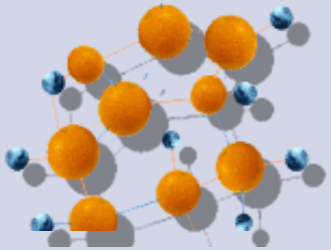
DIRECTIONS OF FUNDAMENTAL AND EXPERIMENTAL RESEARCH

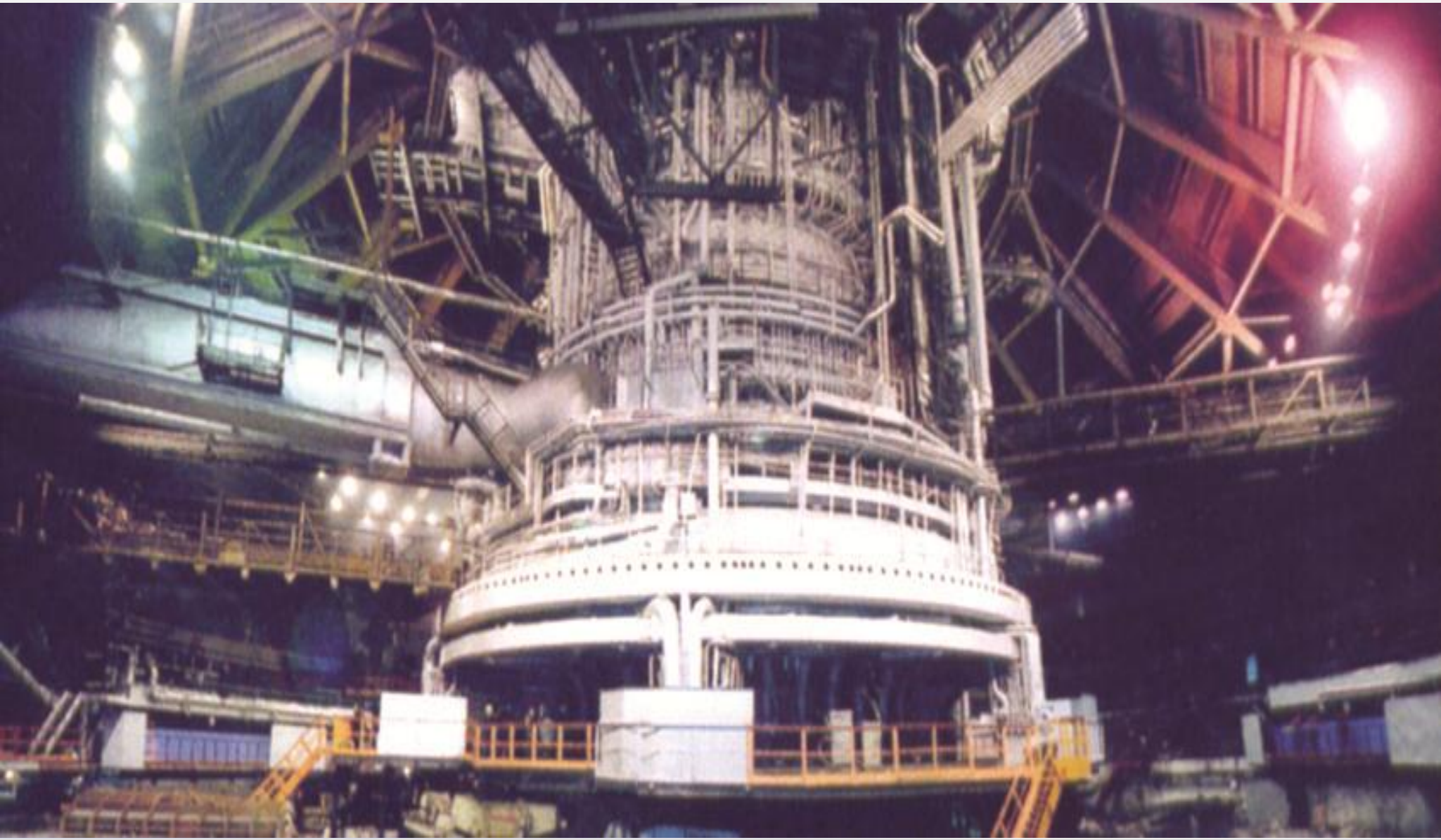


PHYSICS-CHEMISTRY AND THERMODYNAMICS OF PLURAL-COMPONENT METALLIC SYSTEMS AND LIQUID STATE OF SLAG-METALLIC LIQUID MELTS

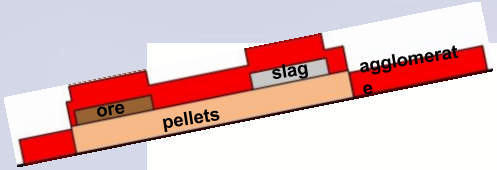
SCIENTIFIC BASIS OF IRON-CARBON ALLOY SHAPING AND CONTROL OF THEIR STRUCTURE AND PROPERTIES

EXAMINATION AND DEVELOPING OF NEW TECHNOLOGIES, EQUIPMENT, CONTROL SYSTEMS IN CAST-IRON, STEEL AND ROLLING PRODUCTION

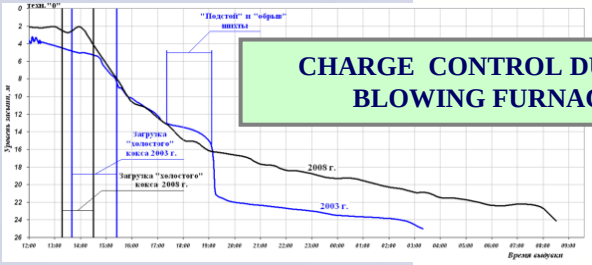
IRON & STEEL INSTITUTE



BLAST FURNACE PRODUCTION OF PIG IRON



FORMING SERVINGS CHARGE AND CONTROL DISCHARGE ON THE TOP

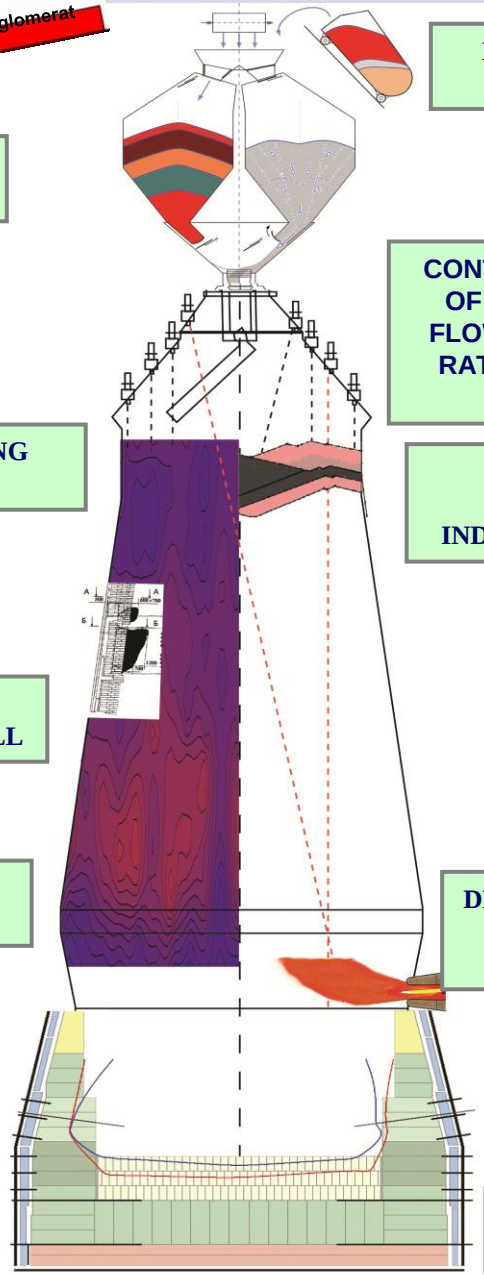


CHARGE CONTROL DURING BLOWING FURNACE

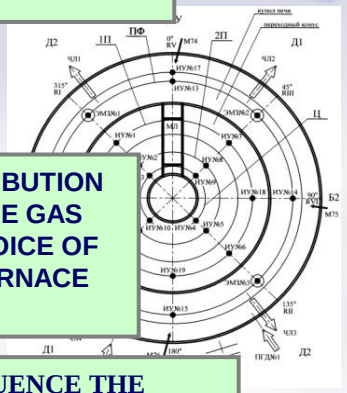
CONTROL SYSTEM THERMAL CONDITION FURNACE AND INWALL

AUTOMATED MONITORING AND CONTROL SYSTEM SLAG REGIME

TECHNOLOGY AGGLOMERATION OF IRON ORE TO THE PRODUCTION OF SINTER FROM THE CHARGE MATERIALS USING TECHNOGENIC WASTE

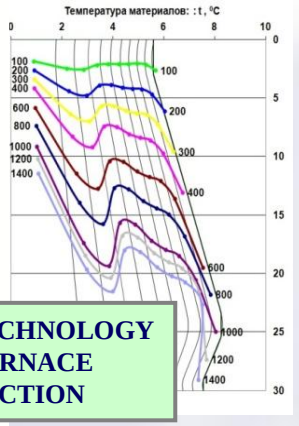


MEASURING SYSTEM SURFACE CHARGE

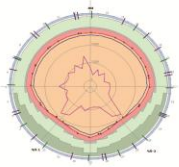


CONTROLLING THE DISTRIBUTION OF THE CHARGE AND THE GAS FLOW BASED ON THE CHOICE OF RATIONAL MODES OF FURNACE CHARGE

RESEARCH OF INFLUENCE THE DISTRIBUTION OF ORE LOAD ON INDICATORS BLAST FURNACE MELTING



DEVELOPMENT OF TECHNOLOGY OF THE BLAST FURNACE WITH COAL INJECTION

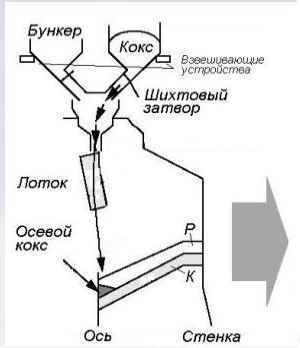


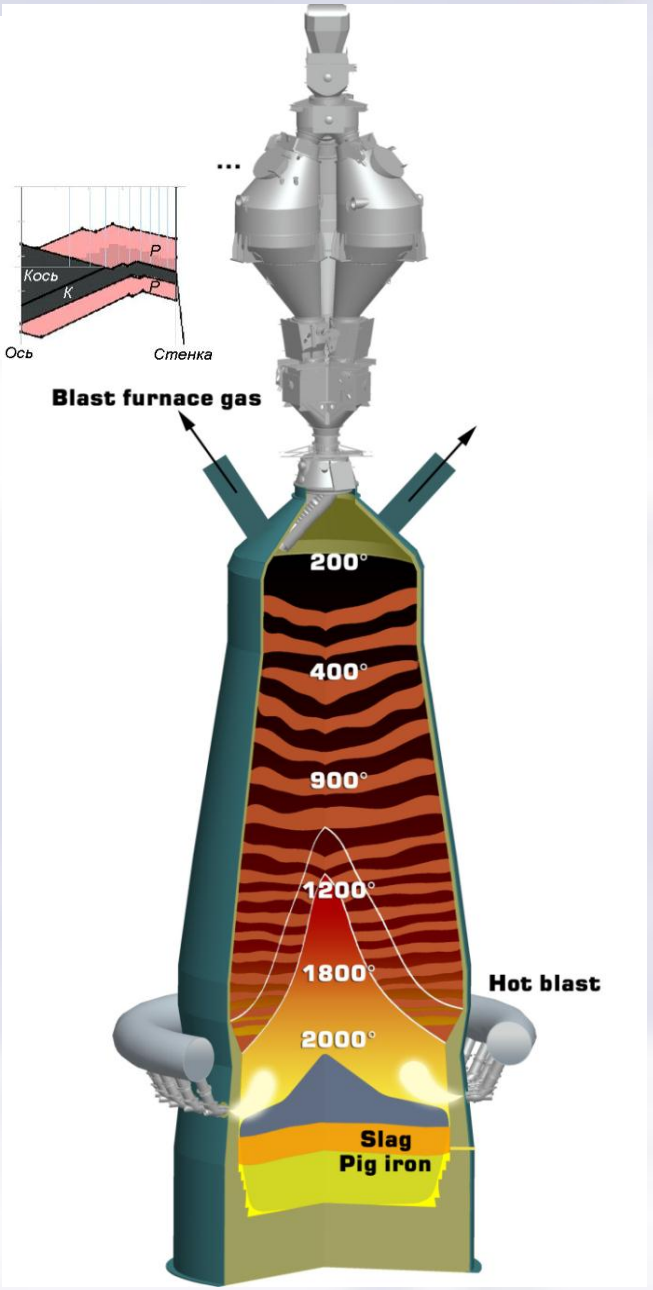
CONTROL SYSTEM RESIDUAL THICKNESS OF THE INWALL HEARTH

Developments realized on the blast furnaces of "Azovstal", "Zaporizhstal", "ArcelorMittal Kryvyi Rih, " Alchevsk Metallurgical Combine "(Ukraine) "Severstal", "Magnitogorsk Metallurgical Combine", "Novolipetsk Steel", "Nizhnetagilskij metallurgical combine"

EFFECTIVE AND ENERGY-SAVING TECHNOLOGY OF OF BLAST FURNACE SMELTING

Realization of a highly efficient and economical production of pig iron consists of design and technological support of complex measures to improve the regime of charge loading and blasting during operation the blast furnace by injection of natural gas, coke oven gas, coal injection.





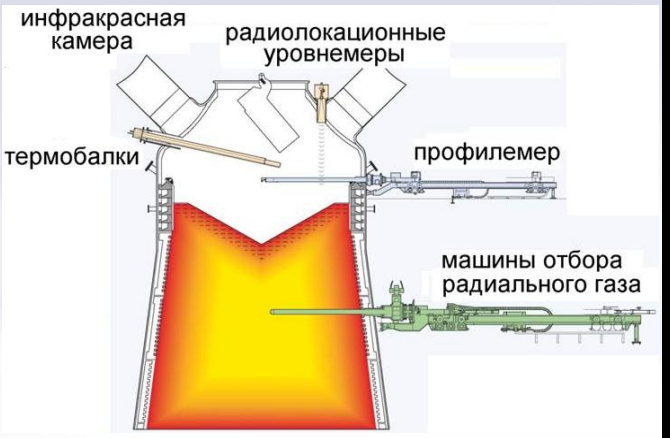
Specialists of the Institute also have considerable experience in improving blast furnace melting at specific conditions:

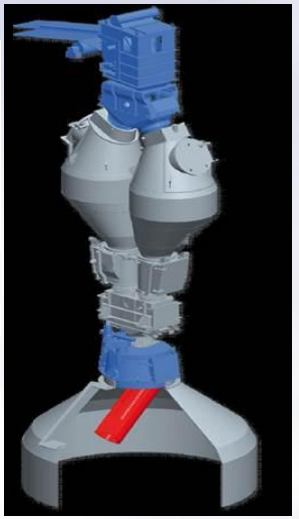
- **blowing-out and blowing-in of blast furnace;**
- **operating irregularity of blast furnace;**
- **heavy service (oxygen content in the blast is more than 30%) and reduced capacity blast furnace melting (using heated nitrogen);**
- **unstable composition and low-quality characteristics of the raw materials;**
- **high alkaline / zinc load;**
- **unsatisfactory technical condition of the cooling system of the blast furnace.**

EXPERTISE

Экспертная оценка проектных решений по загрузочному устройству с учетом достижения требуемых показателей плавки

Expert evaluation of the functionality of the control system charging device. Analysis of the cyclograms of the equipment and the assessment of the bandwidth the system of charging . Development and maintenance of recommendations for selecting a charging device, rational regimes of work and the design parameters of the chute distributor .

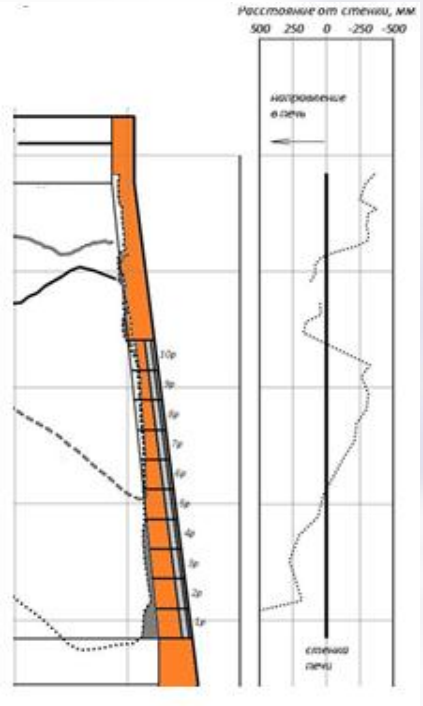




Consultations on the selection of controls and technical solutions in the design of new or reconstructed blast furnace

Technological tuning charging device

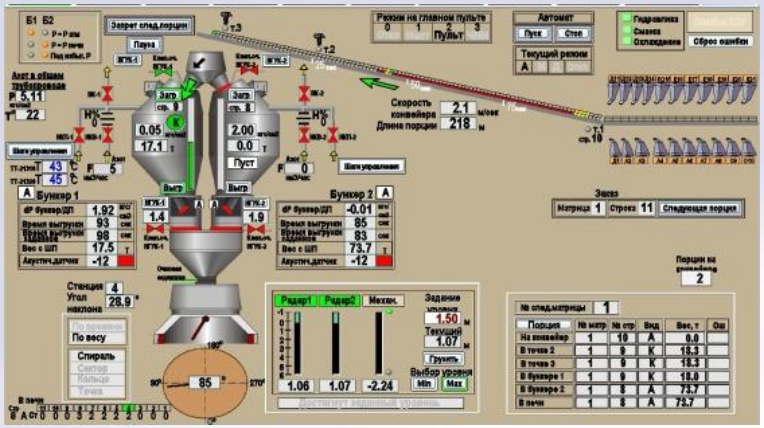
Experimental studies features of the work of charging device, the trajectories of the flow of charge materials in the reaction space of the furnace, the charge distribution on the top.

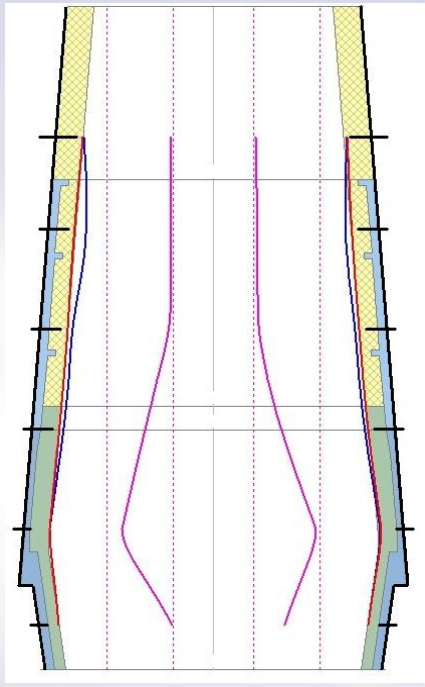


Evaluation of actual parameters of the profile stack and bosh using high precision laser measurement technology.

SYSTEMS OF AUTOMATED CONTROL

Improving control system charging raw materials of the blast furnace

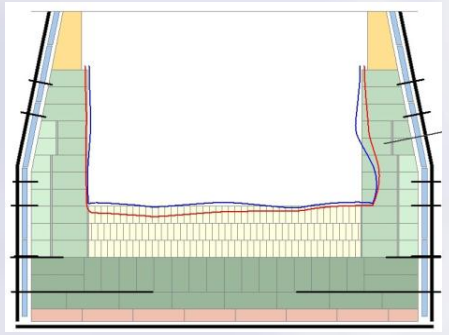




Systems of automated control the thermal performance and the stack erosion of the lining blast furnace

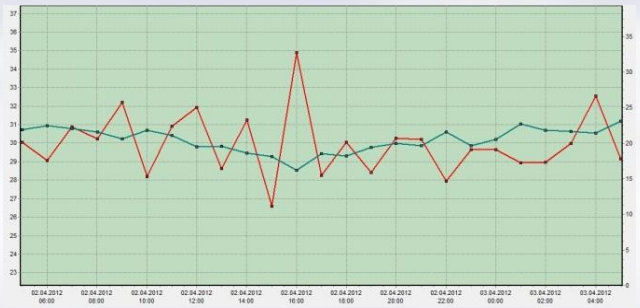
Is monitored:

- **the minimum, average and maximum thermal load on height shaft and the stack erosion;**
- **thickness skull and profile of the shaft;**
- **rate of change lining erosion.**



Systems of automated control the thermal performance and the hearth-bottom erosion of the blast furnace

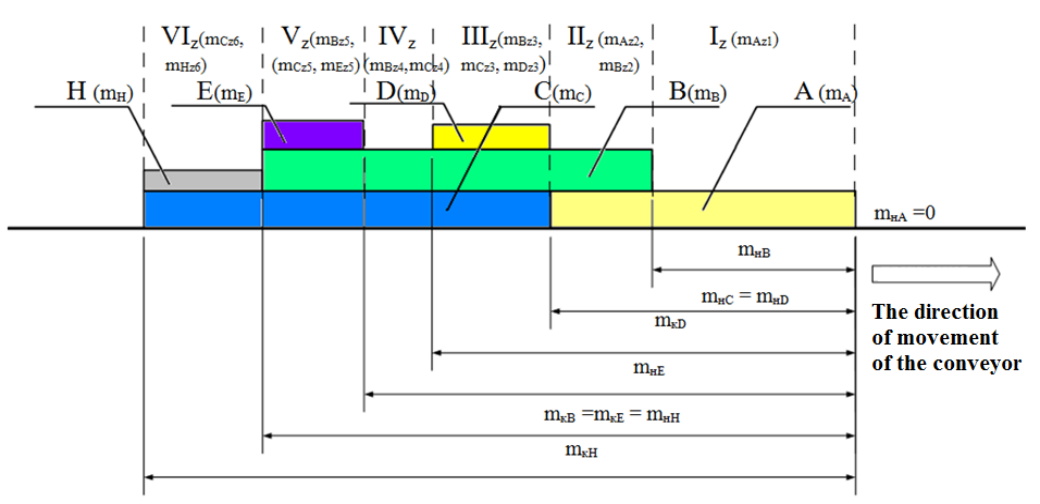
Visualization system includes: a vertical section and a three-dimensional image hearth-bottom erosion, horizontal cross-section hearth-bottom erosion



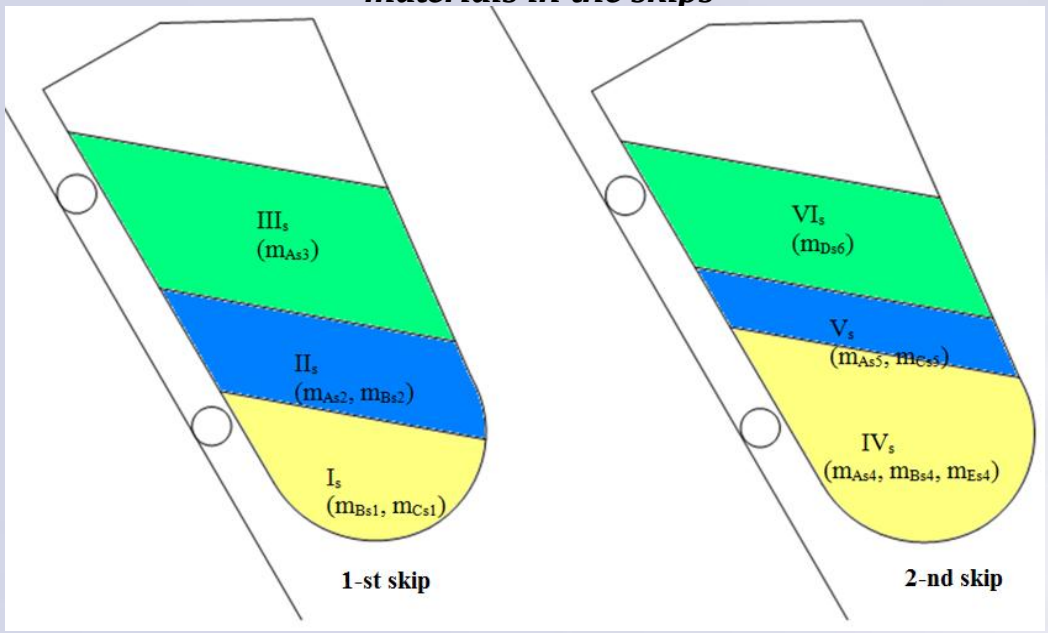
Automated control of the external heat losses and coke rate on their compensation

INTELLIGENT DECISION SUPPORT SYSTEM FOR CHOOSING THE CHARGING MODE, ALLOWING TO PREDICT THE DISTRIBUTION OF COMPONENTS OF THE RAW MATERIALS IN DIFFERENT AREAS OF THE FURNACE

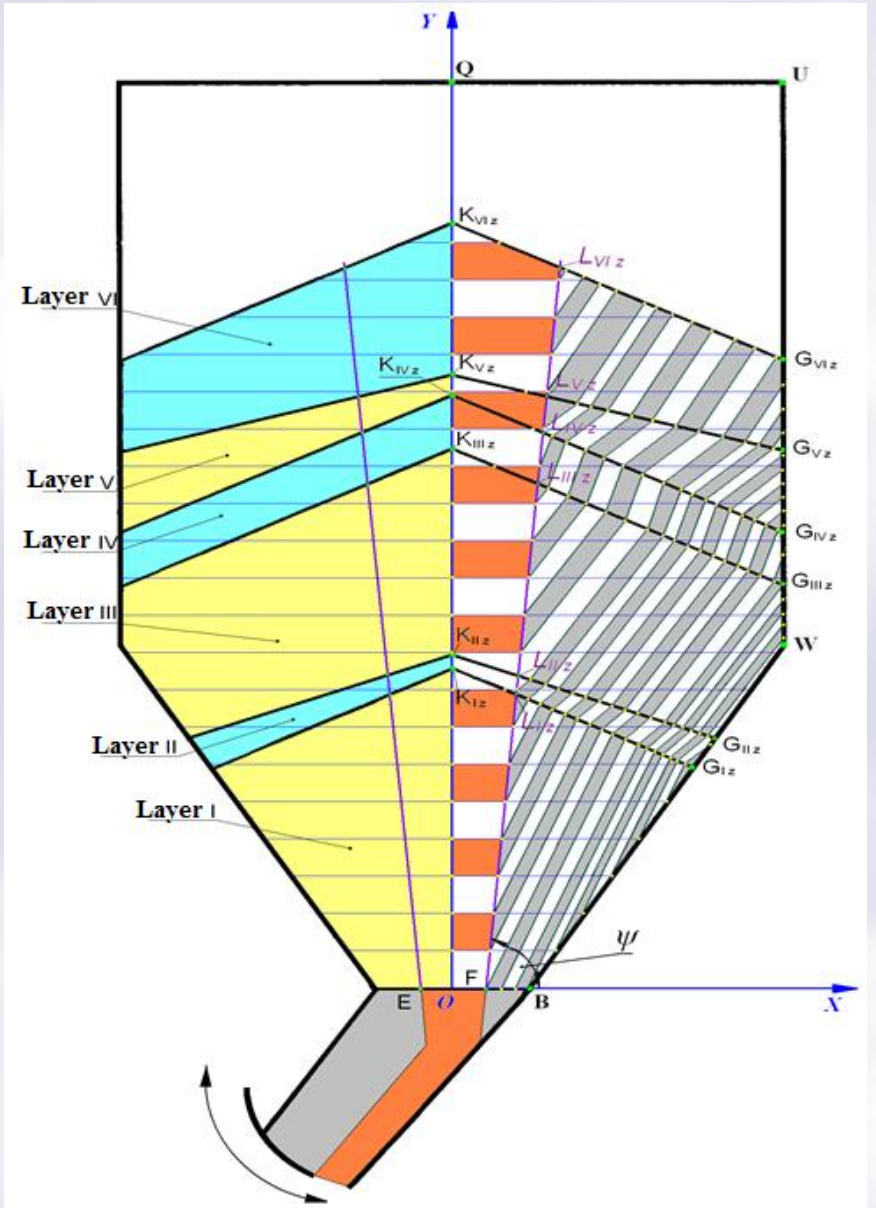
The structure of the portion of the mixed multi-component charge materials on a conveyor belt



Schematic representation of the layers after loading charge materials in the skips



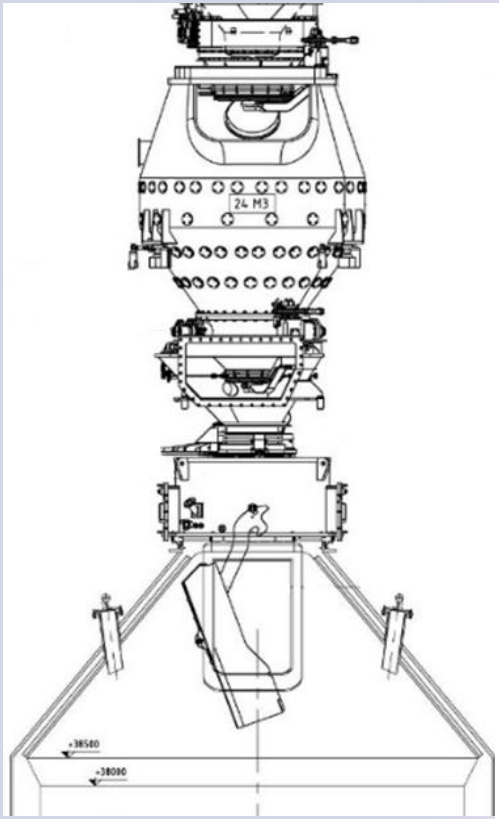
Driving multicomponent discharging portion of the hopper BLT

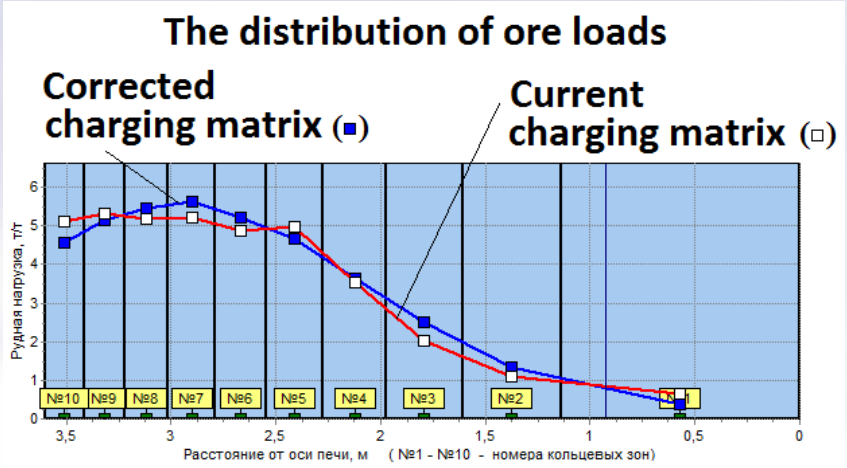


DEPARTMENT OF PROCESS EQUIPMENT AND CONTROL SYSTEMS

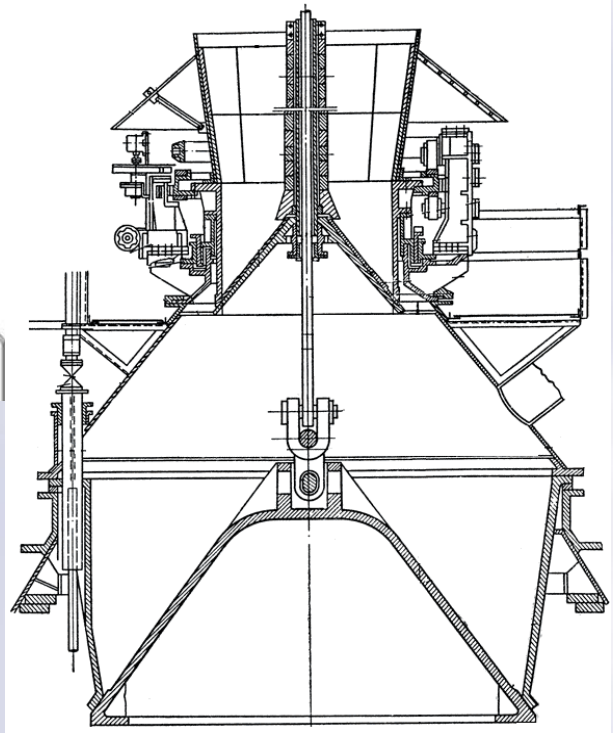
INTELLIGENT DECISION SUPPORT SYSTEM FOR CHOOSING THE CHARGING MODE, ALLOWING TO PREDICT THE DISTRIBUTION OF COMPONENTS OF THE RAW MATERIALS IN DIFFERENT AREAS OF THE FURNACE

For blast furnace equipped with bell-less charging device

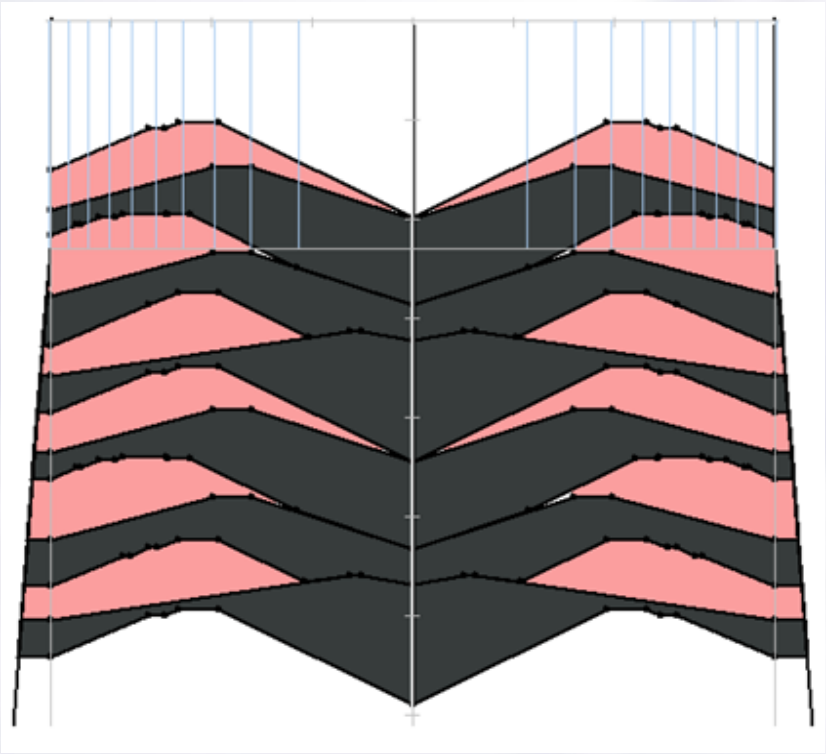




For blast furnace equipped with bell-type charging device



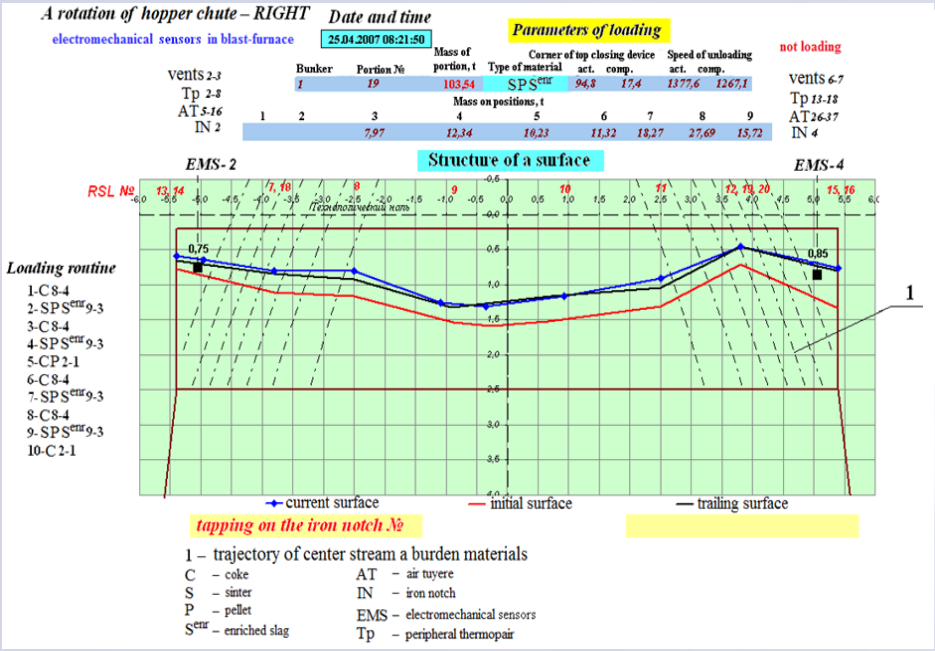
Layers charge



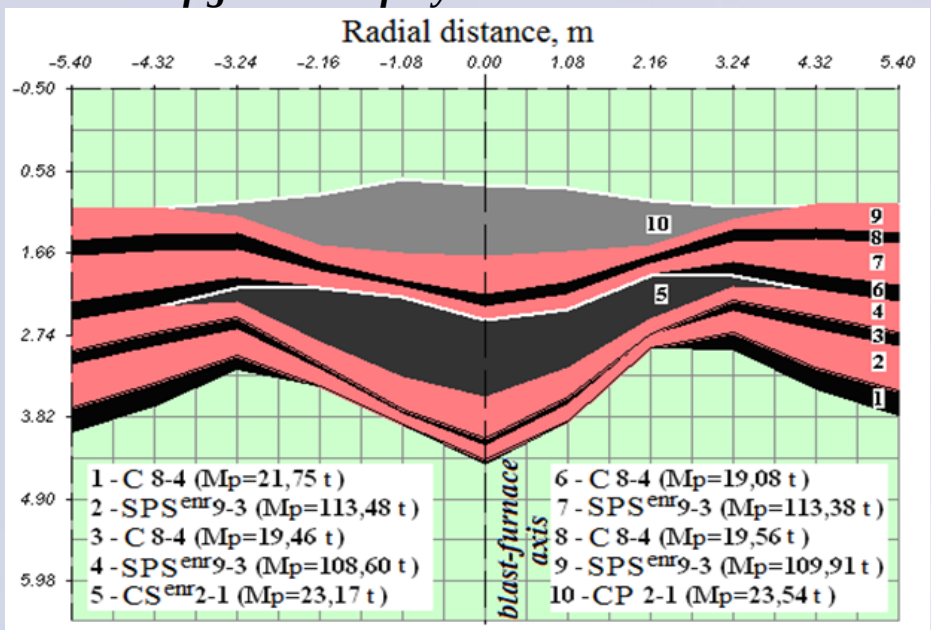
THE INTELLIGENT CONTROL SYSTEM OF THE CHARGE SURFACE BY RADAR LEVEL

DEPARTMENT OF PROCESS EQUIPMENT AND CONTROL SYSTEMS

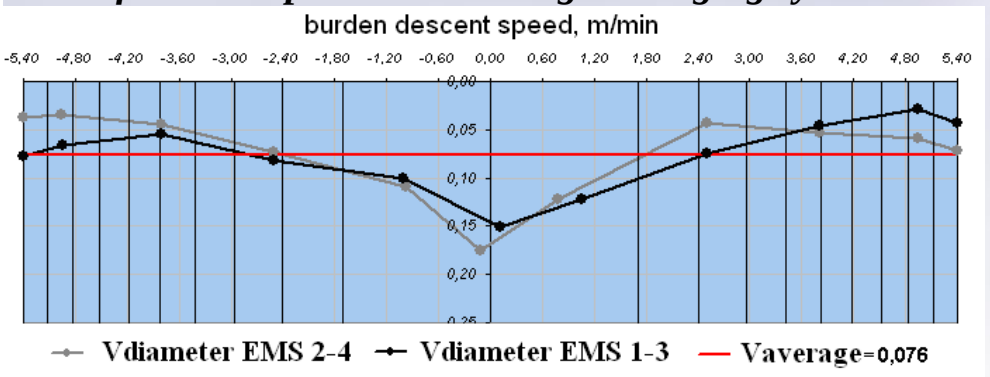
Burden surface profile by the measured furnace top sector radius



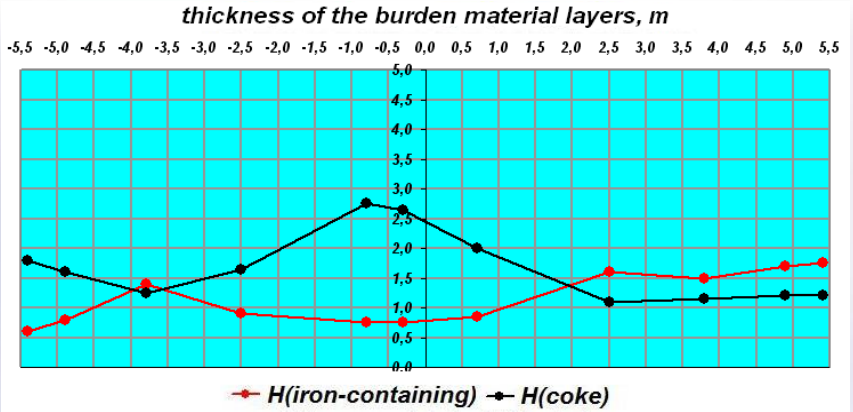
Configuration of layers burden materials

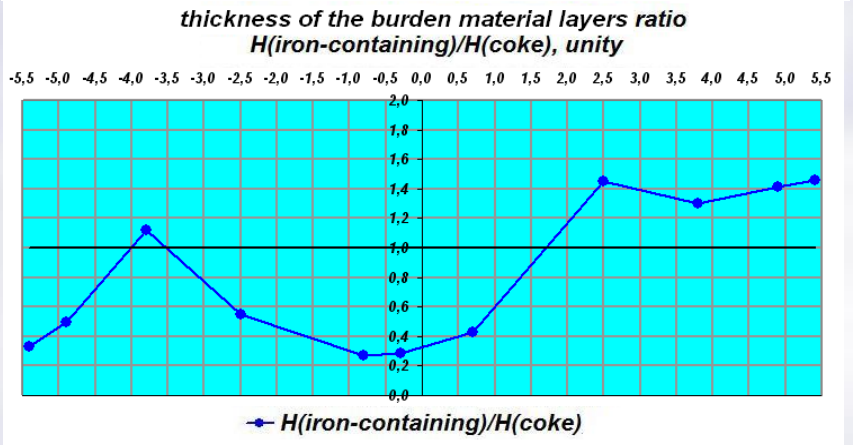


The burden descent speed in various furnace top sections during a charging cycle

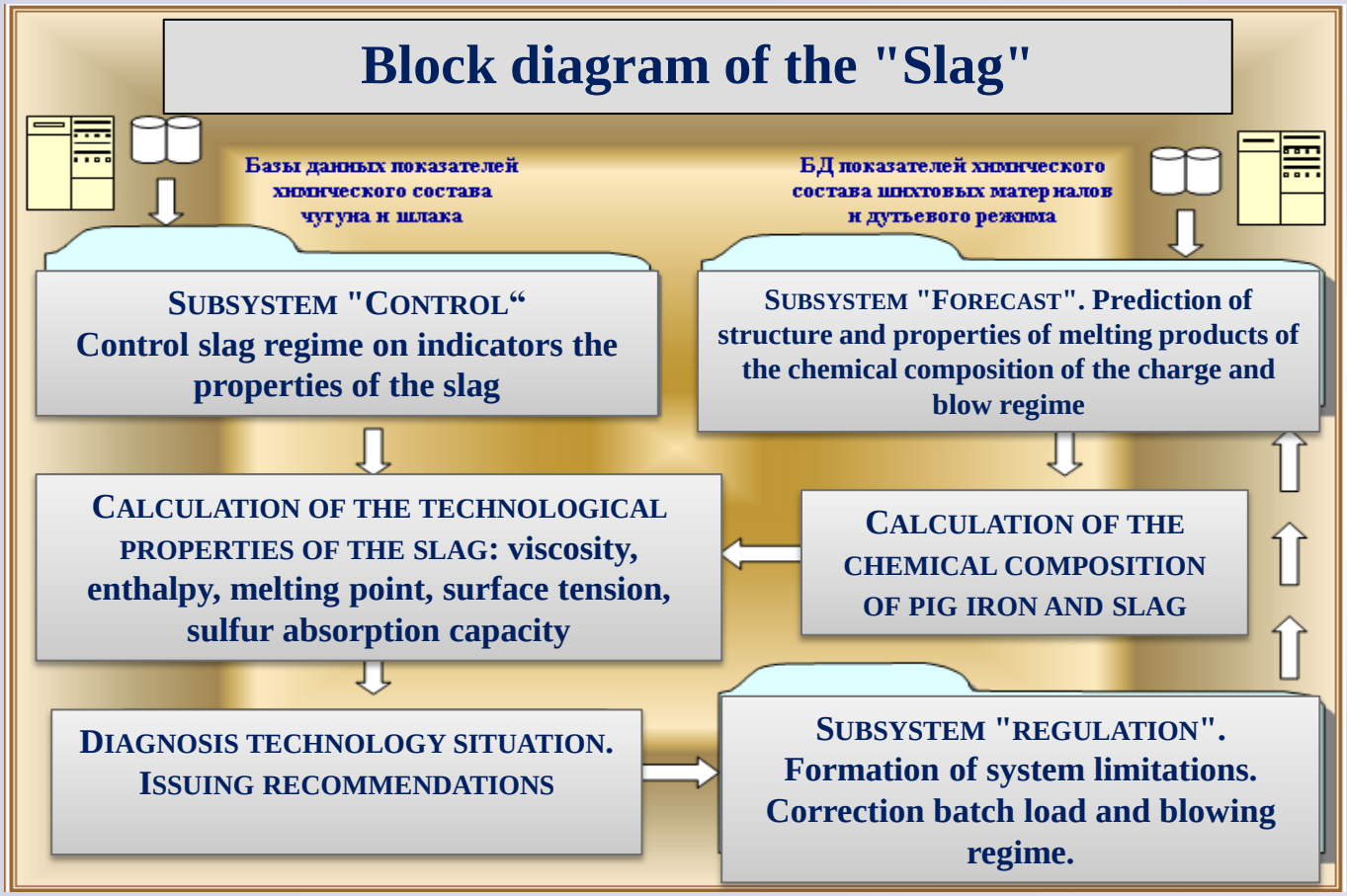


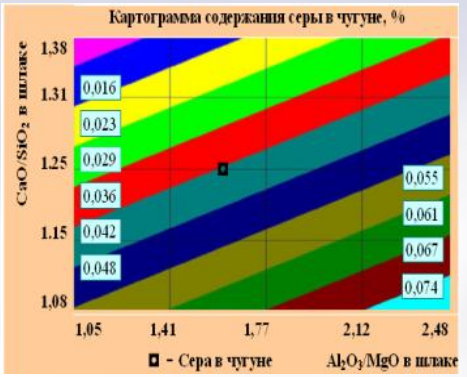
The forms and thickness of the burden material layers by the measured furnace top radius and its ratio

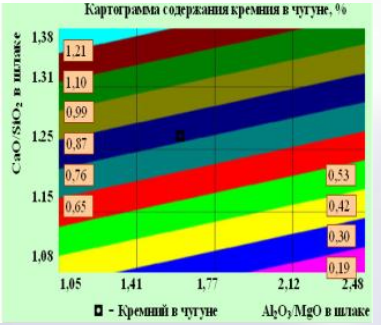




AUTOMATED SYSTEM OF CONTROL AND MONITORING SLAG REGIME IN BLAST FURNACE







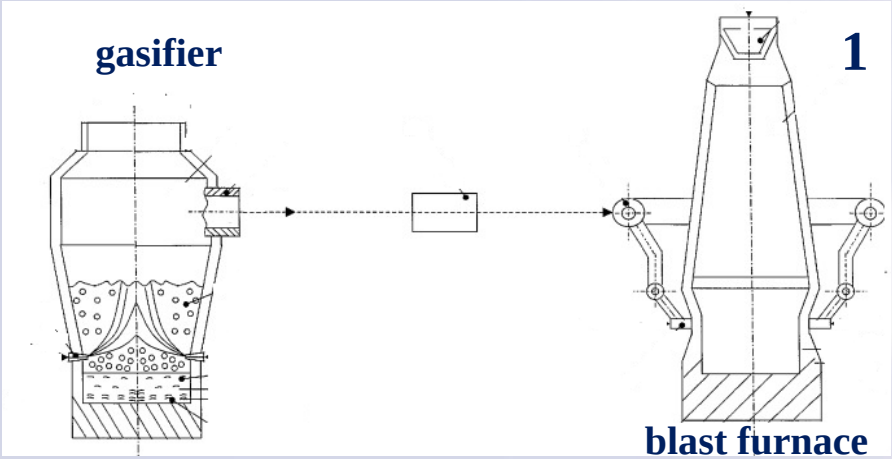
Video Snapshot system "slag" to select the optimum slag basicity according to of the ratio of Al_2O_3 / MgO

The procedure for calculating the parameters of of slag is implemented in the automated system for monitoring and control slag mode blast furnace "slag", which is implemented and has been tested in systems of CAM and automated process control system of blast furnaces in Ukraine and Russia: "ArcelorMittal Kryvyi Rih", "Zaporizhstal", " West Siberian Metallurgical Combine ".

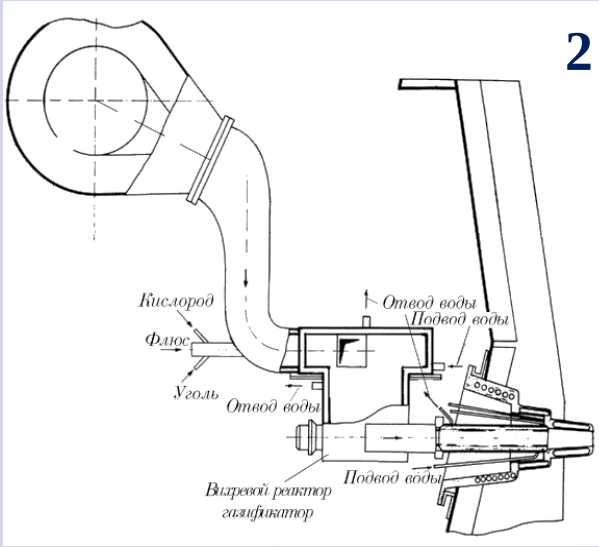
The economic effect of implementing of the "slag" is achieved by stabilizing the technological properties of slag in the optimal range, providing conditioned iron smelting (reduction of variability of the silicon and sulfur content in pig iron), and reducing coke consumption by establishing rational relations in the supply of the raw materials. The system "slag" is based on 5 author's

THE INJECTION OF REDUCING GASES INTO A BLAST FURNACE

It involves the preparation of hot reducing gas by gasification of coal in the gasifier and injecting the resulting hot reducing gas in the blast furnace. There are 2 options:



The design tuyere-gasifier.
Gasifier set to each blast furnace tuyere.

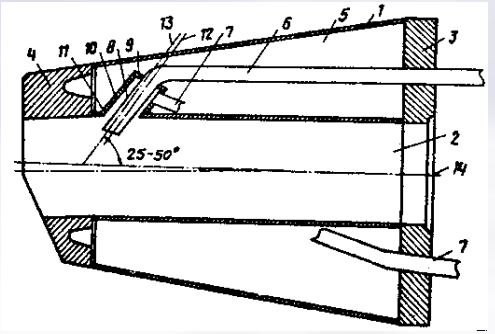


PULVERIZED COKE OVEN GAS INTO THE BLAST FURNACE

The offered technology is simple in maintenance, completely automatic and is controlled by the existing systems "Gas-Blowing".

The economic efficiency is achieved due to lowering of direct reduction degree and coke saving by 15-40 kg/t hot metal as compared to the natural gas. The blast furnace output is increased by 60-70 t/day at the same burden conditions. The whole process proceeds using existing equipment. The original corrosion-resistant unit for coke gas introduction into the blast jet is designed and offered.

The ISI can transfer the technical document files including manufacture of original air tuyere with corrosion-resistant unit for coke gas introduction; operating instructions relating blast furnace smelting conduct; BF blowing-in method using coke gas; the ISI can render engineering services in original technology implementation.



Tuyere blast furnace is equipped with special input unit coke oven

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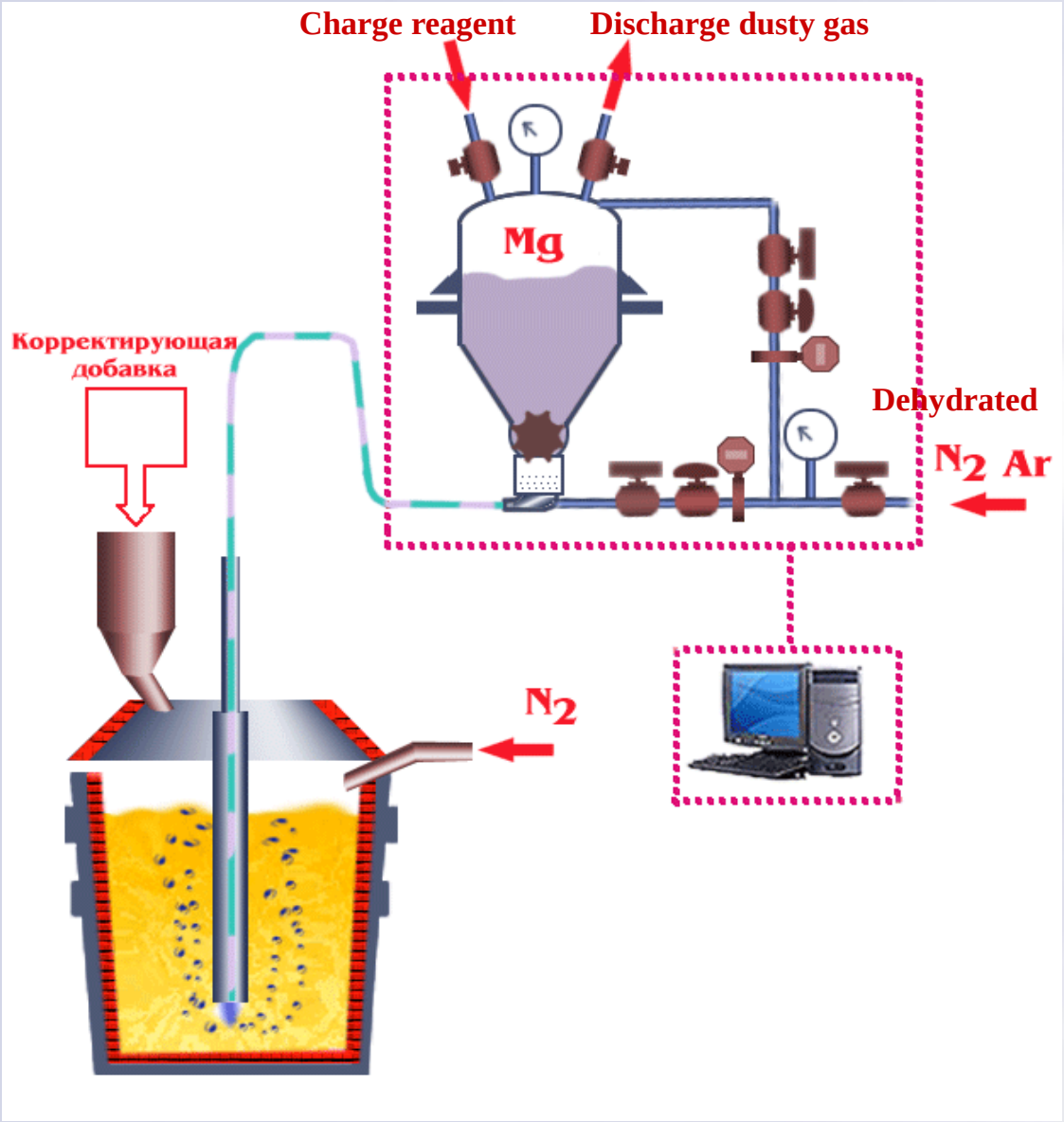
LADLE DESULPHURIZATION

HOT METAL DESULPHURIZATION WITH GRANULATED MAGNESIUM



The main advantage Ukrainian technology desulphurization injection of particulate (granular), magnesium is to provide the highest (in comparison with all other technologies) assimilation sweetening agent and the use of magnesium without various additives.

Initial content of sulfur in cast iron can be - up to 0.10-0.2%, end - until 0.0003%.

The production capacity of the complex - to 6.5 million tons / year

Processing costs 2-2.5 dollars / ton of pig iron

Is realized on 73 complexes desulfurization 40 Chinese steel mills. Capacity of 93 million tonnes.

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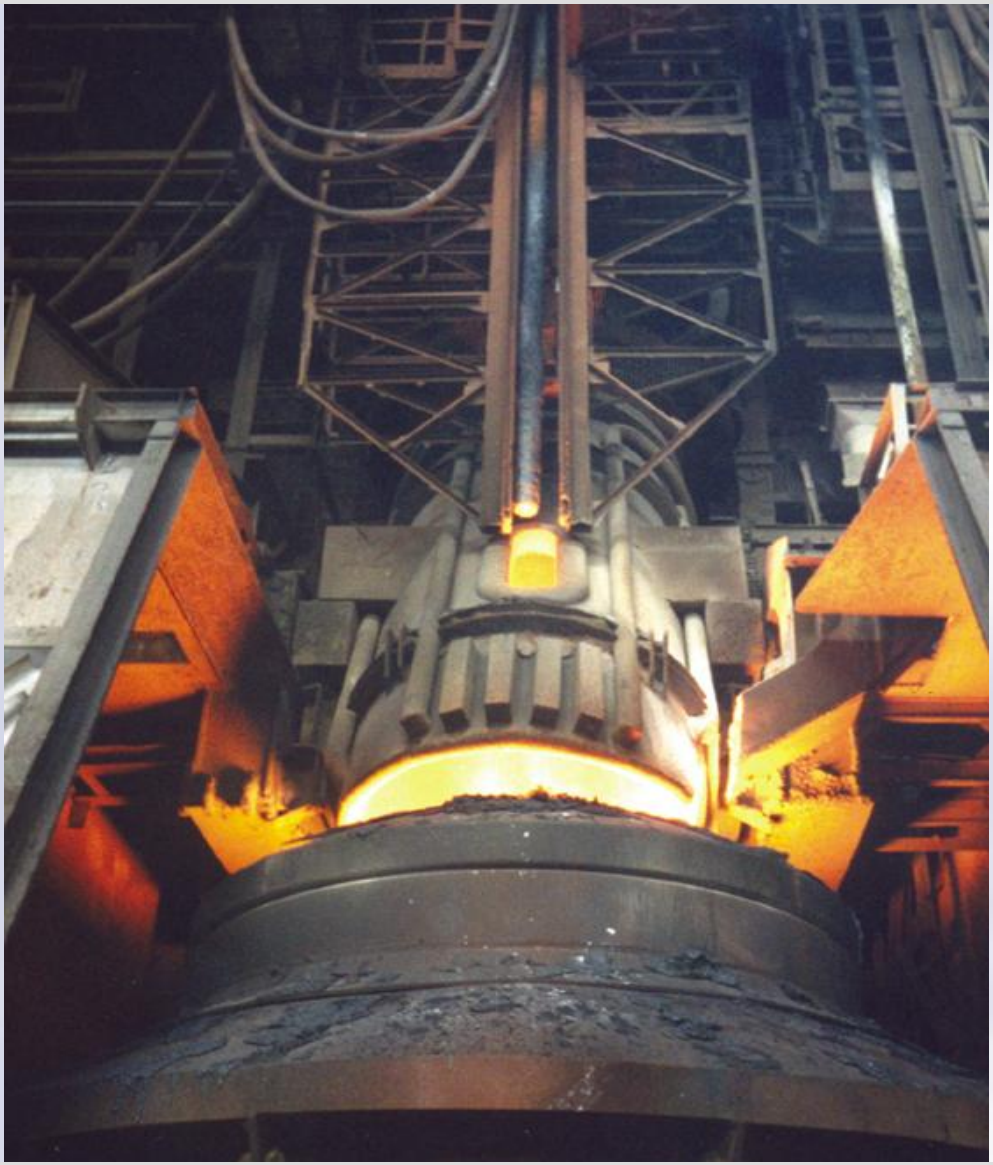
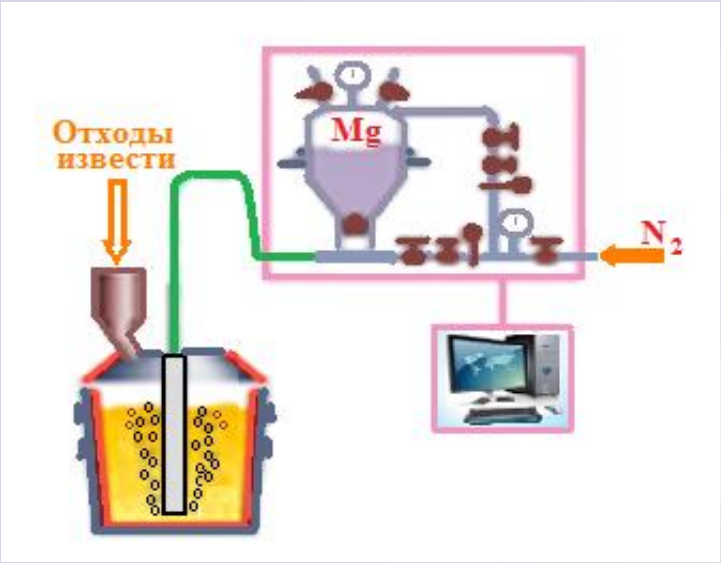
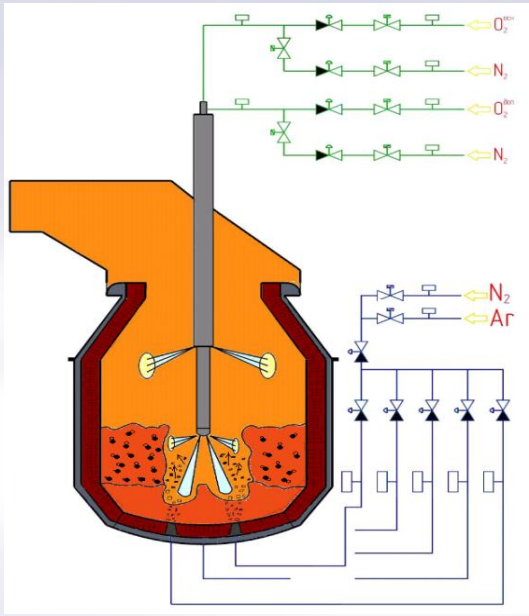


STEELMAKING

TECHNOLOGY OF PRODUCTION OF HIGH QUALITY STEEL



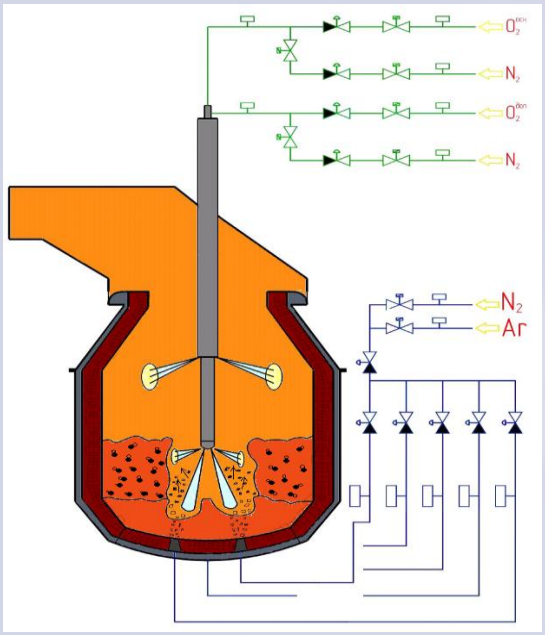
De -S



De-Si, De-P, De-C

Removal of sulfur from cast iron	Removal of Si and P in the converter (Phase 1)	Removal of C и P in the converter (Phase 2)
Produced in a ladle by injecting through a 2 nozzle immersion lance granulated magnesium in a nitrogen stream. If necessary, adjustment of the basicity of ladle slag carried additiving waste lime. The sulfur content in the cast iron after treatment 0.001%. double	Is produced by blowing across the top of converter bath double-bunk tuyere different pulse oxygen jets. Through the bottom served of the mixing neutral gases. Basic slag 1.9-2.1. After treatment the metal temperature not more than 1380 ºC, the content of phosphorus 0.025% and carbon 3.5%. Carried out an intermediate deslagging.	Renewal combination blowing bath with production of slag basicity of 3.5-4.0 and MgO = 10-12%. The resulting metal alloy contains 0.03-0.04% C and 0.003-0.005% P. The temperature of the metal on the tapping about 1640-1680 ºC. Next, nitrogen jets blow forming adhesive slag lining of the converter and the remaining slag is used in the new smelting.

TECHNOLOGY COMBINED BLOWING BATH CONVERTER WITH DOUBLE-BUNK TUYERE

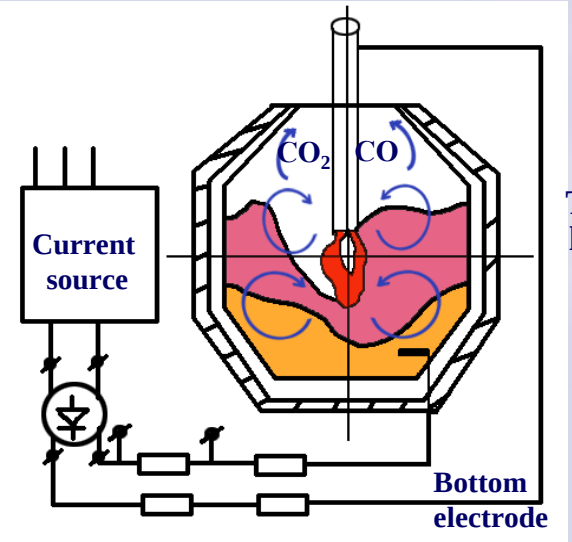


TECHNOLOGY AND DESIGN OF TUYERE PROVIDE:

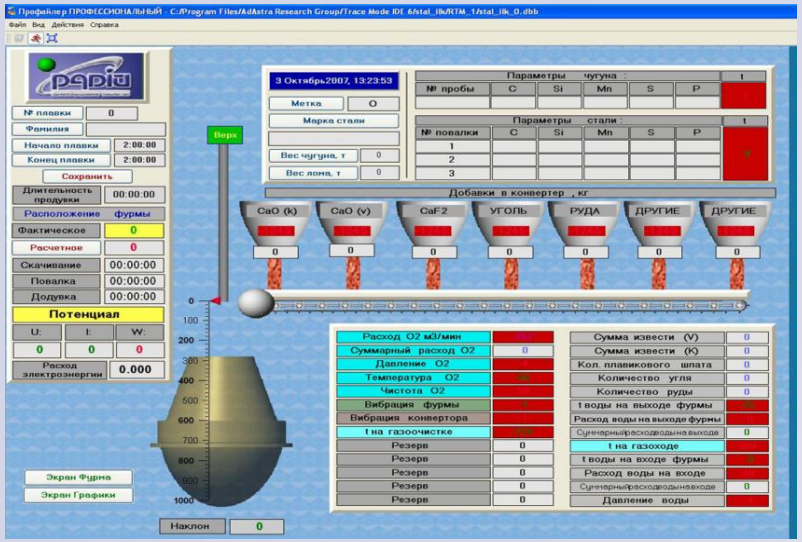
- **Quiet running blowing with flexible control of slag formation and acceleration of phosphorus removal at higher carbon content of the molten metal. Surge suppression, prevention clogging of oxygen tuyere, of the converter mouth and the chimney gas exhaust duct;**
- **reducing the consumption cast iron, slag-forming and refractory materials, ferroalloys, increase liquid steel, productivity and stability of the converter lining;**
- **coating slag scull on the refractory lining of converter by blow nitrogen jets.**

TECHNOLOGY OF METAL MELTING WITH LOW-VOLTAGE LOW-POWER ELECTRIC POTENTIAL APPLICATION TO THE MOLTEN BATH

The technology consists in usage of weak electric fields action on physicochemical processes, taking place under converter operation.



The circuit of superposition of low-voltage electric potentials in the industrial converter



The overall view of the window to control the electrical and technological parameters

Primary effects:

The energy effect reveals itself in the increase of heat accumulation of the bath, which leads to the increase of the temperature of metal at the outlet by 30 to 90 degrees centigrade in laboratory converters and by 15 to 30 degrees in industrial ones depending on the kind (direct or alternating), polarity (positive or negative) and power of the current.

The environmental effect shows itself in the decrease of the dust component in the exhaust gases by 1,5 to 3 times and in dramatic decrease of the exhaust.

The resource saving effect is revealed in the registered growth of the liquid steel output, increase of the residual concentration of manganese and decrease of the consumption of oxygen.

The technological effect is observed in the increase (depending on the polarity and power of the current) of the rate of desulphurization, dephosphorization and denitration, in the deceleration of filling up with metal of the blowing trunk of the tuyere and the expansion of the intervals between its substitutions for this reason (at least by 1,5 to 2 times while processing low manganese pig iron), and also in a generally calmer melting process.

An additional effect is manifested in the possibility to use measurable electric parameters for determining the level of the loading of scrap and surface of the bath, which allows the further creation of a new method of monitoring and control of the converting.

Is realized in the steel mills in Nippon Steel Corporation, Japan

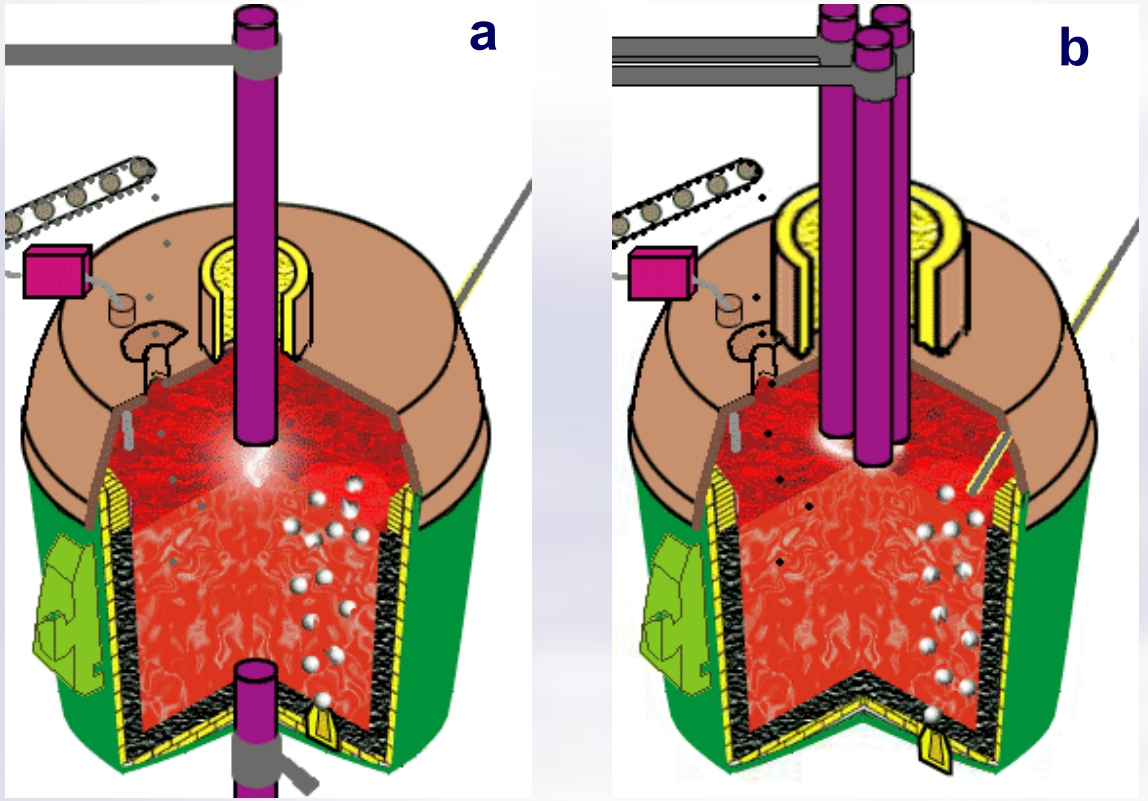
TECHNOLOGY OF PROCESSING ON THE LADLE FURNACE AGGREGATE

PRACTICAL VALUE:

•Saving of ferroalloys, electric power and argon, rising of resistance ability of casting ladles' refractory lining and cost saving of metal production

•The usage of revealed integrating decisions during the modernization of functioning LFA (ladle furnace apparatus) and making of the new ones

The rational location of the two tuyere purging provides increased 6% resistance lining ladle capacity of 250 tons. The application developed by melt blowing conditions such ladles has improved by 0.5 points macrostructure of continuous casting, to increase by 25 - 30% of the chemical homogeneity of the metal and to reduce 4 to 2 points, the number of non-metallic inclusions in steel.

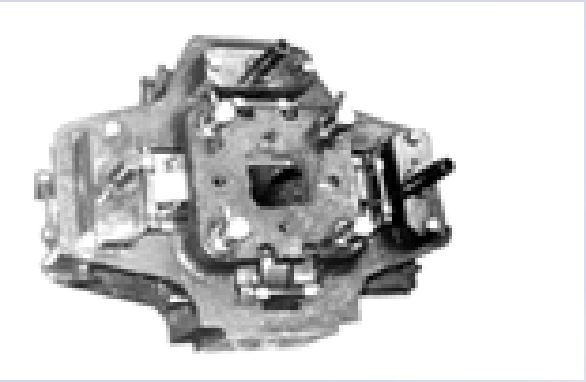


General view of LFA (ladle furnace aggregate) of alternating (a) and direct current (b)

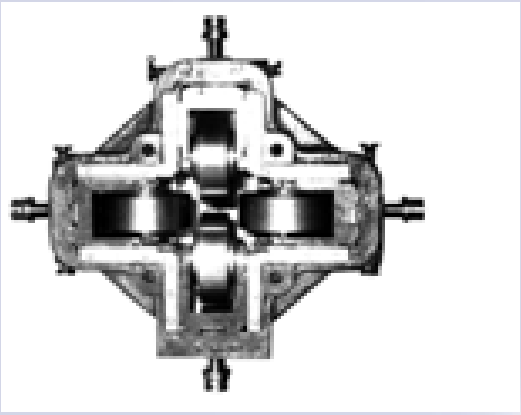
SHAPE AND BAR PRODUCTION

CONTINUOUS BAR ROLLING USING NON-DRIVEN WORKING STANDS

Non-drive cage roughing mill

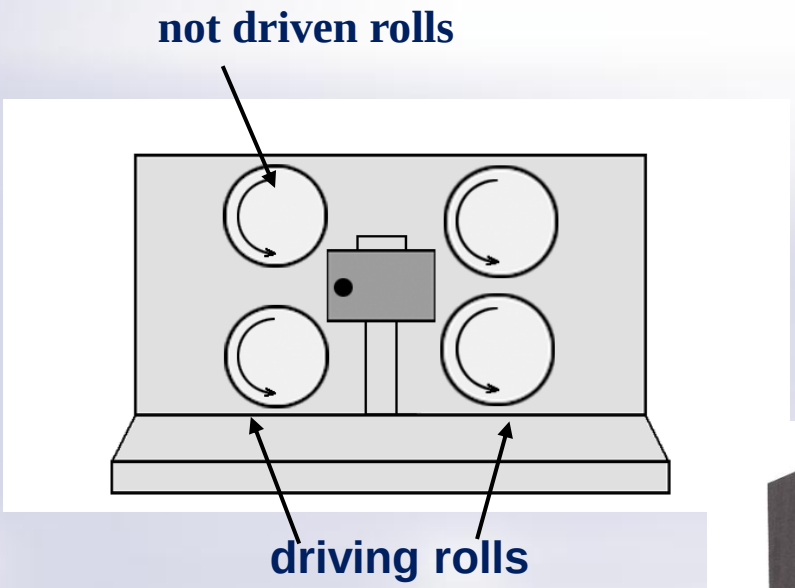


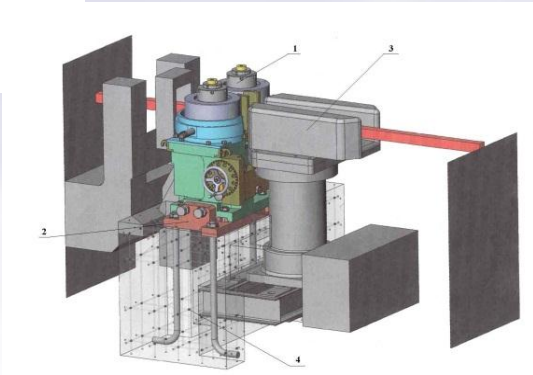
Universal non-drive cage finishing group



Effectiveness:

- increase the drawing ability of the rolling-mill;
- to increase the cross-section of initial billets;
- extend the range of rolled products;
- reduce operating costs by 3-5% due to increase of efficiency rolling process;
- to reduce energy consumption on the deformation;
- to reduce by 5-10% capital cost of the reconstruction of the mill by reducing the number of working stands with the drive.





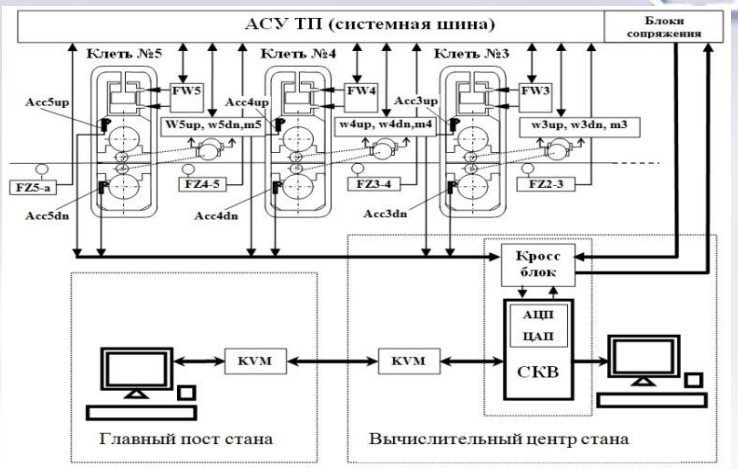
TECHNOLOGY OF SECTION STEEL ROLLING WITH LONGITUDINAL DIVISION IN LINE OF THE MILL

Expansion of size rolled stock of the mill and increase its productivity on 3...5 % by reduction of idle times;
Increase on 10...15 % of stability of the rolls grooves, appropriate reduction of both the rolls charge and quantity of rolls change;
Guaranteed resistance of dividing devices of 3000 tons of rolled steel (maximal - 6000 tons), that in 2...5 times are higher than resistance of known analogues (I.e., dividing cartridges of firm ASHLOW);
Increase of accuracy of longitudinal division and improvement the quality of cutting.

VIBRATION AND MILL SPEED CONTROL SYSTEM

General information about the system:

Vibration control system is designed to control the vibrational situation in the cold rolling mill in real time and aims to prevent the entrance to the phase of a cascade its growth, accompanied by the mill roaring. The system can automatically reduce the speed to the optimal value when the resonant vibration is detected. The system includes a diagnostic function of periodic defects in thickness during rolling.



Block diagram of VCS

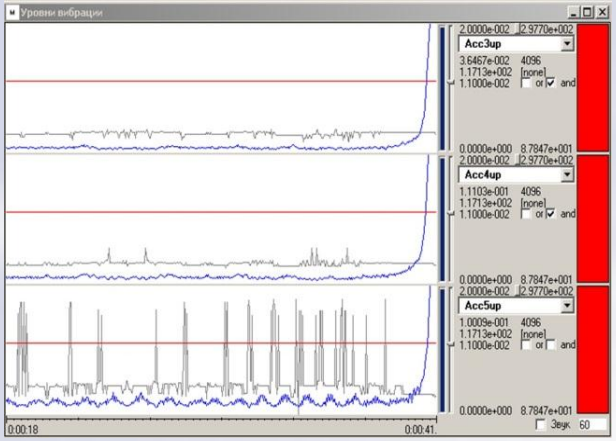
Three last stands of the mill are shown, the rest stands are similar.

Common features of VCS:

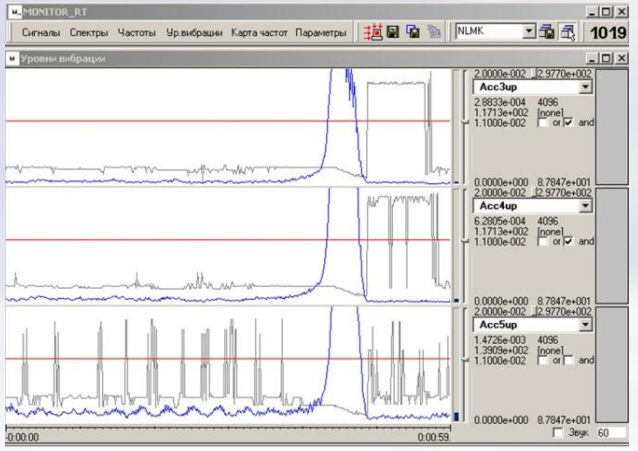
- **control of oscillations synchronization in the stands and mill control;**
- **horizontal stability control of work rolls chocks;**
- **control of reductions and tensions in the stands of continuous mill;**
- **control of high-frequency longitudinal strips gage variation;**
- **control of a neutral angle in the deformation zone;**
- **equipment diagnostics.**

Examples of VCS work

The drawings show examples of resonance vibration occurrence and response of the system. The system working window "Levels of vibration"



alarm signal



after speed slowing down

Is realized in the Novolipetsk Steel (Russia)

THE AUTOMATIC FLATNESS CONTROL SYSTEM OF THE STRIPS

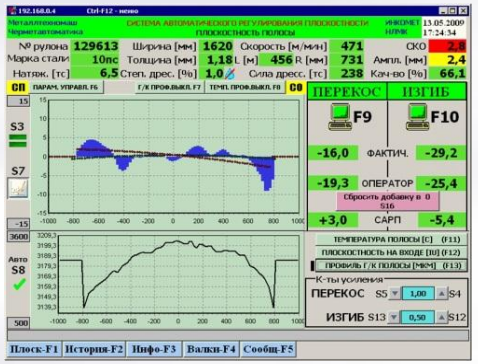
General information about the system:

AFC based on non-contact flatness meter IP-4M is implemented at the Novolipetsk Metallurgical Combine in the framework of technical upgrading program.

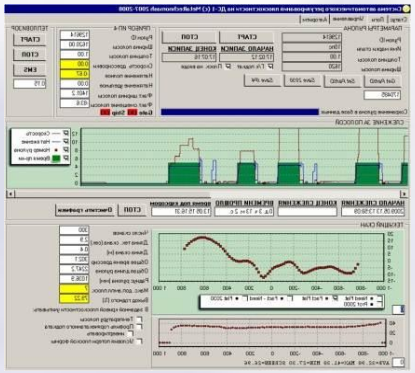
AFC, which uses non-contact methods for measuring the flatness and temperature of strips, is designed to automatically measure and control strips flatness on 1-stand and continuous cold rolling mills and the collection, storage, visualization and recording of process information.

Common features of AFC:

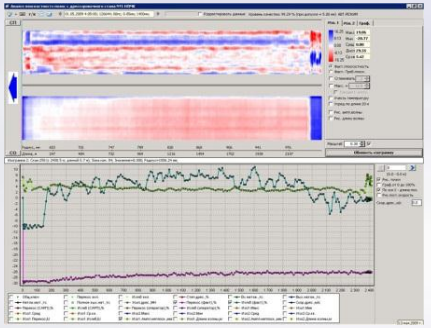
- **measurement and control of hydraulic bending and rolling forces separately from the drive and service side (tilt);**
- **visualization of the desired and actual cross-section diagrams of strips on the operator monitor;**
- **input and ongoing changes specified by the operator of target flatness diagram of strips from the control station;**
- **collect data on the strips flatness and technological information;**
- **storing the collected information for at least 1 year;**
- **visualization parameters of flatness in the form of trends and numerical values, taking into account the taken dimensions;**
- **review of existing information on the AFC work in the form of graphs and tables linked to the production unit (lot number, roll number);**
- **print the accumulated data in the form of reports, graphs and tables (lot number, roll number), (a form of reporting is coordinated at the stage of detailed design by the customer and the developer);**
- **statistical processing of technological information (defined min, max, mean and other parameters);**
- **implementation of the transfer of integral strips flatness characteristics with reference to the lot number, roll number by the customer agreed exchange protocol.**



control parameter and visualization of the current state of the process



control of the rolling process and setting the parameters of the control algorithm



Flatness analyzer - FlatResult

IRON & STEEL INSTITUTE

PHYSICAL METALLURGY AND HEAT TREATMENT

HIGH-STRENGTH STEEL PRODUCTS FOR FREIGHT RAILWAY CARS

Developed high-strength low-alloy steel metal products for freight wagons, which provides a significant improvement of their performance.

This allows:

1. To increase the service life of 23 to 32 years old.

2. To increase the axial load from 23.5 to 25 tonnes.

3. Increase turnaround > 500000 km.

4. Reduce the weight of the wagons.

Existing and new types of steel products for freight wagons:

Metal products	Condition	$\sigma_т$, Н/мм^2	$\sigma_в$, Н/мм^2	δ_5, %	KCU, Дж/см^2
Steel 09Г2Д (used now)	Hot-rolled	≥295	≥430	≥21	≥29 при Т= -40°С
Russian Railways (10ХСНД, 15Г2СФ)	Hot-rolled	≥390	≥550	≥21	≥29 при Т= -60°С
ISI (Ст3, low alloying Ti+Al+N)	thermostrengthening	470-660	600-840	≥18	≥35 при Т =-60°С

The new composition of the microalloyed steel wheel and rail regimes of thermal hardening of the steel wheels. This provided the desired level strength characteristics in combination with high wear resistance, impact and fracture toughness. It provides hardness HB ≥ 320 and a 44% increase of resistance to the formation of defects on the

The structure of the wheel steel microalloyed with vanadium

Designed temperature-time parameters of high thermal hardening wheel strap locomotive of steel micro-alloyed with vanadium. It provides a set of mechanical properties:

$\sigma_в$, MPa	δ_5, %	Ψ, %	$KCU_{+20°C}$, Дж/см^2	$HB_{20мм}$
1170	9,8	14,0	30	336

Is realized in the Interpipe Steel

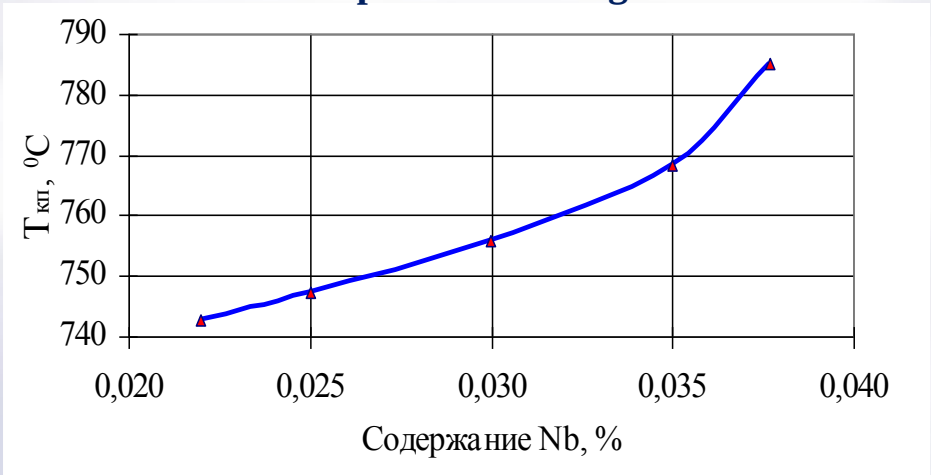
TECHNOLOGY THERMOMECHANICAL TREATMENT OF THICK SHEET

Developed energy saving technology of thermomechanical treatment and equipment for the controlled accelerated cooling of rolled to form the optimal structure and mechanical properties of the steel sheet increased (σ_T = 325 - 425 N/mm^2) and high ($\sigma_T \geq$ 500 N/mm^2) strength. The foundations of the automated monitoring and control of strain-hardening heat flow mills.

Structural charts are drawn and quantitative dependence of the cooling speed influence and changing of the chemical composition on the transformation of the cooled austenite are obtained.

Dimensions of sheets to be cooled:	
thickness, mm	12-50
width , mm	1800-3400
length , m	UP to 24
Cooling water consumption, m3/h:	
for one device	80 - 90
for the complete unit	3000
Water pressure, atm	3 - 5
Speed of sheets movement on the unit, m/s	0.1 1.5
Cooling rate (for a plate 16-50 mm in thickness), °C/c	25 - 7
Coefficient of heat transfer,KW/m^2 degree	2.0 - 2.3

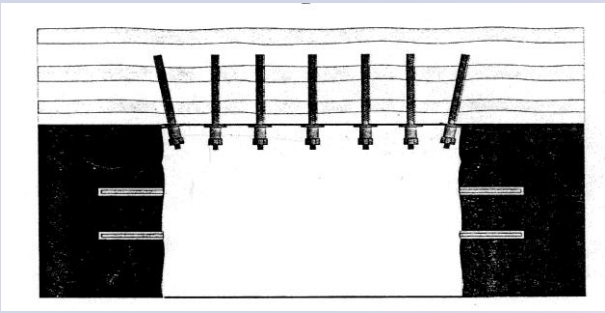
The dependence Tкп on the content Nb after low-temperature rolling



New technologies thermomechanical treatment thick sheet allow by the use rolling heat utilization, optimizing the chemical composition of steel, raising the temperature controlled rolling to reduce energy costs in the amount of 640-1300 MJ/t, saving manganese (10-12 kg/t), and other alloying, improve operating conditions rolling equipment that provides a complex of mechanical properties of low-carbon steel strength class C285 - C315 at high elongation rates (δ≥20%) and toughness (KCV_{20}≥0,7 MJ/m^2).

Is realized in Azovstal, Mariupol metallurgical combine

TECHNOLOGY OF PRODUCTION OF SCREW ROLLED PROFILES FOR STRATA BOLTING THE MINE WORKING



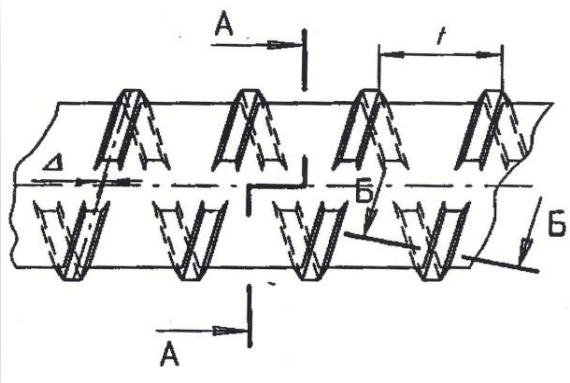
Scheme strata bolting the mine working

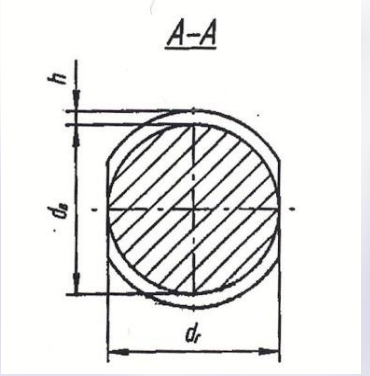
Developed and implemented a technology of rebar screw profile for anchoring mine working classes А400ш and А500ш of steel grade 30ГС.

Designed rolled profile provides the necessary combination of different mechanisms for maintaining the anchor in the borehole and a significant increase in the bearing capacity of the anchor barbells for a wide range mining and geological conditions.

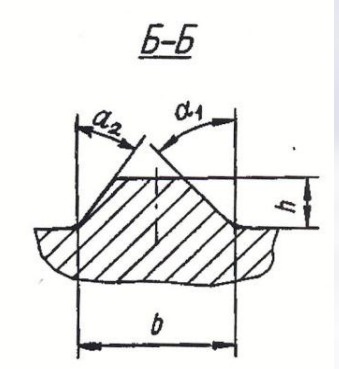
Mechanical properties:

- **yield strength (σ_T) - not less than 500 N/mm^2;**
- **ultimate strength (σ_B) – not less than 620 N/mm^2;**
- **(σ_B/σ_T) – not less than 1,2;**
- **percentage elongation at maximum load (δ_{max}) – not less than 8 %;**
- **percentage elongation after rupture (δ_5) not less than 20 %.**





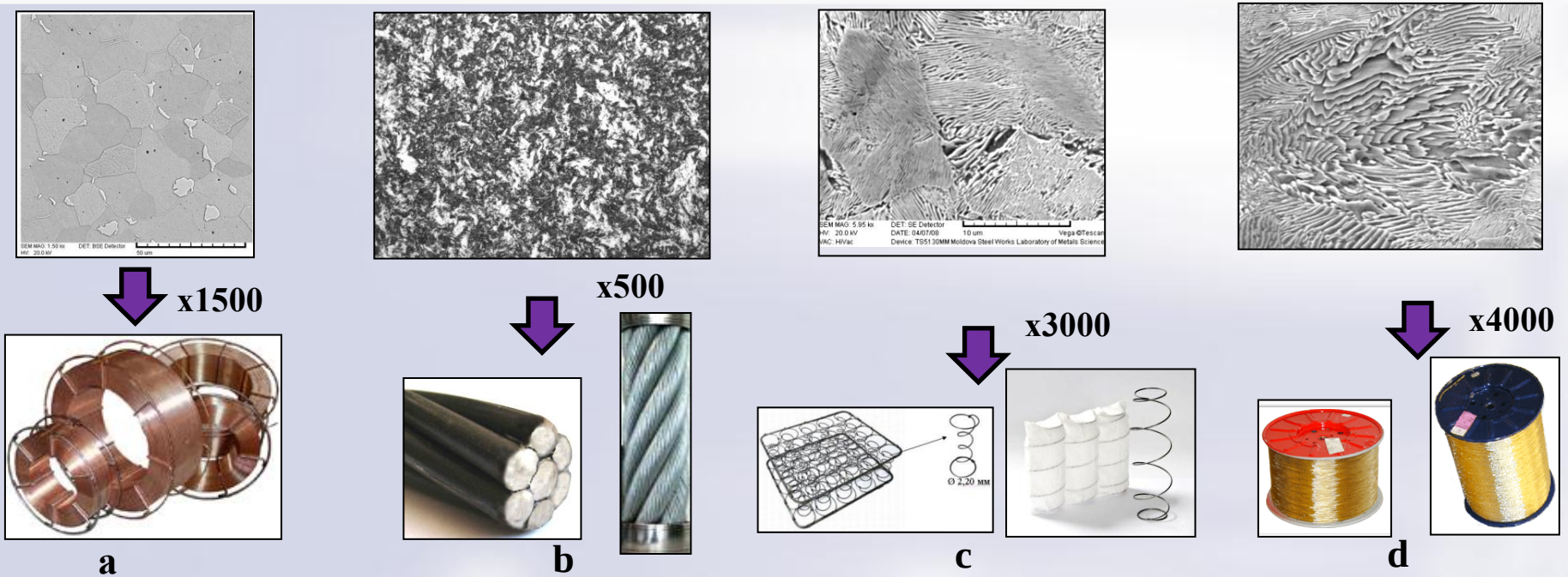
Designed periodic rolling



Is realized in Yenakiyevo Steel Plant

QUALITY WIRE ROD OF WIDE GRADE RANGE

For wire rod increased deformability broad Grades (welding purposes, for the production of high-strength rebar ropes, high furniture spring wire, bead wire, high-strength steel cord) for the first time in modern metallurgy scientifically s boron microalloying.



End-to-end mass-scale sustainable and energy-saving processes of manufacturing of micro-alloyed wire rod with enhanced rolling ability (with aggregate degree of strain to be 97%) in the course of drawing:

- **welding wire rod, Fig. A (Св-08Г2С, Св-10НМ, Св-08ХМ, Св-08ГНМ, Св-08ХГ2СМФ et al.);**
- **wire rod for high-strength PSC strands, Fig. B (C80D2, C82D2)**
- **wire rod for high-strength furniture springs, Fig. C (steel grade 70)**
- **wire rod for tire bed wire, high strength and ultrahigh strength steel wire cord, Fig. D (steel of 85, 90 grades).**

The relevant technical documentation is developed for the above mentioned steel grades.

Is realized in "Moldavian Metallurgical Plant" (Rybnitsa town, Moldova)

BRIQUETTING MATERIALS

TECHNOLOGIES AND EQUIPMENT FOR RAW MATERIAL PREPARATION

The ISI conducts theoretical researches, develops technologies and equipment for briquetting a small fraction of raw materials and industrial wastes from iron mines, coal mines, metallurgical plants and other companies (like coke oven plants, agriculture firms, food processing plants and etc.). We create the design of Briquetting Machines and their technical characteristics (productivity, roll separating force, etc.) for each customer individually, with great attention to physical and mechanical properties of your materials, conditions and requirements of your company. Institute has it's own manufacturing capacities and it produces Roll Presses based on the line of basic modifications

All Briquetting Roll Presses Specifications:

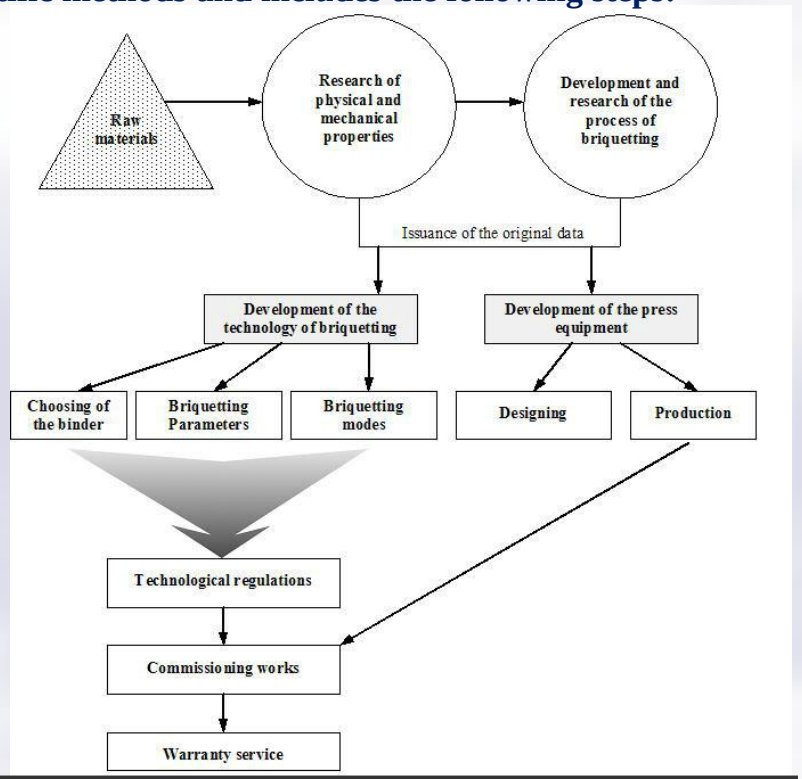
Model	Maximum Roll Separating Force, kN	Maximum Pressing Force, MPa	Roll sizes		Rolls rotational speed, turnover per min	Roll Drive, kW	Transmission torque, Nm	Machine Weight, kg
			Roll Diameter, mm	Roll Width, mm				
19PS	1200	100	647	360	1,8-9,2	30,0; 55,0	35500; 56000	≈8500
21PS	1500	120	647	360	1,8-9,2	55,0	56000	≈8200
22PS	2000	150	647	360	5,5-9,2	75,0	85000	≈12500
23PS	750	100	504	202	2,3-4,6	18,5	17000	≈4000
24PS	1200	120	647	202	1,8-9,2	30,0; 55,0	35500	≈6500

Sizes of briquettes:

Type	Sizes, mm	Volume, cm^3
R14	32,0x30,0x15,0	10...11
R17	40,0x38,5x18,5	19...20
R30	63,6x60,0x27,0	48...50

Typical shape for briquette is "Pelmen-form"

ISI developed an original approach to creation technologies and press equipment for briquetting. This approach is based on our own set of scientific methods and includes the following steps:



We have an experience of briquetting such raw materials:
Metallurgical slimes; Tailings; Mill scale; Cast-iron filings; Screenings of ferroalloys; Ore concentrates (hematite, magnetite, manganese, ilmenite, etc.); Screenings of agglomerate and pellets; Gas cleaning dust from metallurgical plants; Small-sized coke; Coal dust; Wood coal; Stone coal; Refractory materials (magnesium oxide, kaolin clay, etc.);
Metallurgical fluxes (fluorite, limestone, etc.); Sodium Chloride; Silicon carbide; Agricultural fertilizers.

Is realized:
Nippon Steel Co., Ltd. (Japan); "ArcelorMittal Kryvyi Rih"; "Nikopol Ferroalloys Plant"; "Evraz - Bagley Koks" and etc.