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LARGE MINERAL AND CHEMICAL COMPANIES AND THEIR REACTION TO CALLS OF GLOBAL ECONOMY

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Abstract. The development of economy in terms of globalization, growth of innovative technologies provide changes in corporate strategies of the mining global companies. The research objective is to forecast export strategies of the head phosphate producers. Key results of the research: new regularities of the mineral resources markets were found out; approaches to management of companies was put forward; a forecast of the global phosphate market's development was made; factors of manufacturing new and traditional types of product were found out.

Keywords: global market, competition, mineral and chemical company, rare-earth metals, phosphate fertilizers.

JEL Classification: F15, L22, L72.

MINERALINIŲ IR CHEMINIŲ MEDŽIAGŲ KOMPANIJŲ REAKCIJA Į PASAULINĖS EKONOMIKOS IŠŠŪKIUS

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Santrauka. Nauji globalizacijos veiksniai ir pažangių technologijų plėtra daro įtaką žaliavinių kompanijų strategijoms. Šio tyrimo tikslas – prognozuoti mineralinių ir cheminių medžiagų sektoriaus eksporto strategiją. Pagrindiniai rezultatai: atskleisti nauji mineralinių žaliavų rinkų dėsningumai; patikslinti požiūriai į įmonių valdymą; sudaryta pasaulinės fosfatų rinkos kitimo prognozė, įvertinant tradicinių ir naujų rūšių produktų gamybą.

Reikšminiai žodžiai: globali rinka, konkurencija, mineralinių ir cheminių produktų bendrovė, retieji žemių metalai, fosfatinės trąšos.

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Introduction

According to intensification of business competition on the global resources markets, degradation of business environment, decrease of the investment activity and high-profitable giant fields depletion international majors in mineral resources industry develop new competitive advantages so that to sustain effective operations on global market.

The new global challenge facing the world community is to solve food problem and provide economic growth and in presence of the finiteness of land resources it requires planned and balanced gain in agricultural production output by increasing yield capacity. The mineral fertilizers (principally nitrogen (N), phosphor (P) and kalium (K)) play key role in this process. 24% of the world demand capacity for mineral fertilizer sis accounted for by phosphor. That is the reason why the major volume of the phosphate raw materials extraction provides the production of mineral fertilizers. The global market of phosphate fertilizers is notable for demand prevalence over an offer caused by the finiteness of the global phosphate-resources base.

The technological business integration is a clear trend in this sector. The formation of the integrated corporate structures ensures an active role in global economy for both mature and emerging economies. The integration process provides company with competitive advantages but restricts the alternative capabilities for its business. For this reason this process can be described as complex process. Modern mineral commodity markets are the oligopolies where the degree of participant's freedom and mode of entry are predicated upon the market's structure. The high level of concentration and prevalence of large diversified, integrated and network structures are common to companies operating at the mineral resources markets.

Changing tendencies of the global mineral resources markets are due to the determining influence of such factors as: markets globalization, decrease of economic environment, intensification of business competition, development of innovative processes and decrease of investment activity.

The research objective is to forecast export strategies of the head phosphate producers according to the variety of approaches to the strategic behavior's models choice with account of degradation of business environment, globalization of the phosphate market, intensification of business competition and decrease of the investment activity.

Research techniques:

– It was gathered and summarized the data from the mineral and chemical companies' corporate reports for 5 years. Integration factors and expected changes in external environment were estimated. All data related to the consolidation and acquisition of companies in mineral and chemical industry for 5 years was picked up and analyzed. It was worked out complex approach due to system, scenery, situational and monetary approaches to management of the mineral and chemical companies. The statistical analysis of demand factors for the mineral and chemical production, ethanol's production. A review of the rare-earth elements was carried out.
– Methods: analysis of the theory of the integration cooperation and sectorial markets, analysis of the models of the strategic behavior, strategic analysis of the global phosphate market, forecasting methods, methodology of the system approach and situational analysis.

1. Theoretical framework

The estimation of integrative processes' motives and effectiveness is distinct in variety. The neoclassic approach of economics colligates integration not only with increase of the effectiveness but also with possibilities to gain monopolistic advantages and technological factor of production. The exponents of the institutional approach of economics inquire into integration process in terms of transaction costs, agency relationship and property's influence. The dynamic competitive advantages economics approach considered the integration in a context of innovations and adaptation to the lifecycles of products and technologies.

According to the neoclassic approach of economics the main goals of integration are market power's strengthening (Chamberlin 1962: 38–44; Robinson 1933: 28–40); technological benefits generated by the union of the successive manufacturing process's stages; reduction of risk and uncertainty (North 1990: 69–76); slackening of tax and price control. That's why effectiveness of integration will depend on degree of production factor's intersubstitutability; the circumstances of competition and market structure (Bain 1968: 113–118; Clark 1961: 94–98). The "structure–behavior–performance" reflects interaction of market structure, company's behavior and strategy's effectiveness (Pakhomova, Richter 2009: 18–35).

The main disadvantage of the neoclassic approach of economics is that a company is considered to be based on absolute cooperation. And this problem gave rise to development of the institutional economics conceptions. According to the institutional approach a company is considered as a complex of long-term contracts that emphasizes cooperation of economic subjects.

Main advantages of integration are the high level of adaptivity and steadiness against the background of uncertainty as well as contract's protection. Williamson (1985: 40–47) put forward innovative rendering of strategic relationships based on interdependence of participants and long-term contracts. Reduction of transaction costs and its internationalization inside company are considered to be as integrative factors as well as rundown of a contingency

of property priorities which have negative outer effects and solution of external problems and problem of assets' peculiarity. The founders of institutional approach of economics considered integrated company as coalition of resources' owners on the one hand (Cheung 1983: 4–7) and as cluster of interdependent assets on the other (Alchian, Demsetz 1972: 780–784).

The stakeholder theory framed renovated representation of an integrated company as "a company mobilizes its resources towards producing a wealth and other profits (exclusion of purposeful wealth destruction, prejudice and intensification of risk) for numerous concerned parties" (Post *et al.* 2002: 35–56). A company's integration is aimed at long-term development performed to reconcile the interests of concerned parties due to system approach to economic, social and ecological business management. We consider the priority of the stakeholders' interests which causes the resources mobilization as well as its effectiveness to be right.

The dynamic competitive advantages are related to the rivalry of old methods with new innovative ones (Kirzner 2001: 87–95; Hamel, Prahalad 2002: 65–80) substantiated this approach in their works. This approach conform the development of modern innovative economy in the most comparable way. The dynamic facilities are the organizational operations and tools by means of the management operate the resources base and company's potential towards strategy formation (Grant 2003: 52–58, 2011: 180–205; Teece *et al.* 1997: 511). New sources of competitive advantages can be created by the instrumentality of working out new products, concluding the strategic alliances between companies, other organizational innovations generating incremental benefits.

There are three most popular key forms of integration. The horizontal integration often is the extent of competitive and antimonopoly legal system. That is the reason why it is not widely occurring. Diversification and conglomerate integration deceive the effects to be expected so these alliances are fragile. Integration processes historically are connected with the technological business integration.

As advantages of the technological integration can be mentioned the decrease of costs of production including transactional costs, reduction of indirect taxation of intermediate products, ability to implement capital-intensive projects, high resistance to negative market environment's fluctuations.

As for technological integration disadvantages, there are large percentage of direct investment in one particular industry corporation, increase of business risk during industry stagnation, company's overdependence on its departments, necessity of balanced producing process according to stages of operating cycle, decrease of company flexibility, possibility for monopolistic control.

The researches held in Saint Petersburg Mining University found out the main problems of integrative companies' cooperation (Sergeev, Ponomarenko 2011: 104–108; Ponomarenko, Sergeev 2012: 23–31):

- absence of the consistent terminology and approaches to the legal and economic control the integrated structures as well as absence of the standard integrated companies' classification;
- variety of concepts and arguments of integration;
- insufficient justification of estimation proposal of competitive advantages and rational level of integration;
- insufficient development of the estimation methods of corporate integration effectiveness;
- companies' strategic behavior changes influenced by new factors and necessity of mining companies' strategic elaboration;
- absence of the universal business models providing high performance efficiency.

2. Discussion

1. New integrative factors and operating regularities of the mineral resources markets were found out. There are a lot of special aspects of integration in mining industry such as strengthening of innovative productive potential based on the use of integrated technologies, additional facilities of more complete resources extraction and production of new products with higher level of added value and reduction of risks due to operating in different markets.

Recently incorporation has been the distinctive feature of high consolidated global market of mineral fertilizers (Eurochem; Phosagro; PotashCorp). As an example, Mosaic company is the result of business merger of Cargill Crop Nutrition and IMC Global companies. A lot of global companies were interested in buying Potash Corp., one of the largest global producers of mineral fertilizers, such as BHP Billiton Company, Chinese Sinochem Group Company, Brazilian Vale SA Company and OJSC PhosAgro Company. The K+S Group took over Potash One young company. OJSC EuroChem Mineral and Chemical Company took a position of The K + S Group and Belgian part of The BASF and Severneft-Urengoy in 2010 and 2011 respectively. OJSC PhosAgro Company took a position of Metachym and Pikalevo's sodium Company as well as initiated merger of OJSC Cherepovets' Nitrogen and OJSC Ammophos companies. The consolidation of Metachem company's assets was completed. The Potash Corp planned to increase ownership interests in Israel Chemicals Limited from 14% to 25%. Apache Company bought 49% of Burrup in 2012 while Yara International Company's ownership interests increased to 51%.

Despite the certain degree of monopolization it is possible to set up two separate competitive groups:

– global markets' participants generally MNEs having vast sales networks and operating at the majority of the key markets;
– local markets' participants generally operating at one geographically local market and operating under cover of government protectionist measures.

There are the most powerful companies operating at the global mineral phosphate fertilizers market such as The Mosaic (USA), The OCP (Morocco), The Ma'aden (Saudi Arabia), The Yara (Norway) and The PhosAgro (Russia). These companies influence a lot the aggregate offer and framing the rules of the global mineral phosphate fertilizers market.

But there are some local competitors such as The Eurochem, The Uralchem, The PhosAgro, The Akron, JSC Minudobreniya as for Russia. As for Baltic countries there are The Eurochem, The ARVI, The NPK which are aimed to demand of the particular consumers.

2. It was found out the absence of the universal business model and the complex use of the system, scenery, situational and monetary approaches to the management of the mineral and chemical companies was put forward.

The management model selection for company depends on conditions and development of the internal and external company's environment. Strategic company's behavior models were worked out and classified (Ansoff 2000). The selection of the model is due to the expected characteristics of the external environment and the capacity to manage the strategic changes in company. The increasing of interconnection of such external environment's factors as complexity, flexibility and uncertainty proclaims its fast growing changes.

The models suggested (Ansoff 2000: 280–310): reactive model, special management model, long-term planning, strategic planning, strategic management. But these models do not correspond fully to the current and forecast changes of external environment. For this reason it was worked out the complex approach combining system, scenario, situational and cost-based management approaches (Table 1).

As a subject to management the company is regarded as araggregate of interrelated elements having the external environment and internal structure. The scenario approach admits remodeling the strategic behavior of firms in a changing environment. The situational approach based on establishing links between the type of situation and management principles allows considering the specifics of the strategic assets of the mining company. The cost-based approach provides achieving the management objectives aimed at increasing the company's value through the implementation of corporate strategy development.

3. The global growth-stimulating factors were found out and a forecast of the global phosphate market's development for three main segments was made.

Expected changes in the demand for minerals are due to the influence of macroeconomic factors and include three options: pessimistic, most likely, optimistic. Changes in market structure and companies' market power force associated with the processes of integration and disintegration. Forecasted changes in the institutional environment can be quite diverse and include changes in taxation (eg. customs duties), access to mineral resources (auctions), the investment policy's mechanisms (government support and funding, public-private partnerships), globalization (the influence of the WTO), etc.

The global market of phosphate fertilizers is notable for prevalence of demand over supply. Number of regions with deposits of phosphate raw materials is limited, so the market of phosphate fertilizers is highly consolidated. The main suppliers of raw phosphates and phosphate fertilizers are

Table 1. The optimal conditions for the application of management models (source: Ansoff 2000: 280–310)

Management Model	External environment			Internal environment
	Rate of changes	Changes	Periodicity of changes	
Reactive	Slower than company's reaction	Recurring	Infrequent	Traditionally strengths
Special	Corresponds to company's reaction	Logically gradual	Infrequent	Gradual evolution of abilities
Long-term planning	Faster than company's reaction	Logically gradual	Infrequent	New abilities
Strategic planning	Faster than company's reaction	New	Frequent	New abilities
Strategic management	Faster than company's reaction	New	Very frequent	Dynamic abilities
Complex approach	High level of factors' interdependence, complexity, flexibility.	Non-linear, paradigmatic	Very frequent, unpredictable	Dynamic abilities and Strategic assets

the countries with the resource base (de Ridder *et al.* 2012): Morocco, the U.S., China, Tunisia, Russia, Saudi Arabia. 90% of the market is accounted for ten largest producing countries.

Despite the seasonal nature of fertilizer usage, the demand for it is relatively constant. The demand for phosphorus fertilizers, unlike the demand for other types of fertilizers, more stable as phosphorus fertilizers are introduced more often than potassium and nitrogen. The main demand is formed by developing countries in Asia (China, India), Latin America and the Middle East, which accounts for 57% of global consumption of phosphate fertilizers.

The main consumers of phosphates remain industry of mineral fertilizers and feed phosphates producing. Demand in these sectors will continue to grow rapidly, consistently and universally. This increase is due to the following global factors:

- Population growth in the world. According to the United Nations (United Nations) world population will grow at an average annual growth rate of 0.84%. In developing countries, the average annual growth rates of up to 1%. This determines the steady increase in demand for food.
- Growth in per head income. According to the International Monetary Fund (International Monetary Fund) the average annual GDP growth rate over the next five years is 4.5%. Developing countries will be a locomotive of the world economy where the average annual GDP growth of about 6% is predicted. Growth of people's welfare leads to structural changes in the diet – preference is given to protein foods, meat and poultry. In turn, this leads to an increase in demand for feed phosphates and fertilizers.
- Reducing the amount of land suitable for agricultural purposes. The possibility of expanding arable land is practically exhausted. Area of agricultural land per head for 20 years decreased by 1.5 times. This causes the intensification of agriculture, especially in developing countries with rapidly growing population.
- Increased production of biofuels. Due to the increase in global demand arable lands are increasingly used for growing crops as a raw material for the production of biofuels. According to forecasts of the OECD–FAO, the average growth rate over 5 years will be more than 10% (Phosagro).

Thus, demand for phosphorus production is expected to increase in the coming years. While the demand is expanding everywhere, only a few countries have resource base. This fact leads to significant market monopolization. Among developing countries generating major demand for phosphates only China has its own raw material base. However, despite the increase in the production capacity in the next decade China will not be able to meet its needs for high-quality raw materials on its own.

At the same time the instability of phosphates' supply in the world market gives rise to concern. First, it is due to the gradual depletion of ore at existing fields such as deposits in Florida, USA. Secondly, a number of suppliers of phosphates have the export's restriction policy due to the rising of domestic demand for phosphorus-containing products. Thirdly, concerning is unstable geopolitical situation in the Arab countries that are the major producers of phosphate raw materials.

Discrepancy of growing demand and fluctuated global supply of phosphates encourages the maintenance of high prices for phosphates. Currently the deposits with high phosphorus content and low content of harmful impurities are uncommon. Therefore, the poorer deposits are developing increasingly that leads to costs increasing for raw materials.

High prices for the phosphorus production especially for fertilizers (The World Bank) and a tendency for its further growth exacerbate one of the most actual problems of the modern world economy – the problem of hunger in developing countries. While the producers of fertilizers claim its strategic goal of increasing productivity and food security population, high fertilizer prices make it virtually inaccessible to some of the poorest farmers in Africa, Asia and Latin America.

In the near future the growth in demand for phosphates is forecasted for all consumer groups: fertilizers, feed phosphates, technical and food phosphates. Moreover, the competition between these consumers will also gradually increase. This is due to the fact that demand for phosphorus products is formed not only by traditional consumers such as agriculture, building materials industry, food industry, household chemicals. According to the scientific and technological development of various industries the new phosphorus consumers appear. For example manufacturers of lithium-phosphate accumulators that are installed on modern hybrid and electric cars.

Common feature for manufacturers of phosphorus-containing products is a pretty deep processing of raw materials and production of goods with high added value. About a half of the concentrate produced is usually used within the country of manufacture for further production of phosphoric acid and fertilizers. Only a few companies supply their concentrates for export. The situation is similar to the implementation of the phosphoric acid produced. Therefore, the list of the main producing countries of phosphate raw materials is different from the list of the largest exporting countries.

The largest producer of phosphate raw materials – China – does not supply products for export virtually at all. It is connected with the state strategy restricting exports

of phosphorus-containing products due to high prices for phosphate and increasingly growing domestic needs. Since 2012 the government set up 82% export duty for the phosphorus products. As a result of this policy, despite the increase in the production of phosphate raw materials, the export of phosphate fertilizer from China declined by more than 40%. Thus, the global market of phosphate raw materials is represented by only a few companies. The largest suppliers are OCP (Morocco), Mosaic (USA) and PhosAgro (Russia).

The leading country exporting phosphate concentrates (about 13.5 million tons per year) is Morocco. This is caused by the possession of the world's largest resource base, relatively low costs of production, transportation and sales. The state-owned company OCP is a major exporter which has a wide distribution network. The main export markets for Moroccan phosphate concentrates are India, the United States, Western European countries. The OCP export strategy focused on building up a sales share of more concentrated and expensive products. For these purposes, major investments are injected in the modernization of existing production facilities and building new ones. In addition, the OCP plans to increase production of phosphate raw materials from 28 to 55 million tons. Thus, with its huge reserves of raw materials and continuing to implement its strategy of deeper processing and export of products with high added value, Morocco in the foreseeable future will retain its leading position in the global phosphate industry while the OCP will strengthen its influence on world market conditions.

In recent years the global market of phosphate raw materials has its new trend: with growth of domestic demand the largest producing countries become net importers such as China and the United States. The governments of these countries are actively pursuing a policy to reduce the dependence of the national economy on imports of phosphorus-containing products.

In general, the export strategies of world producers of phosphate raw materials are aimed at the production and export of products with high added value, especially fertilizers. This is evidenced by a number of examples when corporations are operating the absorption of high-tech manufacturing units or invest in the construction of new factories for the production of fertilizers. Among such companies can be mentioned OCP (Morocco), Yara (Norway), OCI (Egypt), PhosAgro (Russia) and Ma'aden project in Saudi Arabia.

Also the expansion of markets is purposed in the export strategies of world manufacturers of phosphorus-containing products. Due to the seasonality of fertilizer usage, the specifics of soil in different countries, changes in demand and prices for grain and other factors the demand on phosphorus-containing products is subject to fluctuation. Therefore, one of the main tasks for suppliers is to predict the change of demand geography and quantity demanded for products in the short term as well as to conclude an export contracts.

India being the world's largest consumer of phosphate fertilizers in recent years has purchased mainly nitrogen fertilizer due to rising prices for potash and phosphate. As a result, by the end of 2012 India had recorded imbalance essential elements (phosphorus, potassium and nitrogen) in the soil that caused lower yields and quality of agricultural products. Therefore, in 2013–2014 forecasted recovery of phosphate fertilizer consumption accounts to 7% from the level of consumption in 2012 that is equal to 500 tons of P2O5 (IFA).

According to forecasts of IFA (International Fertilizer Industry Association) and analytical agency Fertecon in the upcoming season 2013–2014 with the growth of world fertilizer consumption by 2.4% outpacing growth demand for phosphorus fertilizers by 3.5% is expected. At the same time the main demand will be formed by high-growth markets in Africa, Central Asia and Latin America. Thus we can expect that the export strategy of phosphates manufacturing companies in the short term in 2013–2014 will focus on expanding its operating in these markets.

4. The capabilities of complex use of mineral raw material were found out based on the generalized conditions and factors of manufacturing new and traditional types of product of mineral and chemical companies.

The global market of phosphorus-containing products is highly organized market. Despite the inherent features of a monopoly it has created an environment of fierce competition. In terms of the phosphate market monopolists are countries provided with the raw material base. However, due to the rapid growth of phosphorus-containing products consumption, the gradual depletion of deposits, the strengthening process of economic globalization the global phosphate market competition will be getting more intensive and the existing structure of consumers and suppliers can change dramatically in the near future. Even today exporting countries are affected by commodity prices changes as well as changes of the world market general environment.

The high growth of global industry, rapid growth of the world population, limited and exhaustible natural mineral resources stimulate the complex use of extracted raw materials. Phosphorus-containing product manufacturers build their long-term development strategy based on the diversification of production in order to reduce the negative impact of such factors as depending on price fluctuations, increased competitiveness. For commodity companies such opportunities lie in the complex processing of mineral raw materials as well as in increasing the degree of extraction of useful components, use a variety of raw materials, the development of supply chain and infrastructure and further integration.

Diversification of production in the mining industry is characterized by the following features:

1) single mineral resources base is developing;
2) total production capacity of the company is used;
3) single technology is used, there is sufficient flexibility in the technological capabilities to produce products;
4) level of complexity, disposability and the rational use of mineral resources is increasing;
5) cost of production, processing and marketing is reduced;
6) more jobs are created as well as the development of human capital is stimulating;
7) available channels of distribution are used;
8) area of disturbed land designated for the storage of waste production and reduced air pollution are reduced;
9) risks associated with the cyclical nature of demand for certain products and market environment are reduced.

A special kind of product diversification in mining is the complete use of mineral raw materials (CUMRM). Rational use of natural resources is achieved by simultaneously or sequentially extracting the valuable components from the raw material as well as using some of the valuable properties of materials. CUMRM projects are characterized by a number of technological and economic characteristics that define its competitive advantages (Table 2).

Quality of raw phosphates and phosphorus waste production allows not only the phosphoric acid production but also fundamentally new products and compete at new markets.

Due to the high level of technological development the European Union and the United States generate the greatest demand for metals that gradually build up its deficit. Saying scarce metals is understood economically significant mineral resources which are exposed to the termination of supplies. Risk of interruption of scarce metals supplies on the world market is due to the several reasons. Firstly, the major part of scarce metals resources is concentrated in a few countries in Africa and Asia which are notable for political and economic instability. Secondly, scarce metals are often found in complex raw materials and can be produced as associated components by a technologically complex and costly processes.

In EU countries studies were conducted to determine the 14 scarce metals which include platinum group metals (PGM) and the rare earth metals (REM).There are five metals particularly the lack of which is critical for energy and energy-saving technologies among them (Table 3).

Table 2. Comparative analysis of product diversification projects and CUMRM (source: authors of article)

Project special aspects	Product diversification	CUMRM
1. Quality of produced products	All types of commercial products are full	Produced both full and by-products
2. Relationship between technological processes and stages	Presence or absence	Communication necessarily presents
3. Usage minerals	One or more kinds	One kind
4. Influencing factors	Demand, competition, the yield of products, innovation, etc.	Demand, competition , the profitability of products, innovation , government regulation, etc.
5. The aim of the project	Profitmaximization	Rational and comprehensive utilization of mineral resources
6. Type of investment project	Independent and complementary	Complementary
7. Management and control methods of the project	Corporate control, economic methods	State control, direct and indirect (economic methods)
8. The main types of risks	Eliminationofdiversifiedrisk	Saving diversified and non-diversified risk
9. Type of cashflow	Flows by product	The total cashflow
10. The procedure for determining the discount rate	Individual discount rate by type of commodity products	Single discount rate

Table 3. Scarce metals, the most critical for the EU economy (source: A review… 2013)

Metal	Market factors		Political factors		Total risk
	Chance of rapid demand growth	Restrictions on expansion of production	Offer's concentration	Political risks	
Dysprosium (REM)	High	High	High	High	High
Neodymium (REM)	High	Medium	High	High	
Telluride	High	High	Low	Medium	
Gallium	High	Medium	Medium	Medium	
Indium	Medium	High	Medium	Medium	

REE group includes 17 elements: yttrium, scandium, lanthanum and 14 lanthanides with unique properties, that is why it's called "vitamins for industry" and its important strategic potential. There are dozens of areas of effective use of rare earth elements in both the military and civilian industries, including high-tech, nano, bio, space, clean technology, nuclear energy, renewable energy technologies, etc. The fast-growing application field of REM is associated with the production of hybrid cars, wind turbines, defense technology, telecommunications, computer and television technology, auto catalysts and petroleum cracking catalysts, lasers, superconductors and fuel cells, metallurgical products with special properties of magnets and materials for rechargeable batteries and battery. Each metal has a specific application.

In the last 50 years the demand for rare earth metals has steadily increased: market volume increased by 25 times. Predictive estimate of demand for REM differ. According to estimates of the Australian company Lynas, global demand for rare earth metals will have increased by 40% by 2014 compared to 2010 (Levin 2011: 97–103). According to Russian National Program, the volume of world demand will be 185 thousand tons/year by 2020. Estimated by consulting company Industrial Mineral Company of Australia (IMCOA), the annual global demand for rare earth metals by 2016 should reach 160 thousand tons and by 2020 it will grow by 50%, reaching 200–240 thousand tons while 130–150 thousand tons of it will be demanded by China. According to the forecast of the analytical group Core Consultants (Voloshin 2013) by 2015 the global shortage of critical REM can reach 20 thousand tons. The REM key customers are the leading countries of the world economy – China (54%), Japan and South Korea (24%), Europe (Germany, France, 13%), USA (8%).

REM offer on the world market is limited – 97% of the market is provided by China. The start of market monopolization relates to the 80th years, when all the countries-producers of rare earth metals were forced to wind down its own production and switch to import of raw materials.

In 1981 giant field Bayan Obo was discovered and mastered in China. China has managed to bring down world prices for REE and destroy foreign competitors. Thanks feedstocks, low environmental standards and cheap labor, China supplied the world market by the REM at dumping prices which led to unprofitable production outside China. After a few years, China has returned prices to "pre-crisis" levels and has become almost a monopoly constantly increasing market volumes. State support for industry associated with financing from the federal budget in China, the establishment of a special fund of the restructuring of production of REM, the formation of strategic reserves of rare earth metals.

Since 2007, China introduced restrictive quotas on the export of rare earth elements while since 2009 merchandise exports decreased by more than 75%. At the same time, the Chinese government in 2009 reduced the number of mines from 400 to 116, tightening supervision over production and reducing the number of small firms. In 2010 China has sharply reduced exports REM completely stopped exports to Japan, severely restricted the American and European manufacturers. In 2012, under threat of sanctions WTO, China has partially restored the export of REM, which is reflected in lower prices. A slight decrease in the planned quotas is scheduled for 2014 along with complete cessation of REM's export by 2015–2016 due to increased domestic consumption.

Further development of this situation is considered to result in the deficit because of physical lack of rare earth metals on the world market. Dysprosium, terbium, neodymium, yttrium, praseodymium, europium will remain scarce in the long run for the major developed countries. In this regard, large consumers of rare earth metals faced a serious problem of its supply. Urgent actions are taken to diversify the sources and to form strategic reserves in national programs. According to the Innovation Metals Corp., by 2012 there was 440 REM projects in 37 countries outside China. The largest – the American Molycorp (19,5 thousand tons) and Rare Element (10 thousand tons), Australian Arafura (20 thousand tons) and Lynas (11 thousand tons), Canada Avalon (10 thousand tons), Quest (12 thousand tons), Frontier (20 thousand tons) (Balashova, Dzhumaylo 2013). In case of the successful implementation of the taken measures China's share in the REM market should be reduced twice by 2020.

The key problems of self-production of REM are generation technologies (innovation) as well as a significant investment. Funding for the production of REM in the world leading economies:

- In the United States a manufacturer of a full cycle (Molycorp-Silmet) established (it has its own deposit, own manufacturing base in the U.S. and Europe including the Baltic states). A special bill introduced in Congress to support the production of rare earth metals including government concessional lending REM state projects under the control of U.S. companies;
- Japan invested $ 1.25 billion in 2010 in the program to establish the State reserve of REM. State (JOGMEC) and private companies (Toshiba, Sujitsu) and other implement projects in Vietnam, India, Kazakhstan, USA;
- European Union generates a resource base abroad. The leader is France which allocates € 250 million to supply security "essential metals" including REM. Development of the production is carried out under the control of REM AREVA in alliance with Rhodia; European Countries enter into agreements with countries producing REM (Germany in 2012 signed an agreement with Kazakhstan and Mongolia) and allocate bank guarantees delivery REM;

– In South Korea, 1.0–1.5 billion dollars allocated to state companies Korea Electric Power Corp. and Korea Resources Corp for promising projects in Africa and Australia.

Russia ranks second after China according to commercial reserves and resources of REM. Various kinds of rare earth minerals are divided into the primary feedstock (natural) and secondary (man-made) sources characterized by metal assay of the light and heavy metal group. Significant reserves allow Russia to develop long-term projects in the area of integrated production and processing of REM.

Technical and economic characteristics of the rare earth production (Valkov 2012: 15–23):

1. In nature there is no individual REM – REM are complex raw materials, actually natural concentrate.
2. Consumer demand changes in time as well as according to the nomenclature of products.
3. The most applicable are "light metals" (lanthanum, cerium, praseodymium and neodymium), less often – "medium" (samarium, europium, gadolinium, terbium, dysprosium, holmium), even less – "heavy" (erbium, thulium, ytterbium, lutetium).
4. "Light" metals are less valuable because of its wider dissemination. Others, including yttrium, more valued in the market.
5. Technological necessity to conduct a complete separation of the concentrate with the release of all elements with a large number (eg 25) steps.
6. The need for all sales made in the domestic or foreign metals markets.
7. Mastering the full technological cycle including the production of high value added products: pure metals and oxides, alloys, high-energy magnets, etc.

Along with the raw resource for industrial production of rare earth metals can be used man-made sources too. One promising source is phosphoric acid, containing 10–20% of REM of their content in apatite ore. It should be noted that there is no ready-to-commercialization technology, pilot tests are conducted. For example, "FosAgro" searches for the optimal technology to improve the depth of processing of phosphoric acid.

However, the greatest interest for the extraction of rare earth metals is phosphogypsum (waste of phosphate fertilizer production). Growth of fertilizer production based on the use of wet-process phosphoric acid leads to an increase in the generation of phosphogypsum. According to preliminary estimates, the global annual production of phosphogypsum is about 215–225 million tons (Kosynkin *et al.* 2012: 47–53). Dumps occupy vast areas and due to the strongly acidic reaction of phosphogypsum have a negative impact on the environment. Therefore, the task of processing phosphogypsum is extremely important not only because of his removal from the valuable elements but also for disposal of environmentally harmful waste and the release of large areas of land. Accumulations of chemical waste in the world have reached a critical value so it becomes a priority task of recycling. Therefore, both in Russia and abroad searching for an effective technology of complex processing of phosphogypsum are held.

Due to the high prospect of this trend in 2012 the company "FosAgro" signed with the Belgian company "Prayon" memorandum on cooperation in the field of extraction of rare earth metals (Phosagro). The Agreement provides the transfer of Belgian technology while transfer of the profits from phosphogypsum processing during the first ten years. Product is a collective group of light rare earth concentrate with high REE content (over 95%). Due to the lack of production in Russia of its processing products will be fully directed to foreign markets.

Thus, the resource base and technological resources of mineral and chemical companies determine the acquisition of new core competencies for their work in the rare earth industry:

1) the development, acquisitiot, planning of innovative technologies of recycling;
2) access to new markets of innovative products and services;
3) active international cooperation and joint projects for the production of rare earth metals on the basis of technological, marketing and financial ties.

Such measures for the integration of Russian companies with Japanese and European manufacturers provide transfer of innovative technologies for processing, obtaining project financing, long-term contracts for the supply of rare earth metals. Organizational integration in the form of alliances and joint ventures can lead to a global market player and strategic changes in the rare earth market.

Conclusions

1. It was identified the new factors of development and integration for the mineral and chemical markets including the development of innovative processes, the use of integrated technologies, the possibility of more complete extraction of mineral resources and production of new products with high added value, reducing market risks. It was found that integration processes are influenced by these factors.

2. It was found that the rate of change of the external environment in modern conditions related to the interrelationship of factors, their complexity, mobility and uncertainty is updating revision of companies' strategic behavior models. It was proposed the complex application of system, scenario and situational approaches to the management of mineral and chemical companies.

3. It was identified global demand and growth factors and predicted the development of the global market for phosphates in three segments. Increase in the demand for phosphate raw materials, primarily in the developing countries of Asia and Latin America is forecasting. This is due to the increased demand for fertilizers, biofuels and the development of new technologies.

4. It was summarized the production conditions and factors of traditional and new types of products in the mineral and chemical companies. Based on it opportunities comprehensive utilization of mineral resources were identified. The strategic objective of creating new long-term competitive advantage of the mineral and chemical companies in the global market is possible be means of the diversification of production and range of exported products. Innovative potential of the mineral and chemical sector, increasing the depth of processing and comprehensive utilization of mineral raw materials are aimed at ensuring the growing demand of high-tech industries.

The results obtained clarify the strategic management, competition and integration theories with respect to mineral commodity markets, in particular mineral and chemical. The obtained results make it possible to predict the development of traditional and new markets as well as refine and adjust the strategy of mining companies with the influence of specific factors.

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