

Ukrainian Institute for Designing Iron & Steel Works “Ukrqiprometz” as an Introducer of Highly Effective and Competitive Projects

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The unique experience of institute "Ukrqiprometz" regarding the development of projects of new construction, heavy overhaul with reconstruction and technical re-equipment of iron & steel plants with a wide implementation of highly effective, competitive technologies and advanced equipment taking into account the world trends of iron & steel industry development is described in the paper.

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Introduction

Ukrainian Institute for Designing Iron & Steel Works “Ukrqiprometz” during 66-year-activity became one of the leading project institutes in mining and smelting industry of Ukraine. Tens of sintering plants, blast-furnace and steelmaking shops, more than hundred of rolling and pipe-rolling departments and mills have been constructed and redesigned under projects of “Ukrqiprometz” both in our country and in the countries of near and far abroad.

The institute accumulated a unique experience on engineering the projects of new construction, as well as capital repairs with redesign and technical re-equipment of metallurgical plants with a wide implementation of highly effective, competitive techniques and advanced equipment in view of the world trends of iron & steel industry development. This problem is urgent also because of constant increase of natural gas and electric power price. The institute understands the importance and urgency of this issue and pays a great attention to the problem of power resource saving.

Results and Discussion

The typical examples of project designs in basic metallurgical processes are as follows:

In agglomeration manufacture: the new sintering machines of up-to-date construction replaced the obsolete ones, which will ensure the course of caking process under advanced technologies and will allow reducing natural gas consumption on charge ignition. So, reconstruction of agglomeration department at JSC "Azovstal" will allow saving natural gas more than 30 % and electric power up to 10 %.

Technical re-equipment of sintering plant JSC "Zaporizhstal" with replacement of out-of-date sintering machine No. 1 by a new one with sintering area 75 m² will allow reducing natural gas consumption by 1.75 m³ on charge ignition and fuel rate in the charge by 2.17 kg per 1 ton of sinter, as well as saving imported pellets in amount almost 150 thousand tons per year and coke about 25.0 thousand tons per year in blast-furnace shop.

The institute carried out technical and economic feasibility study of construction of a new sintering plant at JSC “ArselorMittal Kryvvy Rih” with productivity 10.136 million tons of sinter per year as a part of two largest sintering machines.

In blast-furnace process: one of priorities in energy resource saving is coal injection in the blast-furnace well. Natural gas is not used in coal injection. Now, coal injection plant in the blast-furnace well No. 2-5 is being constructed at JSC "Zaporizhstal". Start-up is planned in the current

year. Injection of 150 kg coal in a blast furnace per one ton of pig-iron will save coke - 80 kg/t of pig-iron with no natural gas.

Waste-heat recovery unit projected by "Ukrghipromez" has been started up for the first time in Ukraine in the overhauled and reconstructed BF No. 2 at JSC "Zaporizhstal". The similar unit in BF No. 5 at JSC "Yenakiyevskiy Iron & Steel Works" is at the stage of adoption. Start-up of these units for BF with capacity 1500 m³ allows saving 9 million m³ of natural gas per year. BF No. 3 at JSC "Yenakiyevskiy Iron & Steel Works" is under construction. The modern casting yard, installation of tray-type cone-free charging device, advanced stoves will allow saving coke up to 45 kg/t of pig-iron.

"ArselorMittal Kryvvy Rih" will receive the similar saving after reconstruction of BF No.6. It would be desirable to accelerate the start-up of coal injection units at JSC "ArselorMittal Kryvvy Rih" and JSC "Yenakiyevskiy Iron & Steel Works". Coal injection unit on BF No. 9 at JSC "ArselorMittal Kryvvy Rih" will allow saving 525 thousand tons of coke per year and 350 million m³ of natural gas. Coal injection unit on BFs No. 5-8 will allow saving 700 thousand tons of coke per year and 475 million m³ of natural gas.

In steelmaking: open-hearth process substitution by electric steelmaking or pneumatic steelmaking is a huge potential for efficiency increase in power consumption, this will allow reducing natural gas consumption by 80-110 m³/t. Adoption of steel continuous casting will increase yield by 10-15 % and considerably lower consumption of energy resources.

Today, our institute together with scientific research institute is working on creation of steelmaking units of new generation on the basis of plasma technologies of casting ultra-long (approximately 100 m) billets on space-saving continuous-casting machines. In total, only 34 % of steel is teemed on continuous-casting machines at metallurgical plants of Ukraine.

Substitution of open-hearth process by electric steelmaking is planned at JSC "INTERPIPE NTZ". "Ukrghipromez" has worked out a technical and economic feasibility study of electric steelmaking complex construction with productivity 1320 thousand tons of cast tubular and wheel billet at "Dneprostal" Ltd. Construction of electric steelmaking plants is carried out by "Danieli", Italy. As soon as electric steelmaking complex starts up, open-hearth process at JSC "INTERPIPE NTZ" is liquidated. Introduction of electric steelmaking

complex into service will allow reducing natural gas consumption by 64 million m³ as well as will ensure functioning of water supply plants without trade waste discharge.

The out-of-date steelmaking technology and equipment at JSC "Integrated Iron & Steel Works "Zaporizhstal" do not provide proper quality of products. Substitution of open-hearth process by pneumatic steelmaking with the use of continuous casting machines with subsequent rolling on a sheet rolling mill will provide saving natural gas 247 million m³/year, electric power 26 million kW·h/year.

In rolling: power saving technologies include utilization of metal heat in slabber wells, waste-heat recovery from all heating devices in rolling shops, etc. For example, construction of waste-heat utilization plant behind a heating furnace is provided on the medium-section mill 390 constructed in 2009 at JSC "Makeevskiy Iron & Steel Works". Productivity of waste-heat boiler is 10 tons of superheated steam per hour. Natural gas saving is equivalent to 4.2 thousand tons of coal equivalent per year due to waste-heat recovery.

Conclusions

Power saving prospects in iron & steel industry are primarily related to renovation of basic production assets, wide implementation of highly effective, competitive technologies, new advanced equipment, natural gas substitution by alternative fuel, considerable reduction of losses of power and material resources at all stages of manufacturing process.

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**ГП «Укрghipromez» - разработчик
высокоэффективных,
конкурентоспособных проектов**

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Приведен уникальный опыт института ГП «Укрghipromez» по разработке проектов нового строительства, капитальных ремонтов с реконструкцией и техническим переоснащением металлургических объектов с широким внедрением высокоэффективных, конкурентоспособных технологий и современного оборудования с учетом мировых тенденций развития черной металлургии.