



URALMASHPLANT

**STRAIGHT GRATE
INDURATION MACHINES**



The “Uralmashplant” JSC, is a key equipment supplier for basic industry sectors: mining, metallurgical, and oil-and-gas industries.

In 2013 the “Uralmashplant” marked its 80s anniversary.

The main shareholder of the “Uralmashplant” is the “Gazprombank” JSC, one of the three largest Russian banks.

Today, the “Uralmashplant” JSC is a company providing the state-of-the-art engineering, welding, metal-working, mechanical assembly, and tool production works.

Main product assortment includes:

■ Mining equipment

- walking and track-type draglines,
- track-type open-mine excavators,
- cone and jaw crushers for all crushing stages,
- ball and rod grinding mills, semiautogenous and autogenous grinding mills,
- concrete-production equipment.



■ Metallurgical equipment

- sintering equipment,
- indurating equipment,
- blast furnace equipment,
- continuous casting machines,
- rolling equipment,
- press-forging equipment,
- rolling mill rolls

■ Oil-and-gas drilling equipment

- complete movable, stationary, and cluster drilling rigs with loading capacity from 160 to 600 tons,
- drilling equipment packages.

■ Handling equipment

- heavy cranes for metallurgical works,
- handling equipment for nuclear plants,
- general purpose special and bridge cranes.

■ Power equipment and nonstandard equipment

- hydraulic turbine units,
- transfer and homogenizing equipment units.



A company development strategy is aimed at creating a world-class machine-building company able to fully fulfill customers' needs for modern equipment.

STRAIGHT GRATE INDURATION MACHINES

History

Uralmashplant has begun to manufacture the pelletizing equipment since 1964, when the first domestic straight grate induration machine OK-2-108 was put in service at Sokolovsko-Sorbaisky ore mining and processing enterprise. In seven years, already 12 such machines were in operation at Sokolovsko-Sorbaisky ore mining and processing enterprise. All these machines were manufactured by Uralmashplant.

Uralmashplant supplied straight grate induration machines to many ore mining and processing enterprises of the USSR, including Lebedinsky GOK, Kachkanarsky GOK, Kostomukhshsky GOK, Mikhailovsky GOK, Northern GOK, Central GOK and Pechenganikel works.

To eighties, 80% iron-ore pellets in the USSR were produced at the equipment issued by Uralmashplant.

In all, for the period from 1964, Uralmashplant built about 50 straight grate induration machines of conveyor type for the ore mining and processing enterprises of Russia, Ukraine and Kazakhstan at which 90% iron-ore pellets in these countries were produced. These machines allow heat treatment of pellets from iron-ore and chromic concentrates, phosphorous ores to be carried out, oil shale and ash residues of the electric power stations to be processed and cement clinker to be produced.

At present time, Uralmashplant is the single in Russia designer and supplier of the induration machines of conveyor type with the working area of 108 – 700m² and completing equipment to them.

Today, the equipment of Uralmashplant for production of iron-ore pellets for blast furnaces or subsequent metal deposition competes, successfully, with the products of the leading world manufacturers.



Specifications of straight grate induration machines of conveyor type

Type of straight grate induration machine	OK-108	OK-306	OK-315Л	OK-324/336	OK-520	OK-520/536
Capacity, t/h	90...110	280	304	259.2	391	360
Working width/length, m	2/54	3/102	3/105	4/84	4/130	4/134
Working area, m ²	108	306	315	336	520	536
Pellet layer height, mm	320	450	480	500	400	400
Number of gas-air chambers, pc	27	34	35	27	32.5	33
Dimension of gas-air chamber, m×m	2×2	3×3	3×3	4×3	4×4	4×4
Number of pallets, pc	136	189	171	142	204	210
Pallet size, m×m	2×1	3×1.35	3×1.5	4×1.5	4×1.5	4×1.5
Weight of pallet, t	3.225	6.8	8.21	9.48	9.05	10.5
Pallet speed, m/min	0.5...3.0	0.63...3.8	1.5...3.5	0.72...2.5	1.8...5.6	1.8...3.12
Fuel heat rate, MJ/t (thd Cal/t)	1260 (301.0)	502 (120.0)	200 (47.6)	648 (155.0)	540 (129.0)	586 (140.0)
Maximum temperature above pellet layer in roasting zone	1350	1350	1280	1300	1300	1350
Maximum temperature in gas-air chamber of recuperation zone, °C	550	550	550	550	550	600
Pellet temperature at outlet from machine, °C	300	150	120	130	130	130
Machine drive motor power, kW	20	47	22	22	32×2	32×2
Weight of machine	1230	3500	2950	2610	4064	4580



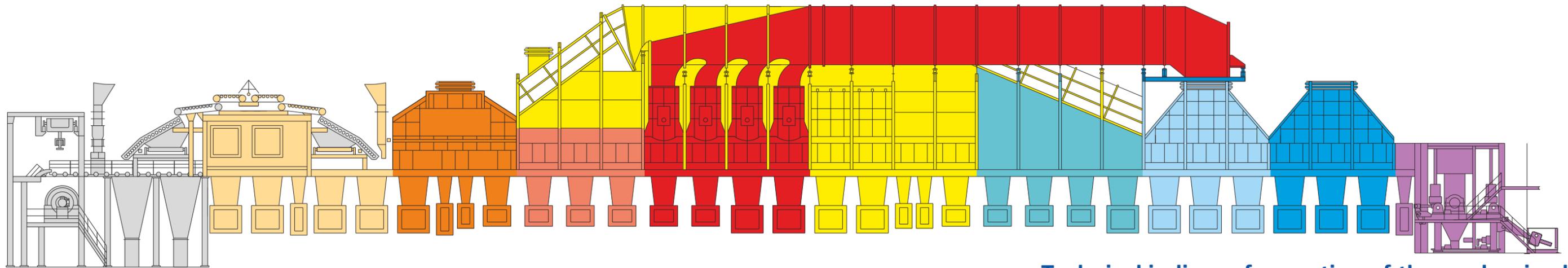
Use of straight grate induration machine of conveyor type

- production of pellets of iron-ore and nickel concentrates, chromic ore, phosphate rock
- production of cement clinker
- non-waste oil shale process
- any processes connected with roasting

Offers from Uralmashplant

- complete supply of the straight grate induration machines of new generation of any area and capacity
- reconstruction of operating balling plants
 - using of modern processes
 - economical gas flow circuits
 - maximum use of the existing production buildings, foundations, service lines
- supply of separate units of roasting equipment and spare parts





Advantages of straight grate induration machines of new generation

- optimal process, developed proceeding from the physical-and-chemical and mineralogical properties of source burden materials, mechanism of the processes in heat treatment of pellets, requirements to quality and metallurgical properties of ready-made product;
- economical heat circuit and parameters of gas-air flows in the machine which are optimal for the specified process;
- designs of furnaces, headers and gas pipelines of the machine, securing the specified heat-engineering parameters and indices of the heat circuit.

First, such approach was used in the process of updating the operating induration machines at Lebedinsky ore mining and processing enterprise in 1998-2001. Implementation of two stages of updating increased the machine capacity by 25% and reduced consumption of natural gas by 32%.

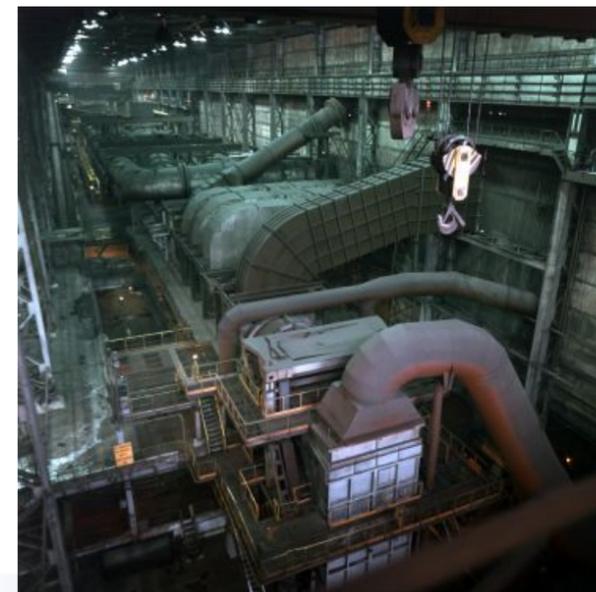
Uralmashplant cooperates closely with TOREKS Scientific and Production Promotional Enterprise Ltd. (NPVP TOREKS) created in 1990 by the leading specialists of VNIIMT and PTP URALENERGOCHERMET who design heat circuits for the straight grate induration machines of Uralmashplant.

These decisions have been used in the process of modernization of the straight grate induration machines at Mikhailovsky GOK. Affordability of the first stage of modernization (2004-2005) at the Mikhailovsky ore mining and processing enterprise made up 1.5 milliard rubles per year.

When comparing the indices (equipment usage factor, specific capacity, heat rate, natural gas rate and electric power rate per a ton of pellets) of operation of the modernized machines at Mikhailovsky GOK with the similar indices of the Lurgi's machines, superiority of the equipment issued by Uralmashplant over the foreign analogs is evident.

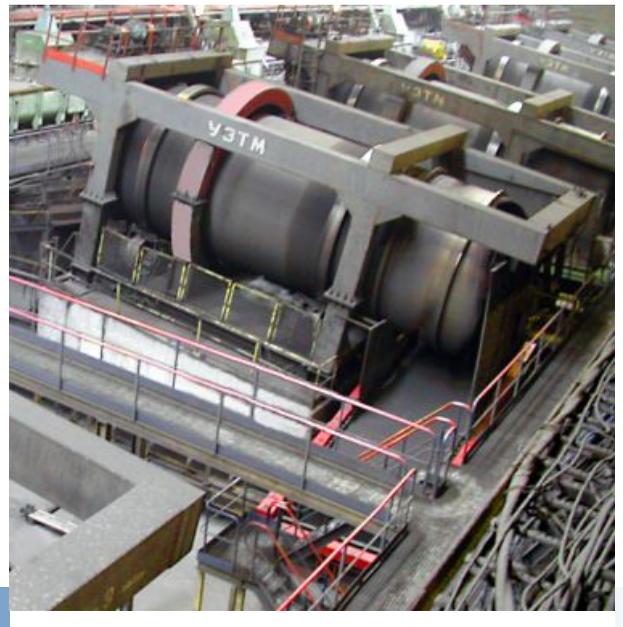
Technical indices of operation of the modernized machine No.1 at Mikhailovsky GOK in production of pellets of magnetite concentrate

Serial No	Indices	Before updating 2002	Stage I of updating (2005 r.)		Stage II of updating (2007 r.)		Indices of Lurgi's machines, 2005	
			Value	±%	Value	±%	Average	Max
1	Equipment usage factor	0.775	0.846	+9.0	0.932	+20.2	0.90	0.91
2	Specific capacity, t/(m ² /h)	0.92	1.13	+23.0	1.21	+31.2	1.10	1.19
3	Daily specific capacity, t/(m ² /h)	22.1	27.2	+23.0	29.0	+31.2	26.4	28.5
4	Heat rate, MJ/t	585	405	-30.8	335	-42.1	390	350
5	Natural gas rate, Nm ³ /t of pellets	16.4	11.4	-30.4	9.5	-42.1	11.0	9.8
6	Power rate, kWh/t	33.1	30.2	-8.8	28.5	-14.0	26.5	24.5



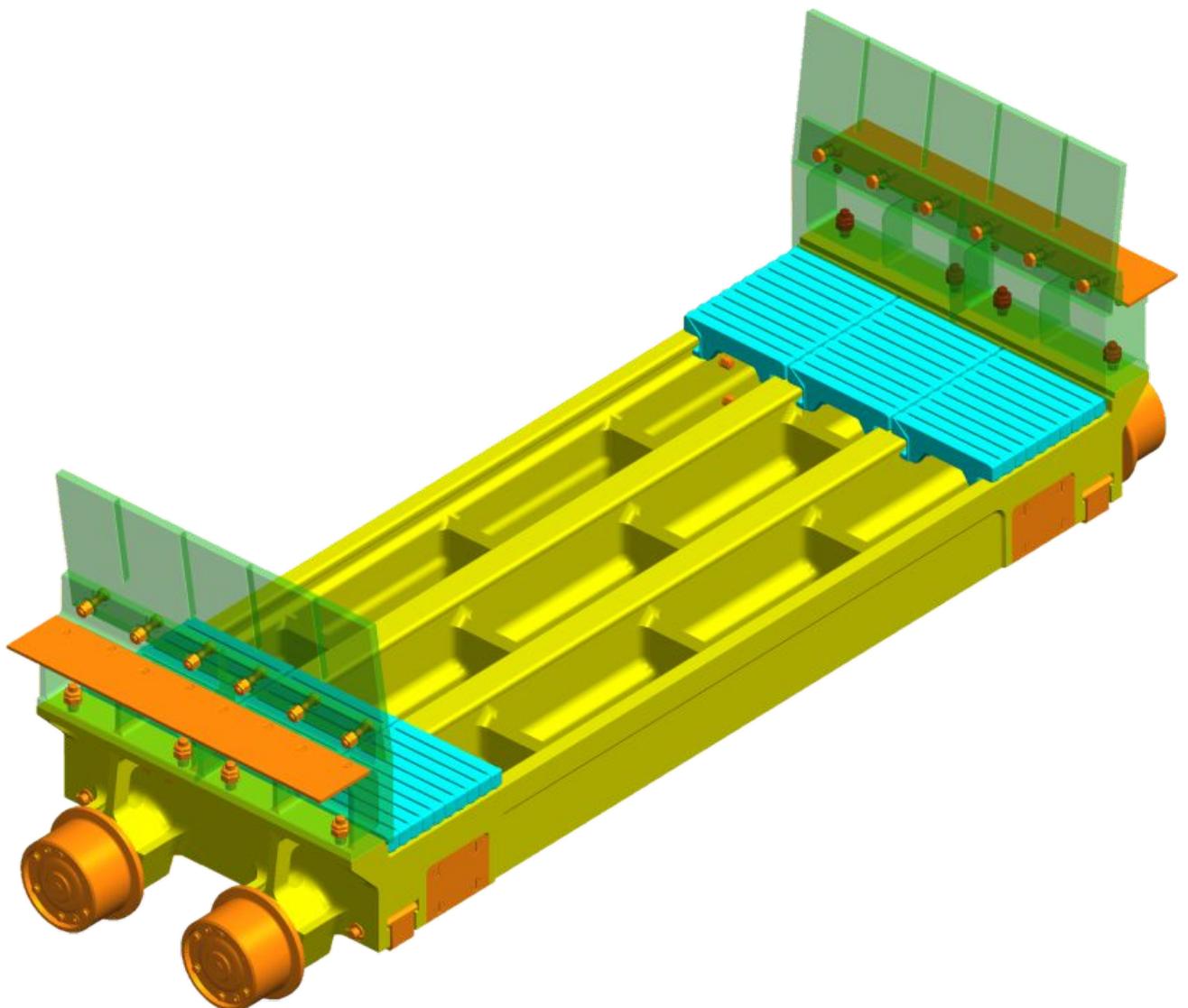
Main technical decisions

- efficient gas-air flow circuit – maximum use of the process gases by means of their circulation over the process zones
- double-layer charging of green pellets in the straight grate induration machine with their subsequent drying in layers – increase pellet quality
- direct run of high-temperature coolant from cooling zones to roasting zones – reduction of electric power consumption
- application of injector torches:
 - a possibility of using oxidizing agent for hot air combustion
 - reduction of fuel consumption
- sealing of increased tightness – reduction of electric power consumption
- drawing of gases via sealing of wind boxes for aspiration of gases blown out through the sealing of delivery chamber – reduction of electric power consumption for aspiration
- economical and efficient electric drives:
 - a possibility of meeting all process requirements
 - high level of electric drive diagnostics and, hence, reduction to the minimum of number and duration of shutdowns
- modern automation system
 - service of high level
 - easy control
 - a possibility of optimization of the process efficiency with the help of the mathematical models



Design

- a system of pallet condition diagnostics and protection of the equipment in emergency situations
- the pallet component material – heat-resistant steel and alloys
- the grate bars are equipped in its head part with flanges and dents to exclude skewing of the grate bars in the grate
- symmetrical, tilting grate bar frame of pallet simplifies repair
- the propel mechanism of pallet runs on rolling anti-friction bearings
- unloading device with load hold-down – decrease of pellet spill in discharging
- pallet replacement device is equipped with automatic grippers to exclude manual labor and reduce number of shutdowns



Complete delivery set

- straight grate induration machine with high-performance devices for pellet unloading and quick pallet replacement
- drum, rotary, two-shaft and vortex mixers for burden mixing
- drum and bowl type pelletizers to produce green pellets
- roller-type, three-product screens for sorting of green pellets after balling complete with crusher for crushing coarse pellets
- fired pellet screens
- a possibility of delivery set expansion

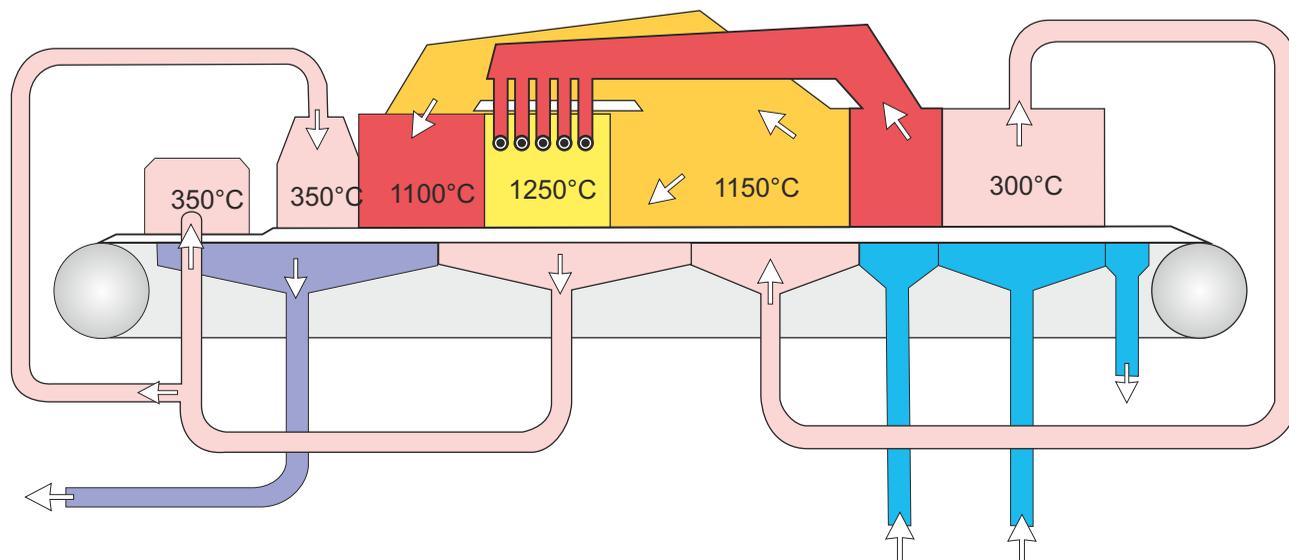
Service

- designer's supervision of the equipment erection, adjustment and putting in service with bringing its operation indices up to the design ones
- technical maintenance, diagnostics in guarantee and post-guarantee periods
- participation in updating of the equipment issued earlier
- a possibility of attracting on the contract basis the specialized organizations for rendering services

Guarantees

Uralmashplant guarantees trouble-free operation of the equipment within one year but not more than within 18 months since the date of shipment, provided that the conditions of transportation, storage, erection, adjustment, tests, putting in service and service are observed.

The guarantee does not cover the rapidly wearing parts.



STRAIGHT GRATE INDURATION MACHINES

Reference list

Supply year	Customer	Country	Type of equipment	Qty
2015-2016	Visakhapatnam Steel Plant	India	Sinter machine-1 (revamping & upgradation) and phase-1 of sinter machine-2 (revamping & upgradation)	1
2014	Ahluwalia Group, Shri Jagannath & Steels Pvt. Ltd.	India	Straight grate induration machine for 100% hematite. Working area – 189 m ²	1
2013	Minera Steel and Power Pvt. Ltd.	India	Straight grate induration machine for 100% hematite. Working area – 108 m ²	1
2013	Crest Steel and Power Limited	India	Straight grate induration machine for 100% hematite. Working area – 189 m ²	1
2013	Mikhailovsky GOK	Russia	Construction of pelletizing plant no.3 with straight grate induration machine "MOK-592M". Working area – 592 m ²	1
2012	Northern GOK	Ukraine	Pallets 4.0x1.5	69
2011	Northern GOK	Ukraine	Reconstruction of straight grate induration machine Lurgi-278 "B" Working area – 278 m ²	1
2011	Northern GOK	Ukraine	Balling Disk "04-7500"	
2011	Lebedinsky GOK	Russia	Balling Disk "04-7500"	1
2010	Northern GOK	Ukraine	Reconstruction of straight grate induration machine Lurgi-278 "A" Working area – 278 m ²	1
2010	Kola MMC	Russia	Pallets "TO 1-2x1-Y"	20
2009	Lebedinsky GOK	Russia	Pallets "TO-4x1.5"	45
2009	Northern GOK	Ukraine	Balling Disk "04-6000"	6
2007	Lebedinsky GOK	Russia	Balling Disk "04-7500"	2
2007	Central GOK	Ukraine	Reducing gear	1
2007	Karelsky Okatysh	Russia	Drive component for drum pelletizer "0Б – 3.6x10"	2
2005	Mikhailovsky GOK	Russia	Drum pelletizer "0Б -3.6x14"	4
2005	Sokolovsko-Sorbaisky GPO	Kazakhstan	Roller distributor "TP-2200"	1
2005	Karelsky Okatysh	Russia	Drive component for drum pelletizer "0Б – 3.6x10"	2
2004	Mikhailovsky GOK	Russia	Pallets "TO 4x1.5 – Y"	132
2004	Sokolovsko-Sorbaisky GPO	Kazakhstan	Reconstruction (project) of straight grate induration machine. Working area – 120 m ²	4
2004	Aksusky ferroalloy plant	Kazakhstan	Reconstruction (project) of straight grate induration machine. Working area – 34 m ²	1
1995	Central GOK	Ukraine	Straight grate induration machine. Working area – 324/326 m ²	1
1995	Lebedinsky GOK	Russia	Straight grate induration machine (Project). Working area – 315 m ²	4
1987-1993	Kachkanarsky GOK	Russia	Straight grate induration machine. Working area – 228 m ²	4
1992	Donsky works, Hromtau	Kazakhstan	Straight grate induration machine (Project). Working area – 108 m ²	1





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