TRANSLATION OF THE ARTICLE FROM "UNIDO IN RUSSIA" MAGAZINE

№ 9, January 2013 http://www.unido-russia.ru/archive/num9/art9_9/

==========

PROSPECTS FOR INTERNATIONAL INDUSTRIAL COOPERATION BETWEEN BRICS COUNTRIES IN METALLURGY CLUSTER

M. Chukin Professor, Doctor of Science
Vice Rector of MSTU ,Magnitogorsk
Member of Academy for Quality Problems,
Honored Worker of Higher Professional Education of Russia,
Head Department engineering & metallurgy technology, faculty technology and quality,
Director of MSTU Nano Institute,
Included in the list of the top 500 country managers in administrative reserve under patronage of the President of Russia

O. Tulupov Professor, Doctor of Science
Director International Union Metallurgmash
Expert Engineering branch offices of Public Association "Business Russia"
Winner of the Government Award of the Russian Federation in the sphere of science and technology.

I.Kulkov Academy Counselor RIA
National Expert of UNIDO / BRICS
Executive secretary International Science Bridge
Member Coordinating Committee AFROCOM
Member of Economic Society of South Africa

This material, continues the series of publications on BRICS theme in development of UNIDO Project «Partnership between BRICS countries in Technology and Innovation for development of SMEs" to create BRICS Technology Platform.

The first article of "Parity of BRICS" was published in October issue № 8, 2012 "UNIDO in Russia", in which the project UNIDO / BRICS was introduced in brief.(see Reference enclosed)

This article is dedicated to Metallurgy, one of the priorities of BRICS industrial clusters in economic development which is one of the sectors of BRICS Technology Platform. The article is based on the Conception of international industrial cooperation between BRICS countries in the sphere of metallurgy, developed by Magnitogorsk State Technical University, International Union METALLURGMASH and International Science Bridge.

The basic purpose of an interregional UNIDO project for BRICS countries is to create conditions for effective cooperation and substantial strengthening of economic and technological potential of participating countries to ensure sustainable economic development and strengthening of financial and social stability within countries through mutual economic integration and sectoral coordination to take a stronger position in the modern globalized economy, through intra substitution of import.

To implement these global challenges it is necessary to create optimal conditions for effective development, cooperation and the implementation of technological capabilities in key industrial sectors, especially in metallurgy, as it is a priority industry cluster of economic development of all countries and especially the BRICS countries, which provide the formation and the development of different sectors of the economy. Metal consumption per capita is one of the fundamental factors of the welfare of the population. In Europe, for example, the figure is 345 kg / person per year.

According to the study prepared by the Worldsteel called «Sustainable steel at the core of a green economy», in 2011, global steel consumption was 215 kg per capita. All in the world of produced 1.518 million tons of steel, more than half - 51.2% - was consumed in the construction sector. 14.5% consumed in mechanical engineering, 12% in the automotive industry, 12.5% in the manufacture of metal products, 4.8% in the transport sector, 3% in the sector of electrical equipment, and 2% in the production of household appliances.

According to the geographic structure of consumption in the year of 2011 (1,371 million tons) leadership has kept China, which accounted for 45.5% of global demand for steel products. Japan had 4.7% of global consumption, the rest of Asia - 14.6%, in the EU (27 countries) - 11.1%, the rest of Europe - 2.4%, for the country's NAFTA - 8,8%, CIS - only 3.9%, Central and South America - 3.4%, Middle East - 3.3%, Africa - 1.7%, Australia and New Zealand - 0.5%.

Russian Metallurgy Equipment Manufacturers have extensive experience in international cooperation in metallurgy, including establishment of Steel industry in China, India (Bhilai), Africa (Adjeokuta) and successfully participate in technological cooperation in the modern metallurgical international; market.

In accordance with the needs of national economies the proposed Concept is aimed to achieve this goal, it involves the organization and coordination of international industrial cooperation of BRICS countries in all sectors of economy, especially, metallurgy, as basic sector of any industrialized economy.

The main areas of cooperation in the framework of this Concept is (Fig. 1 and 2):

- technical and technological areas of cooperation;
- cooperation in science and innovation;
- organizational forms of cooperation;
- training, retraining and advanced training in the sphere of metallurgy;
- the economic component of cooperation.

Fig. 1. Block diagram of Concept of international industrial cooperation between BRICS countries in the sphere of metallurgy

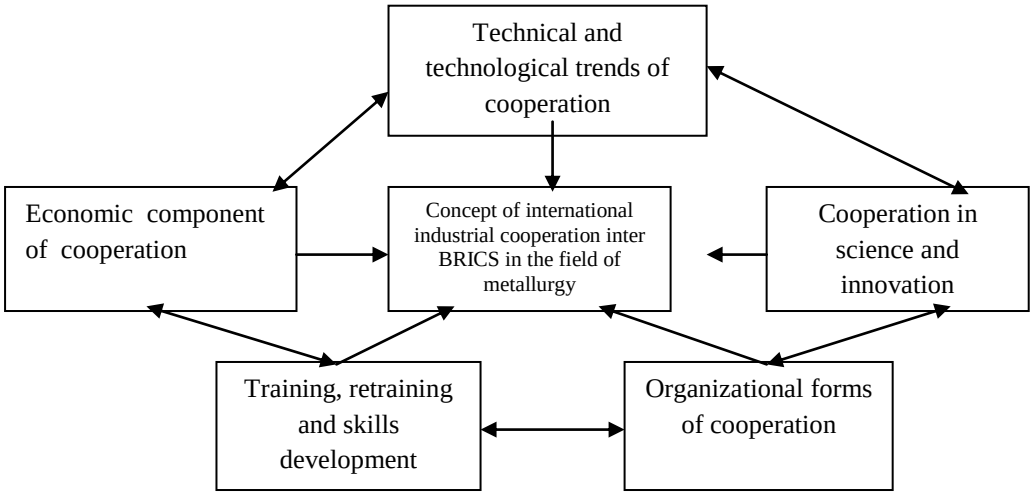
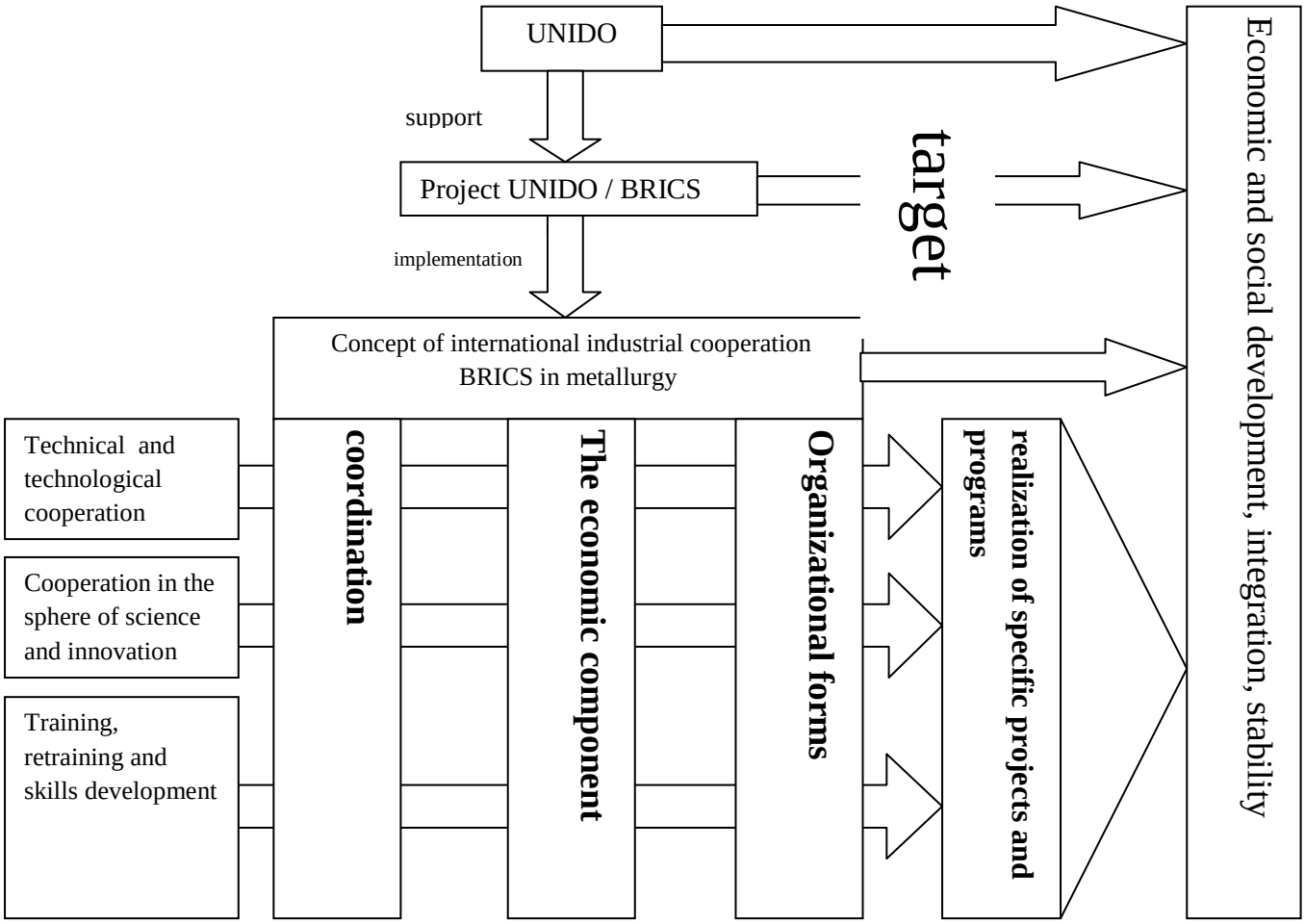


Fig. 2. System Diagram of Concept of international industrial cooperation between BRICS countries in the sphere of metallurgy

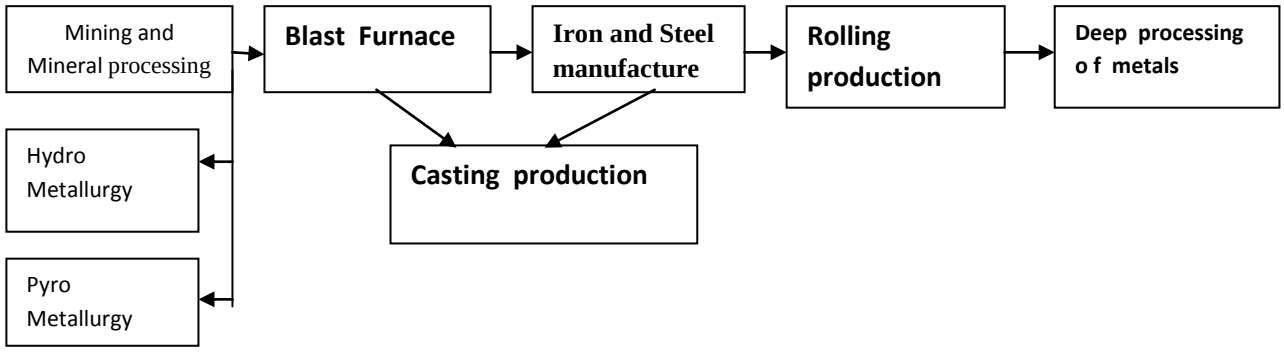


It should be noted that evaluation system, approaches and principles used in creation of the Concept in the sphere of metallurgy are rather universal and also applicable to other basic industries.

Let's try to consider briefly all aspects and start with the technical and technological areas of cooperation.

The BRICS cooperation in this area, involves the joint improvement of existing technology and technical facilities (equipment), and the joint development of innovative production cycle at different process stages of metallurgy (Figure 3).

Fig. 3. The diagram of the steel production cycle



The implementation of cooperation in this sphere will ensure equitable and sustainable development of the industry and meeting the needs of enterprises, continuously growing high-tech industries (primarily mechanical engineering) in the high-tech products and the services in all countries of BRICS.

This involves the exchange of experience and implementation of already existing technologies in specific projects with joint development and transition to joint research programs. For example, R&D, carried out by universities and engineering companies with large industrial enterprises in Metallurgy and Machine-building JSC "MMK", "Severstal", JSC "OMZ", This experience can be extended to international level.

Another important component of the concept is the cooperation in the sphere of science and innovation.

Originally metallurgy was formed as an industry based on natural resources, the original composition and processing of technology which determines the properties of the final consumer product. However, the current global trend to increase the proportion of secondary materials and the general level of steel consumption necessitates cooperative effort of the participating countries in order to develop and commercialize technologies for resource-intensive, and the use of high-tech equipment in the metallurgical enterprises.

Priority directions of innovative development of science, engineering & technology in BRICS countries:

• Environmental management;

• Nanotechnology in metallurgy;

• Information and communication systems;

• Energy-saving technologies.

We want to give a few examples of the science-based approaches in these areas of the industry, which have already been implemented and are able to diversify and spread.

One of the solutions for the environmental management system may be a comprehensive new technology called "duplex process for steel and construction industries". It can solve two problems at once: getting highly profitable products - complex alloys from poor ores of manganese and silicon, as well as a result of residual product quality clinkers for further processing in cement.

This technology differs in economy and in the lack of adverse effects on the environment because of the originality of the process construction.

An example of the application of nanotechnology in industry is already implemented project of production of the nano structured fittings with start diameter of 9 mm for pre-loaded concrete structures (construction of port terminals, buildings, railway sleepers for high speed rail and other infrastructure).

This technology of nano structuring allows to a combine in reinforcement high strength characteristics and plastic properties of carbon steels. This product is already used to strengthen a new generation of concrete sleepers for high speed and heavy duty lines.

The main competitive advantages of nano structured fitting - is a high quality product at a lower cost of production. In addition, it allows you to get savings of metal sleepers up to 20%, at the same vary moment, allowing to increase the speed up to of 350 km / h and increase the capacity of the railway line, and hence increase in the turnover of 1.7 times in the heavy-duty highways. New fittings provide durability of sleepers (up to 70 years) and guarantees a high operational reliability and longer service life of concrete sleepers will increase time between overhauls time and reduce maintenance costs of railways and thus railways in general.

Another example of environmental management is the modern Russian design based on the use of nanotechnology - the "Green Coal". It can solve actual problems, providing autonomous energy saving through the use of a low-grade and non-market coal or waste coal production as main recourses, which are also present in large metallurgical complexes, based on the manufacture of nano structured composite fuel.

In addition, the technology enables the development of environmentally "green energy" due to the total absence of carbon monoxide (CO) after combustion and a significant reduction in the emission of carbon dioxide (CO2) and other harmful gases. It also provides a non-waste fuel combustion to form a useful material with high added value for building purposes and the return water use.

Development of technique and technology is impossible without advanced development of human resources, so one of the strategic priorities of innovation development of the economies of the countries of BRICS is an innovative system of training and retraining of personnel.

To do this in the sphere of training it is necessary to ensure certain conditions.

It is necessary to develop a system (complex) of modern criteria of training personel for enterprises of mining, metallurgical and machine-building complexes and coordination between universities, manufacturers, research agencies in the questions of training of engineers and technicians in the new environment.

It will also create and implement international programs for training and development of metallurgical engineering and metallurgy, including the training of highly skilled engineering, technical and managerial personnel and to create new specialized flexible programs.

Therefore, for the organization of effective education and training of specialists, technicians and workers at the level of international standards for mining and metallurgical complex and engineering it is necessary to create a special center, which has a university base and having an inter-regional status.

Connection with programs BRICS

The system have to comply with the basic provisions of targeted development programs BRICS, including the development of education, associated with the formation of a segment of the national innovation system of training and retraining on the basis of universities, introducing new educational technologies of continuing education and promoting the integration of educational institutions. An example of such cooperation are international training and skills development of new production lines for the production of steel and rolled products, implemented by the International Union "METALLURGMASH" together with the members of the Union – MSTU (Russia) and Danieli (Italy).

All BRICS countries have problems in training of engineers which require the priority consideration. Coherence among them education and the business community and the high level of technical and methodological support of educational institutions. In this situation, the system for training and retraining of personnel for the mining sector should act as a key partner in the federal and regional governments, and large businesses in the process of policy implementation of socio-economic and industrial development of the region.

The goals, objectives, structure and the main activities of the specialized Training Centers in the countries of BRICS

The purpose of the center is the establishing of coordinated, flexible and adaptive system of training and retraining for the mining industry and mechanical engineering.

The main tasks of the center should be: the development, approval and accreditation of educational plans and programs of vocational training, organization of advanced training, professional development and qualification standards, as well as consulting and expert activities in the organization and the improvement of the educational process.

Form of incorporation of the Center may be an international non-profit partnership, defined by the founders of all the participants of the BRICS and UNIDO.

The center should have the right to engage in educational activities in accordance with the licenses of the founders of the participating countries in the sphere of Continuing Professional Education, suggestingto obtain a license in their own during the development of the project.

The coordination actions of the center are done by the Coordinating Board of the Centre and public bodies, including the representatives organizations, the co-founders of the BRICS, members and UNIDO, and also the project partners.

Cooperation within BRICS is mutually enriching and mutually beneficial, which determines opportunities for close cooperation between the BRICS countries. The organization of effective cooperation implies the implementation of several major events across organizational forms of cooperation.

The first step is the creation of a single information system, which provides for the implementation of the activities promoting the cooperation of countries of BRICS in the sphere of metallurgy, based on:

• mutual placement of information in the mass media;

• publication of information in the scientific-technical and production journals and publications;

• creation of a single information portal.

And in this regard it should be a very effective one of multifaceted international initiatives UNIDO's Technology Platform on a single information portal in the framework of the UNIDO / BRICS.

The platform is developed by experts of the United Nations Industrial Development Organization (UNIDO) to combine technological capabilities of the participating countries in order to create a sustainable economy, the development of the real sector, to strengthen financial stability and social stability, for development of secondary sector, which is the basis of social and economic stability of the society.

Development of the system technology platform and its application is based on the factors determining the development of priority industries, modernization and diversification, it includes:

• Ability to holders of technological potential for integrated proposal for the countries of BRICS to use the modern technology of world-class competitive equipment, professional engineering services and system training of specialized professionals.

• The need for the national economies of the countries of BRICS in mutually beneficial international technology cooperation for the active development of the priority clusters under long-term plans for industrial development of countries – participants of the Union.

The complex of the creation of a technological platform of BRICS based on a single information portal and Quick Reference data (on line Compendium) provides business networking and building of partnership for the purpose of creation joint projects, their development and implementation.

Second, it requires work on harmonization of standards and unification of the certification system on metal produced in the countries of BRICS, which implies bringing their content in line with other standards to ensure interchange of products (services), similar in qualities and information contained in standards.

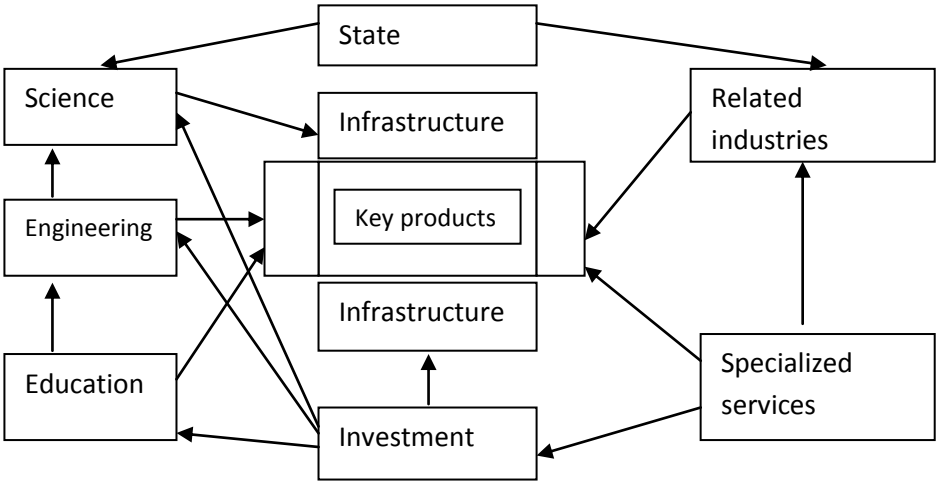
Harmonization of standards will be important to beneficial exchange of goods (services), the conclusion of agreements on certification, development and cooperation in the sphere of metallurgy and the joint solution of scientific and technical problems, the improvement of the quality and competitiveness of products in foreign markets, the optimization of the material costs and energy consumption, improvement of safety at work and environmental protection.

The economic component of cooperation involves the implementation of two main activities:

1. Development and implementation of basic and applied programs supported by the countries of BRICS.

2. Forming of the technology cluster, realizing the production potential of the countries of BRICS in the sphere of metallurgy, under which is understood a group of geographically coterminous interconnected companies and organizations combined with them operating in a certain area, which are characterized by common activities and complementary to each other (Fig. 4).

Fig.4. Basic structure of economic cluster



The practice of cluster development in different countries shows that they are, first, provide more efficient access to the required resources and specialized factors of production (new equipment and technology, qualified personnel, developed infrastructure, including training and R&D, etc.);

Secondly, clusters facilitate the movement of information flows within the cluster and accumulate specific information (knowledge), access to which is better organized and requires lower costs;

And, of course, within a cluster different activities complement one another (in response to consumer demand, marketing, procurement), thus increasing the quality and efficiency of work.

The development of such a cluster for a such global association as BRICS undoubtedly requires effort and experts from all interested parties and can be implemented on a base of single specialized center BRICS for training and retraining of personnel for the industry, which, obviously will combine the best forces which will develop the structure and document which will become the basis of the cluster. It will take into account the interests of all stakeholders at all levels of economic and political cooperation.

The experience of forming such clusters, bringing together both companies producing equipment, engineering companies and research organizations which developed advanced technologies in metallurgy and mechanical engineering, the Russian organizations already have.