Cluster Development Concept of Kazakhstan Engineering on Innovative Basis

Shuakhbay Zamanbekovich Zamanbekov

Kazakh State Women's Pedagogical University, Ayteke bi street, 99, 050000, Almaty, Republic of Kazakhstan
zamanbekov50@mail.ru

Abstract: This article consideres the main questions of developing the engineering branch of the republic on a cluster basis. The concept of engineering clustering and necessity of its development for ensuring stability and efficiency of production development of engineering products and increasing its competitiveness is stated in the article. The prime purposes and tasks facing engineering on activization of innovative activity by means of formed clusters are defined as well. Thus special attention is paid to the choice of priority engineering clusters necessary for re-equipment of the enterprises of other industries by cars, processing equipment at the level of international standards. The basis of a choice is made by connection of a cluster with innovative infrastructure which is referred to a service sector, as innovative infrastructure is the most effective tool of introducing new technologies in production of engineering production. In this regard we can consider possibility of creating a cluster structure engineering of the republic in the form of regional or branch clusters, in certain regions of the country where necessary preconditions for formation and their functioning are found. The general structure of engineering cluster indicating the location of priority subsectors of engineering on areas of Kazakhstan is given in the article.
[Zamanbekov S.Z. **Cluster Development Concept of Kazakhstan Engineering on Innovative Basis**. *Life Sci J* 2013;10(4):1030-1035]. (ISSN:1097-8135). http://www.lifesciencesite.com. 133

Keywords: cluster, innovation, integration, modernization, structure, priority.

Introduction

For the years of independent development of Kazakhstan the machine-building branch of the republic started to restore and develop after a long period of degradation. Two major program documents accepted in 2003 and 2010 promoted it: Strategy of industrial and innovative development of the Republic of Kazakhstan for 2003-2015, aimed at achievement of a sustainable development of the country by diversification of branches of the economy and its withdrawal from raw orientation and the Program of forced industrial and innovative development of the Republic of Kazakhstan for 2010-2014 referred on creation of high technology productions focused on output from high value added cost, and first of all, in processing branches [1].

In these documents innovation is defined as the major factor defining not only competitiveness of national economy, but its steady growth as well. Full use of this factor for ensuring further dynamic development of national economy is possible when carrying out the purposeful innovative policy by the state,which provides assistance and supports to innovative activity of all managing subjects, engaged in development of products of essentially new types of production and technologies [2].

As a result of consecutive implementation of innovative policy on creation of potentially competitive industries by the state, including export-oriented productions in non-raw branches, and also conditions for developing science-intensive and high technology productions, Kazakhstan has considerably promoted in development for the last decade and according to the results of 2012 it entered into the number of fifty most competitive countries of the world [3].

This powerful advance became possible thanks to realization by the state the innovative policy of measure system for production support with high added value cost and stimulation of economic efficiency of enterprises manufacturing industry, including engineering, through transfer of technologies, technological modernization, improvement of business processes, advance of export production, attraction of the private capital to innovative sphere, creation of favorable conditions for attraction of foreign investments and credits in processing sector of the economy [4].

Cluster approach which allowed production companies to conduct steadily the innovative activity aimed at using scientific researches and development of innovations demanded by the market was one of the instruments of innovative policy implementation [5]. The innovative policy based on such approach caused high-quality changes in the reproduction process, connected with integration of science opportunities, business and education that finally led to creation and diffusion in branches of national economy and its regions the industrial formations called clusters [6,7].

A cluster represents system industrial group of close, geographically interconnected companies and organizations cooperating with them which are in common operation in a certain type of business

(production) and activities which are characterized by common activities and relationship with each other. For the first time cluster was introduced into a scientific and practical world by M.Porter with the definition as "a group of geographically adjoining and cooperating companies and organizations operating in the certain sphere, characterized by common activity which mutually complement each other" [8].

The first clusters of oil and gas engineering in the republic were created in the territory of the Western Kazakhstan and Atyrau regions and under the name of "Metallurgy and metal working" in mining and metallurgical branch of Karaganda region which are successfully functioning, confirming advantages of developing these branches on a cluster basis. Such formations in the form of clusters have positive impact not only on activity of the enterprises included into it, but also on the economy of the region and the country as a whole, as cluster provides a close interaction of enterprise structures, higher education institutions and scientific centers, public organizations, administrative establishments, etc. As practice of cluster work shows, integration of structural subdivision efforts provide necessary conditions for development of innovative activity, increasing flexibility and mobility of the companies, growth of competitiveness and market stability.

For fixing positive tendencies in national economy development in recent years it is necessary to carry out clustering of its leading branch - mechanical engineering on the basis of developing its concept which adequately answers to developing conditions of innovative development of this branch during the modern period [9]. Necessity and expediency of creating such concept consists in accurate designation of character, direction and scales of the taken and realized measures of the state's innovative policy concerning engineering and its priority directions. At the same time the concept of engineering clustering is necessary for creation and use of new favorable opportunities for its development on the basis of conducting constructive and effective dialogue between affiliated companies of this branch, their suppliers, with the government, and other institutes, coordinations of their actions on mutual improvement of their ties in common interests of a cluster.

Features of engineering and specifics of its ties with other industries, a current state of this branch, possibility of using experience of foreign countries which pursue active industrial policy on a cluster basis in the field of developing machine-building complex are considered in the Concept.

Engineering takes an important place in national economy and defines prospects of its development on an innovative basis. The strategic condition of production capacity of the state as it provides activity of the major branches of its economy is bound to these branches: fuel and energy, mining- metallurgical and agro-industrial complexes, transport and communication, light and food industries, industry of a consumer market.

Engineering is in a technological chain of extracting and processing industries participating in production of machinery and equipment [10]. The enterprises of this branch depend on the enterprises of suppliers delivering raw materials, energy, materials, completing knots and mechanisms, summarize all merits and demerits of their economic activity.Therefore engineering is a link of all branches of economy, directly or through their suppliers. Normal functioning of machine-building branch depends on a general state of the economy of the country, as well as the normal condition of economy of the state depends on situation in engineering as it is technical basis of goods' production [11].

Because of the leading role of engineering in the economy all developed countries of the world attach special significance to this branch, creating priority clusters for its development. For example, clusters have quite big development in Germany, in this country they were created on the basis of using scientific and technological backlog and consolidation of efforts of industry and scientific centers with orientation to the market both internal, and international ones.Thus the innovative system in a machine-building complex of this country has a traditional priority that provides its dynamic social and economic development.

Taking into account the aforesaid, the developed concept of the republic's clustering of engineering will serve as the initial platform defining basic provisions of innovative development of machine-building branch on a cluster basis [12]. Proceeding from predestination of this concept the prime purposes and tasks facing engineering are defined and problems constraining its development with development of scientifically reasonable references on creation of branch or regional clusters in the priority directions of mechanical engineering are considered.

Within cluster initiative measures for activization of activity of enterprise structures with organization of large-scale production in this branch, intensifying the state support measures of domestic engineering workers and strengthening their competitive advantages in internal and external markets are indicated as well [13]. This concept is carefully thought over in all aspects and represents a formulated idea of preferable ways of engineering

development and its priority branches on prospect till 2020. Its purpose is ensuring of necessary stability and efficiency of developing machine-building production branches in Kazakhstan, assortment change of its production with changing demand in the market, increasing of competitiveness of machine-building equipment of the country by means of creating priority clusters of engineering providing its exit to foreign markets [14].

The main objective of priority machine-building clusters choice is re-equipment of enterprises of other industries with cars, processing equipment at the level of international standards, their disposal from expensive import, updating the production machinery of economy with development of essentially new branches using high technologies, thus carrying out modernization and updating their own technological and production base of mechanical engineering [15].

Proceeding from a goal and task, the concept predetermined necessity of setting and solution of the following tasks taking into account realization of basic provisions of the program of social and economic development of the country according to Strategy of industrial and innovative development of the Republic of Kazakhstan till 2011-2014 and Industrilization map of Kazakhstan for 2010-2020:

- determination of potential opportunities of products of machine-building production development, potential demand for it in the internal and external markets;
- identification of the most perspective productions and opportunities of their placement taking into account the saved-up production potential, availability of scientific-technical and skilled regular labour force and sales market production, selective investment support of the most effective enterprises providing release of high technology, competitive production in internal and external markets;
- creation of conditions for developing the products of machine-building production focused on specific consumers, expansions of international cooperation, assistance in creation of joint ventures and productions with the leading firms of the world, attraction of investments and financing of technical updating and development of productions;
- stimulation of development of advanced technologies, new science-intensive productions, ensuring updating and extension of a made production range, growth of its competitiveness at the expense of quality improvement, cost and price reduction, development of modern methods of pre-sale preparation, realization and after selling service;
- improvement of regulatory legal base, tax and customs regulations for providing competitive domestic production in the internal and external markets;
- overcoming of critical dependence of domestic economy from import of engineering production and metal working, saturation of the domestic market by high quality goods of domestic production;
- saturation of a machine-building complex of the country by modern equipment corresponding to international requirements on ecology and safety;
- improvement of economic and social infrastructure of a machine-building complex;
- creation of favorable conditions for putting into effect and effective operation of new powers on production of machine-building equipment;
- adjustment of openness degree of the domestic commodity market by separate types of goods, protection of domestic producers against unfair import, introduction of domestic goods to the world commodity markets, improvement of the trade balance of the country;
- improvement of financial and economic position of enterprises, creation of conditions for attraction of investments into branches and crediting of enterprises by the second level banks;
- increase in labor productivity;
- stage-by-stage integration of the Republic of Kazakhstan into the world machine-building market;
- rendering technical, technological and methodical assistance to businessmen on organization and production development, execution of standard technological documentation;
- increasing the level of defence capability of the state at the expense of development and release of military equipment of new generation.

The basic principles of the Concept implementation and choice of priorities of cluster initiative are:

- providing of production competitiveness in internal and external markets;
- economic efficiency of production;
- decision-making basing on transformation of machine-building complex on scientific and reasonable methods and computer technologies focused on its use;
- phased implementation of the Concept, proceeding from available financial resources.

Priority directions in creation of machine-building clusters of the Republic of Kazakhstan are:

- tractor and agricultural engineering, including production of equipment and spare parts for the branches engaged in processing of agricultural production;
- transport engineering, including production of tanks, cars, equipment for carrying out railway

works, containers, parts of track structure, equipment and spare parts for railway transport;

- engineering for oil and gas extraction as well as oil and gas processing industries;
- production of equipment for mining and metallurgical complex;
- automotive industry;
- electron and household engineering.

All above-stated priority branches of engineering have competitive advantages and their use creates favorable conditions for their development. These advantages are first of all availability of firm minerals, including ferrous and non-ferrous metals, rather capacious domestic market, availability of transportation conditions by all means of transport, high level of electrification, available scientific and technical and production potential with corresponding infrastructure, capable to provide development of specified priority of engineering branches.

However, the infrastructure of machine-building enterprises of some branches of machine-building complex doesn't correspond to the international practice, namely:

- low extent of using high technology equipment and modern means of estimation and control at all stages of product's life cycle, especially at development of new product;
- low level of using integrated systems of information technologies and software products;
- low volume of enterprises expenses on carrying out research and development.

Under these conditions priority branches of engineering can't normally develop without essential state help, its coordinating action with the system of measure supports of machine-building production development.

However, in industry structure of the RK small growth of a share of machine-building production has been observed in recent years. Specific weight of this production makes 4,0% in a total amount of industrial production that is very low in comparison with a similar indicator in the developed foreign countries where it makes from 36% (Great Britain) to 50% (Japan) [16]. Besides production of engineering of the republic is characterized by still low competitiveness and it is generally realized in domestic market [17]. In production of this product one can see insufficient innovative activity which is caused by low level of investment, referred to development of this branch [18].

Besides, some other problems constraining development of engineering were revealed by research and they are:

- high level of wear of main and service equipment;
- low technical condition of active part of industrial and production funds;
- incomplete use of available capacities;
- innovative unattractiveness of the branch and insufficiency of current assets of enterprises;
- deficiency of qualified personnel in the sphere of production and management of enterprises;
- low level of cooperation ties between machine-building enterprises of neighboring countries and leading global manufacturers of similar production;
- low share in production of science-intensive, high technology products with high value added cost.

For solution of these problems it is necessary to stimulate innovative activity of machine-building enterprises aimed at innovative and technological development by means of formed clusters which are capable to carry out large innovative investments in engineering development.

In the Concept with the purpose of further development of machine-building branch and its priority directions on a cluster basis on production of competitive equipment some administrative territories of the republic regions are determined including Astana and Almaty cities where formation of regional or branch clusters on the basis of available scientific-technical and production potential for production of concrete final products and engineering branch is considered to be expedient. The most perspective place for successful development of the following priority branches of engineering are areas where it is favorable to place joint and new ventures of creating machine-building clusters:

• tractor and agricultural engineering, including production of equipment and spare parts for the branches which are engaged in processing of agricultural production - Astana city, Northern Kazakhstan, Kostanay, Kyzylorda, Pavlodar, Southern Kazakhstan regions;

• transport engineering, including production of tanks, cars, equipment for carrying out railway works, containers, parts of track structure, equipment and spare parts for railway transport – Almaty city, Almaty, Zhambyl, Northern Kazakhstan regions;

• engineering for oil and gas extraction as well as oil and gas processing industries - Northern Kazakhstan, Astana city, Eastern Kazakhstan, Almaty city;

• production of the equipment for mining and metallurgical complex – Karaganda, Eastern Kazakhstan, Zhambyl regions, Almaty and Astana cities;

• automotive industry – Almaty city, Western Kazakhstan, Northern Kazakhstan, Southern Kazakhstan, Almaty regions;

• electron and household engineering – Almaty city, Southern Kazakhstan, Northern Kazakhstan, Almaty, Zhambyl regions.

Dynamics of ties in a cluster is intensifying in oil-extracting areas of Aktau, Atyrau, Uralsk where a significant amount of enterprises specializing on production, transportation and storage of oil and gas is concentrated, one can also see the growth of regional ties in Northern Kazakhstan area, which is considered to be the sector of agricultural engineering. In the territory of Eastern Kazakhstan region it is possible to create a cluster of mining and metallurgical engineering, uniting it to a functioning cluster "Metallurgy- metal working" in Karaganda region. The large megalopolis of the republic – Almaty can become a place of cluster transport engineering formation. Pavlodar region where there are powerful plants of this type of engineering is suitable for creation of machine-tool constructing cluster and instrument-making engineering. The cluster of electron and household engineering can be placed in one of the regions of Southern Kazakhstan area which has necessary potential for it.

Creation of transport and logistic service clusters for service of machine-building clusters in various regions of the country is quite possible in the long term.

The structure of machine-building cluster on the number of participants and internal sectionings is a common one, but taking into account specific feature and priority of engineering subsector it is possible to create clusters which differ by their structure.

So, the following interconnected structures are included in cluster :

1. Management:

- Ministries and departments;
- Akimats (city halls);
- Banks and other financial institutions;
- Legal and auditor services;
- Branch public association of engineering.

2. Suppliers (raw and materials):

- cars and equipment;
- technologies;\
- packaging;
- metal (raw materials);
- energy resources;
- transport services.

3. Personnel:

- higher and specialized secondary educational institutions.

4. Engineering industry on branches:

- agricultural;
- transport and road-building;
- chemical and oil and gas (production and processing);
- mining;
- power;
- MIC (military industrial complex);
- tool;
- light and food;
- animal husbandry and forage production;
- aircraft and instrument making.

5. Innovative infrastructure:

- branch scientific and design institutes;
- branch technological magazines.

6. Special (consulting, design, advertizing and other) services.

7. Consumers of machine-building production.

The created machine-building cluster will be the basic center stimulating development of other allied industries and it will also create export base of the country. Its final products are:

♦ equipment for the mining industry;

♦ equipment for the fuel and energy industry;

♦ transport means;

♦ equipment for agriculture;

♦ equipment for manufacturing industry;

♦ equipment for defense complex;

♦ electric equipment and equipment for communication.

According to the character and type of their production machine-building clusters bring larger return on invested funds for their development. In the course of their functioning they generate known effects at the level of structural elements (internal effect) and at the level of economy of a region or country (outer effect). In the aggregate these effects increase competitiveness of a machine-building complex of the country and its export potential.

Thus, the concept of cluster development of engineering during its realization will promote :

• overcoming of production downswing, stabilization, accumulation of potential and jump in industrial production, optimization of external and internal cooperation and adjustment of economic relations with CIS countries, other states, integration into the world economy;

• improvement of management structure by a machine-building complex, privatization, demonopolization, development of small business in the production sphere;

• restructuring of enterprises of a machine-building complex with ascertainment of enterprise positions in relation to market and buyers' needs;

• technological reorganization of a machine-building complex on the basis of advanced

technologies, improvement of quality and competitiveness of released products;

• high-quality change of export structure, reduction of import goods volume at the expense of introduction of high technologies in production of domestic production for protection of domestic market and augmentation of investments into engineering;

• investment of scientific ensuring for further increase in production;

• radical modernization of enterprises of engineering industry of Kazakhstan and provision of their entry into the world machine-building market;

• creation of new manufacturing capacities on production of machine-building equipment, as well as knots, units and components with participation of strategic investors;

• reduction in consumption of material of released machine-building devices.

The expected general result of concept implementation - creation of competitive machine-building branch in the country and security of its priority development as the basis of technological base of stable and steady growth of the economy of Kazakhstan.

Corresponding Author:
Dr. Zamanbekov
Kazakh State Women's Pedagogical University,
Ayteke bi street, 99, 050000, Almaty,
Republic of Kazakhstan
zamanbekov50@mail.ru

References

1. Information on a course of realizing the State program on forced industrial and innovative development of the Republic of Kazakhstan for the period of 2010-2014 for 2010-2012. www.mint.gov.kz.
2. A New Economy? The Changing Role of Innovation and Information Technology in Growth. Paris, OECD, 2000.
3. Strategy "Kazakhstan-2050". New political policy of the state. Message of the President of the Republic of Kazakhstan N. Nazarbayev to the people of Kazakhstan. December 14, 2012.
4. World investment prospects survey 2008-2009 / UNO. New York; Geneva, 2008. p. 22.
5. Humphrey J., H. Schmitz, 2000. Governance and Upgrading: Linking Industrial Cluster and Global Value Chain Research. IDS Working Paper №120.
6. Klevin A.N., S. T. Mitin, 1999. About the problems of restructuring a machine-building complex. // Industry of Russia, No. 3 March.
7. Palterovich D. M., 1982. Planning of technical modernization of production. - M: Economy, p. 232.
8. Volkov N.N., T.V.Sakhno, 2007. Industrial clusters of the USA, - the USA-Canada, Economy-Politics-Culture, No. 1, p. 51.
9. David P., D.Foray, 1995. Assessing and Expanding the Science and Technology Knowledge Base. OECD, STI Review, No 16.
10. Kudinov A.A., 1999. About priority directions of engineering development //Bulletin of Engineering, No. 9, p. 42-43.
11. Ward W., B. Deren, 1991. The Economics of Project Analysis: a Practitioner's Guide. (EDI Technical materials). Washington, D.C., 318 p.
12. Mingalayeva G., 2000. Clusters and formation of region structure /G. Mingalayeva, S.Tkacheva//World economy and international relations. No. 5. p. 97-102.
13. Tukkel, I.L., 2002. Restructuring of industrial enterprises as the problem of innovative development / I.L. Tukkel//Bulletin of engineering. № 1. p. 60.
14. Porter M.E., 1998. The Competitive Advantage of Nations: With a New Introduction. N.Y.: The Free Press, 1990, Palgrave Tenth Edition.
15. 15. Spitsyn A.T., 2004. Strategic priorities of national economy modernization of Russia. / AT. Spitsyn. M: Economy, p.556.
16. Iansiti M., J.West, 1997. Technology Integration: Turning Great Research into Great Products. Harvard Business Review, May-June.
17. Global Competitiveness Report 2007-2008. World Economic Forum,2007.
18. Francis J.C., 1991. Investments: Analysis and Management. MacGraw-Hill, 874 p.

18/10/2013