

RISK MANAGEMENT OF PETROCHEMICAL INDUSTRY ENTERPRISES

УПРАВЛЕНИЕ РИСКАМИ ПРЕДПРИЯТИЙ НЕФТЕХИМИЧЕСКОЙ ПРОМЫШЛЕННОСТИ

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Abstract: Risk management in petrochemical industry is a vital part of industrial management nowadays. Due to this authors conclude following scientific results:

1. Identification of the most significant risks for petrochemical enterprises.
2. The formation of indicative indexes which will allow to identify symptoms of significant risks promptly.
3. Working out of reaction algorithm to risks' signals in the petrochemical industry.

KEYWORDS: RISK MANAGEMENT, PETROCHEMICAL INDUSTRY, INDICATIVE INDEXES

1. Introduction

Chemical industry in Russia is a basis of country's economy, forming framework for its long term development. Petrochemical industry is described by its scale and specialization, difficult and science derived products, long and expensive process of product being developed and put into production, high competitiveness in the industry. Consumers of petrochemical products are nearly all of the industry sectors, agriculture, services, trade, science, culture and education, defense sector. National competitiveness and growth depends on the development of petrochemical sector. Petrochemical industry is the key industry for Russian economy and is growing rapidly. Therefore, enterprises experience many risks most likely due to industrial specifics. Negative factors are first of all rapid growth of production technologies with the restrictions for western markets access because of sanctions and fluctuation of the prices for hydrocarbon materials. To be competitive on the market petrochemical enterprises should use risk management as a core management system in the unstable economic environment. Risk management should be based on scenario planning, including formulating preventive key scenarios as a reaction to typical threats.

2. Theoretical preconditions

2.1. Systematization of risk sources

First of all most significant risks for petrochemical enterprise should be identified. It is important for money distribution on risk management tools.

For petrochemical enterprises following risk objects are described: personnel, machinery, store, products and information. (Tab.1) Moreover, reputation and financial condition should be considered. When creating risk management system one should think about ecological danger. Petrochemical industry is the first for economical loss due to accidents and traumas. [1] Consequences are both crucial for the enterprises and environment.

Table 1

Typical risk sources in petrochemical industry

| Risks factors | Possible consequences | Impact |
|------------------------------|------------------------------|--|
| Machinery | | |
| High level of machinery wear | Machinery is out of function | Repair or purchase costs |
| | Accidents | Managing consequences |
| | Production stops | Costs to start production |
| Hardware obsolescence | Loss of production | Missed opportunities Purchase costs |
| Personnel | | |
| Fluctuation of personnel | Labour productivity loss | Costs for search and education new employees |

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|-------------------------------------|--|---|
| Threat of key personnel dismissal | New employees search Possible technology loss | Costs for search and education new employees |
| Accidents and diseases | Production loss | Lost opportunities |
| Stocks of raw materials | | |
| Supply failures; force majeure | Production stop | Revenue loss, costs for raw materials stock, production start |
| Supply of defected materials | Defected products output | Costs for defected materials and products return |
| Price growth on materials | Price growth on products | Profitability loss |
| Products output | | |
| Outdated assortment | Advantages loss | Revenue loss |
| Market saturation with products | Production stop | Resources loss |
| Product competitiveness | Sales volume decrease | Advantage loss |
| Defected products output | Loss of consumers' trust, products' return | Costs for the return and utilization of the products |
| Information | | |
| Loss of database | Need to restore information | Extra costs for data restore |
| Information flow to the competitors | Company's technology's loss | Advantage loss |

However, measuring probability and volume of damage, it is revealed that another critical risk for petrochemical industry is production stop because of decrease in demand. This can happen because of alternative fuels emerging (bio, hydrogen, electric, radionuclides, isotopes, methanols, etc.) [2] and market variation for economical and political reasons.

2.2. Risk' indicators reasoning

On the whole operation of petrochemical industry can be characterized with numerous indicators, each of them solving particular management task and giving specific information. Effective risk management should be based on sufficient and reliable information. In this course it is logical to consider most important indicators – risk indicators. [4].

Following demands are made for operative risk indicators:

- risk indicators should be informative and include all enterprise's operations;
- risk indicators should be verified with reliable information, which is used for their calculation;

- to derive normative risk indicators enterprise's work should be analyzed thoroughly with the conditions it works in;
- indicators should be calculated on a regular basis using up to date information.

Based on derived objects and risk factors it is proposed to use economic indicators to identify risks (Tabl.2)

Table 2

Risk objects and economic indicators comparison

| The object of risk | Index | Indicating |
|--|--|---|
| 1. Capital assets | Equipment wear index | Level of stop danger and damage danger |
| | Number of production stops due to damage (in dynamics) | |
| | Capital productivity of machinery (in comparison with other enterprises) | Efficiency of machinery use |
| 2. Personnel | Indexes of retirement and hiring of personnel (in dynamics) | Indicates general problems |
| | Index of specialized personnel retirement | Loss of key personnel |
| 3. Materials and raw materials in production | Part of damaged raw materials delivered in a period of time | Signals for contract changes with unfair suppliers |
| | Number of delivery delays according to suppliers, number of days delayed | |
| 4. Financial condition | Operative index - cash flow | Clean income on company's account in dynamics – minus loans, credits, account replenishment |

It is important to note that analysis of financial state of the enterprise is not enough for risk identification, what is identified is more likely dealt with events already happened. For risk management economic indicators are shown which can be calculated with up to date information as frequently as needed.

3. Results and discussion

Generalized algorithm for risk management(pic.1) is based on typical risk management technology by Tokarenko G.S. [3] Therefore, authors' point of view lies in its development. Firstly, informative basis of the mechanism is provided, including risk indicators. Secondly, risk management is separated into three units, which will serve as mechanism elements: identification and measurement unit, transformation unit, effectiveness control of risk management unit.

Organizational structure comprises management board consisting of process coordinator, analytics and heads of divisions who are experts in specific fields necessary for production.

Information base for risk management algorithm is a united database on enterprise's risks and system of key risk indicators, which are formed in the process of risk management.

System of key indicators is connected with the process of data transformation – identification, risk assessment and control. In the course of primary risk identification some regularities may be revealed, which can help to determine risk signals. Indicators discussed earlier can form a basis of indicative indexes for particular enterprise. However, in process of risk management algorithm key indicators system may change upon inner and outer environment changes.

On the algorithm entry there is uncertainty of enterprise wok, which cause risk formed by inner and outer environmental factors.

Information about risks is gathered in identification and risk evaluation unit. Information is altered with several steps: risk factors are identified, they are evaluated and systematized, for instance, risks map is drawn, which help to establish key risks for

the enterprise. Researchers share opinion that it is necessary to manage integrative enterprise risk, management efficiency should be estimated based on its level.

In connection with this final step of information alteration should be identification of integrative risk index level with the components which will be managed. Petrochemical industry enterprises risk components are: risks of technogenic accidents, production risks, commercial risks, financial and managerial risks, most important of which is production risk.

Next step in risk management is risk transformation.

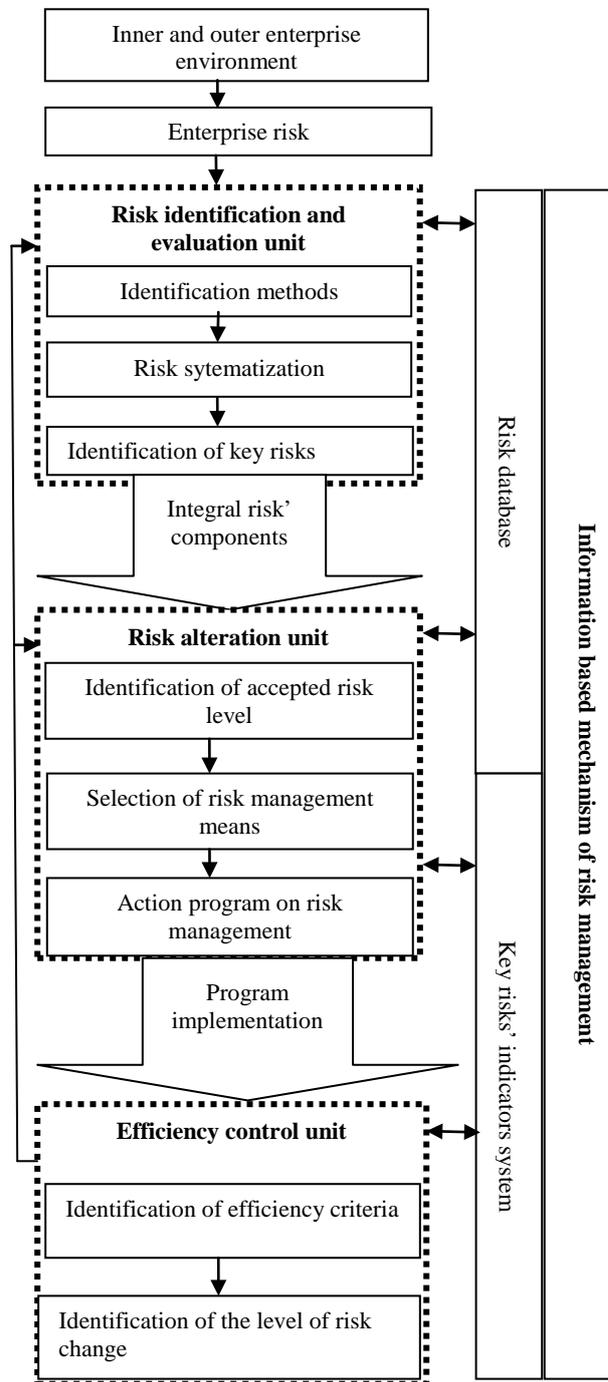


Fig. 1. Risk management algorithm based on indicators.

Thus, risk management program is formed, which should include actions to minimize risk according to the number of risks identified, level of accepted risks, finance sources. Program should be included in financial plan of enterprise. First of all it is important to focus on risks which are most influential on integrative risk. For petrochemical enterprises most influential is the risk of machinery damage, so primary efforts should be taken to diminish this risk.

Last step of proposed algorithm is control unit. On this stage efficiency criteria of risk management are identified and results of

risk management are analyzed. As an efficiency criteria for risk management level of absolute and relative integrative risk change can be used. Control unit should have feedback with other units, because as a result of efficiency evaluation risk management program is corrected and key risks are specified.

The outcome of risk management mechanism realization is minimization of integrative risk level and uncertainty decrease in enterprise work.

On the whole, this mechanism is universal. Therefore, in petrochemical industry risk management following problems may occur.

Integrative risk evaluation is rather problematic. First of all, separate enterprises are usually integrated into holdings so head company's risks should be considered also. On the level of particular enterprise it is difficult to evaluate those risk, thus it is difficult to form integrative risk level. The solution lies in creation of unified risk database on each holding enterprise.

Secondly, petrochemical industry experience hazards, as a result risk of technogenic accidents which have many consequences: ecological, social, economical, should be differentiated from other risks. It is not reasonable to take this risk into consideration when evaluation integrative risk.

Thus, it is obvious that integrative risk management face certain difficulties. In this connection it is possible to divide risks into production risks, commercial, financial, managerial risks. According to these groups risks may be integrated and managed.

Integrative risk evaluation problem can be solved, when risk management mechanism will operate in full and will be supported by automatic systems, which are in use in credit organizations, for example.

4. Conclusion

Thus, the conducted research is characterized by the following scientific results..

1. Identification of the most significant risks for petrochemical enterprises.

Specificity of petrochemical enterprises management determines range of factors which influence or threaten all participants.

Therefore, most important risk factors are: high ecological disaster level due to production accidents, financial threats, modernization, quality of the workforce, political factor, sanctions on invest and technological support from foreign partners, territorial unevenness of hydrocarbon distribution, mid term tendencies for the hydrocarbon replacement, thus forming new alternative industry. These risks are evaluated based on different criteria aimed to identify the sources and measures which should be taken.

2. The formation of indicative indexes which will allow to identify symptoms of significant risks promptly.

Authors offer the system of balanced indexes, comprising economic and entrepreneurial risks. Along with that normative values of indicative indexes are established, discrepancy to which in mentioned limits serve as risk signal and demand prompt reaction.

3. Working out of reaction algorithm to risks' signals in the petrochemical industry.

Scientific results is carried out with scenario approach, which supposes different scenario realization of managerial system in accordance with risks signals.

5. Literature

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