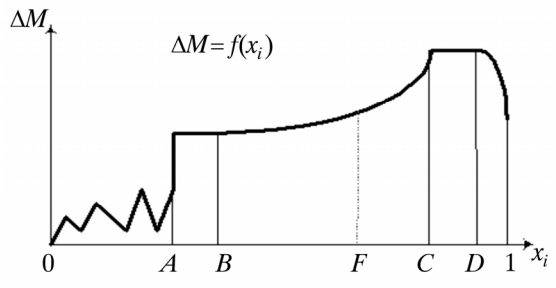

Fig 2. Dependence of the additional profit margin gain on changes of transportation volumes in i-th channel of logistic system

Movement on an abscissa axis from $x_i = 0$ up to $x_i = A$ is the process of accustoming the channel to the passing of the given freight traffic. Small volumes of transported production on this section cause absence of constant loading and incidental work with different financial results.

In point *A,* "saturation" of the channel takes place, allowing to stabilize work, create preconditions for the organization of steady connections between elements in the channel (carrier, stevedore, sender, forwarding agent, etc.) and it is essential to the increase of an overall performance. Volumes of transportation in point *A* are the minimum volumes of freight traffic, providing serviceability and competitiveness of this direction. Section *AB* illustrates stabilization of work in the context of increased volumes of transported cargo.

In point *B,* "the critical weight" of the freight is formed, allowing to achieve discounts from tariffs due to further increase in transported cargo volumes. The additional profit margin rising in section *BC* characterizes process of gaining discounts due to the increase in the volumes of transported cargo. At the same time, higher volumes of transported production mean that bigger discounts can be given. Therefore, regression $\Delta M = f(x_i)$ is not linear.

In point *C,* scale effects with carriers, forwarding agents or stevedores is exhausted, it characterizes absence of reserves in gaining discounts due to further increase in transported cargo volumes. Section *CD* shows that further increase of volumes does not entail further increase of the additional profit margin.

Point *D* characterizes condition of logistic system, in which most of manufactured production goes through l-th channel, and the sizes of freight traffic in other channels, for example k-th channel, become smaller than volumes providing competitiveness of direction *k*.

Further increase of the total freight traffic share, in l th channel characterizes process of the channel's competitive degradation; efficiency of all logistic systems is reduced, the additional profit margin falls.

Additionally, there is point *F* describing possible restrictions to carrying and processing capacities of the i-th channel. In this case, further movement behind point *F* will be characterized by decreasing additional profit margins due to increasing idle time, pending processing, reductions in the turn of cars, etc.

5. Conclusion

Summarizing the above mentioned characteristics, it is important to regard the logistic delivery system of *Belaruskali's* production as a system consisting of a number of channels. At the same time, each of the channels consists of chains (elements) providing movement of material, information, and financial streams. Such chains are railway and frontier transfer stations, transshipment ports, stevedore terminals, forwarding companies, bodies of customs and state control, banks, etc. The logistic effect is the effect of synergy, and it is achieved through rational distribution of freight traffic between transshipment ports (channels of the system). Thus, not only do the volumes of cargo transported through the channels of logistic system represent the result, but they are also the most powerful factors of influence, forming logistic system as a whole.

The questions under consideration in this article are characteristic not only to *Belaruskali's* production delivery systems. The majority of exporting enterprises in a state, which has no exit to sea, face similar problems of choosing transshipment ports, defining the size of freight traffic, and synchronizing chains of delivery.

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