



**YUZHTRANSENERGO**





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PUBLIC JOINT STOCK COMPANY

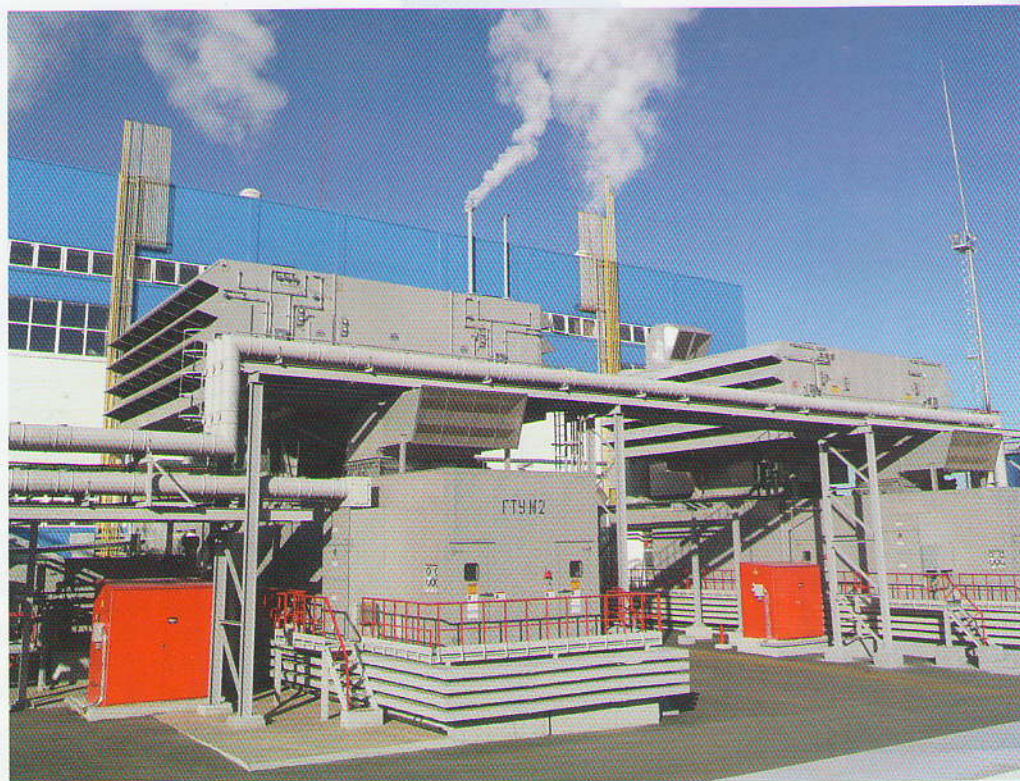


Public Joint Stock Company "Yuzhtransenergo" was established in 1965 (privatization in 1996) and has two industrial sites with total area 19 000 sq.m. The enterprise specializes in production, packaging and repairs of the following power generation and boiler equipment:

- Gas turbine power plants with unit capacity 2.5; 6; 15; 16 MW (ISO, +15 °C);
- Cogeneration (CHP) plants based on gas-turbine engines manufactured by Ukrainian enterprises "Zorya"-Mashproekt", "Motor Sich" and "Ivchenko-Progress";
- Waste heat boilers (up to 50 MW, hot water) and heat recovery steam generators (up to 75 t/h of steam), installed after mentioned above or any other engines. The boilers can work either as in heat utilization mode only or together with supplementary firing system with increase of heat generation;
- Auxiliary equipment for cogeneration (CHP) plants (air-cleaning systems at GTE inlet, noise suppression systems, automatic control systems (ACS) with higher level for power plants and waste heat boilers / heat recovery steam generators);
- Bypass bubble-tight valves, boiler supporting structures, ladders and platforms, stacks;
- HF-welded fin tubes (carbon steel, low-alloy and high-alloy steel), convective blocks and heat exchangers.

The Company renders the following services:

- Design works;
- Installation and adjustment supervision of the equipment supplied;
- Pre-commissioning and commissioning;
- Operating personnel training.



2 HRSGs (KUP-75-3.9-440, 75 t/h of steam) after 2 General Electric LM6000 PD Sprint (45 MW)  
at 115 MW CHP plant, Voronezh, Russian Federation



# GAS TURBINE POWER PLANTS

## CHP PLANTS



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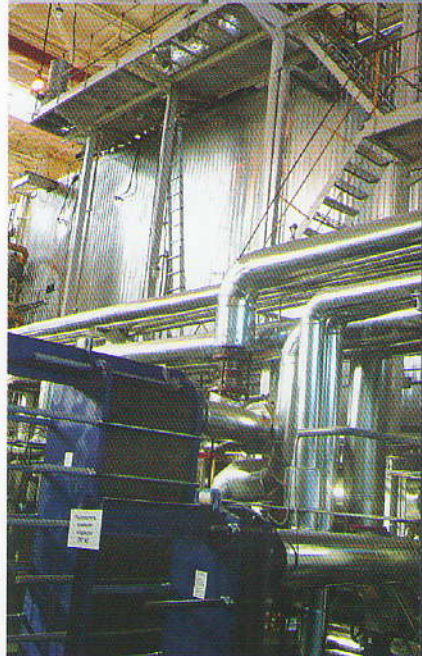
Gas turbine power plants are intended for operation in base, half-peak and peak modes, in autonomous mode, parallel with the grid and/or other power plants, together with waste-heat boilers and heat recovery steam generators, steam turbines (cogeneration mode) in various sectors of industry.

The use of GTE exhaust gas heat increases an overall efficiency of CHP plants up to 90% compared to 30-35% for single cycle gas turbine power plants. By-product heat from gas turbine engines can be used to produce hot water, motive steam for steam turbine, process steam, process heat (hot air for various applications).

Waste heat boilers and heat recovery steam generators are designed and manufactured subject to individual customer's requirements, since even with the same heat-carrying agent they may have variabilities according to the following:

- place of installation (indoor / open-air);
- arrangement (horizontal / vertical / combined);
- GTE exhaust duct location (vertical / horizontal).

The Company shall design and manufacture any type of waste heat boiler and heat recovery steam generator for CHP application subject to specific requirements of the customer/project: heating/steam capacity; water/steam temperature, pressure, etc.



56 MW gas-turbine power plant in Zhanazhol, Kazakhstan

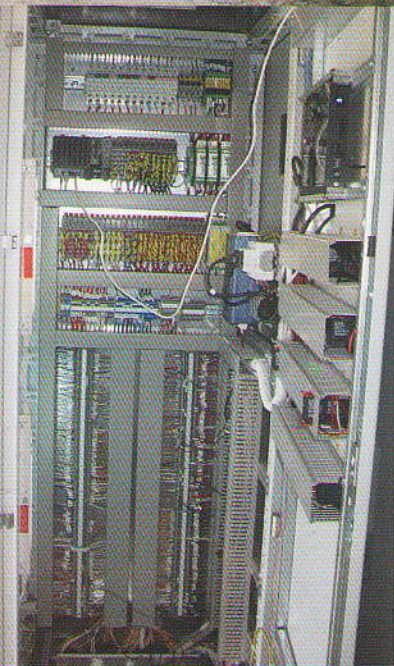




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# GAS TURBINE POWER PLANTS

## CHP PLANTS



Power Plant Parameters (GTE model)	EG-2500 (AI-20DME)	EG-6000 (D-336)	EG-16000 (DJ59)	EG-15000 (DB90)
Rated capacity, MW	2.5	6	15	16
Fuel specifications:	Natural / associated gas	Natural / associated gas	Natural / associated gas (ISO 2314)	Natural / associated gas (ISO 2314)
- required fuel pressure	12 kg/cm <sup>2</sup>	24 kg/cm <sup>2</sup> (min. 20.4)	25 kg/cm <sup>2</sup>	30 kg/cm <sup>2</sup>
- required fuel temperature	-15 ... +80 °C	-15 ... +80 °C	+20 ... 60 °C	+20 ... 60 °C
- fuel consumption per 1 kW <sub>(e)</sub> generation	0.334 kg/h	0.25 kg/h	0.257 kg/h	0.214 kg/h
Electrical efficiency, %	24	32	30	33.5
Total efficiency in CHP mode (electrical + thermal)	80-85% - GT power plant with waste heat boiler (hot water) 75-80% - GT power plant with heat recovery steam generator (superheated steam)			
Exhaust gas specifications:				
- NO <sub>x</sub> , mg/nm <sup>3</sup>	- 100	- 150 (75*)	- 150	- 80
- CO, mg/nm <sup>3</sup>	- 120	- 300 (200*)	- 25	- 50
* - low-emission chamber				
Sound level (noise) at 1 m from enclosure / container, dB	85	80	80	80
GTE time to major overhaul, hours	25000	25000	25000	25000
GTE specified lifetime, hours	100000	100000	75000	100000



EG2500-M1, 2500 kW Gas Turbine Power Plant



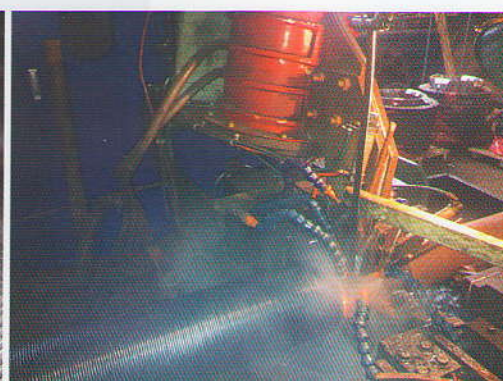
# HF-WELDED FIN TUBES, CONVECTIVE BLOCKS AND HEAT EXCHANGERS



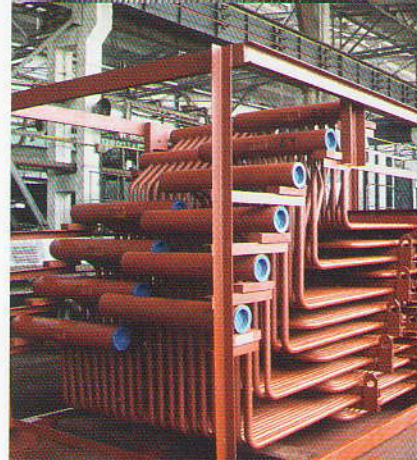
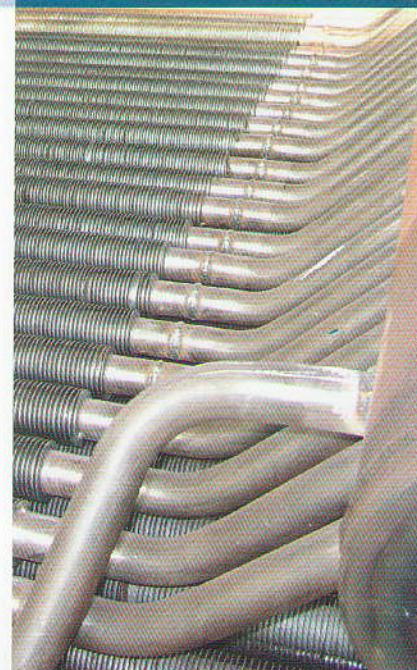
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## High Frequency Welded Fin Tube Specifications

Tube diameter	18-114 mm
Fin height	8-25 mm
Fin thickness	0.8-3.0 mm
Pitch	4-50 mm
Material	Carbon steel, low-alloy and high-alloy steel
Maximum tube length	12 m
Galvanization	Fin tube hot-dip galvanization is possible
Application	Waste heat boilers, heat recovery steam generators, heat exchangers, air and gas coolers, oil coolers, radiators, refrigerators, condensing units, heaters, economizers, baking furnaces, etc.



GTE-50 (3 x 15 MW) + KUV-30 (3 waste heat boilers), Kzyl-Orda, Kazakhstan





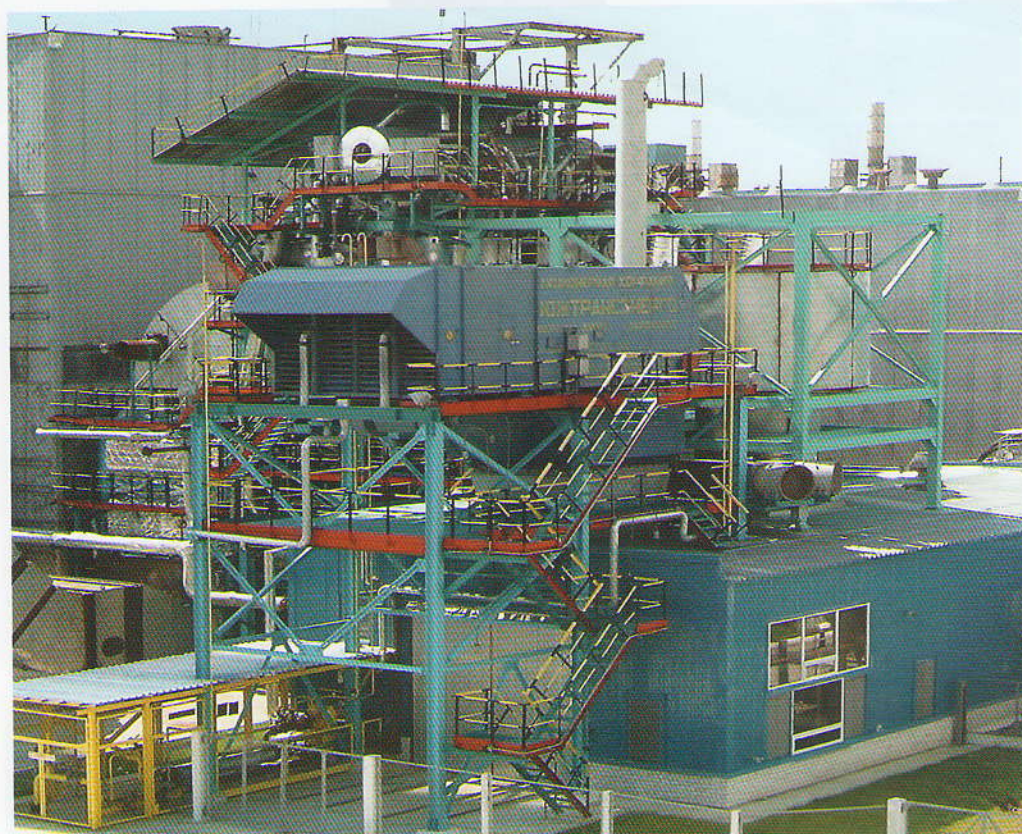


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# HEAT RECOVERY STEAM GENERATORS

**Heat Recovery Steam Generators (HRSG) Specifications**

Parameters	KUP-25	KUP-70	KUP-75
Steam capacity (at $t_{amb} = +15\text{ }^{\circ}\text{C}$ ), kg/h: - in autonomous (utilization) mode - in combined mode	20000 25000	70000	43500 75000
Superheated steam pressure, MPa (kgf/cm <sup>2</sup> )	1.3 (13)	4.0 (40)	3.9
Superheated steam temperature, $^{\circ}\text{C}$	230 $\pm$ 10	440	410 (utiliz.) 440 (comb.)
GTE exhaust gas temperature at HRSG inlet, $^{\circ}\text{C}$	380	350-400	451.8
Feed water temperature at HRSG inlet, $^{\circ}\text{C}$	75	80	104
Continuous blow-down, %	7	5	5
Exhaust gas flow rate per HRSG, kg/s	20,5	96	129,3
Air-flow resistance of HRSG gas path, kPa: - in combined mode - in autonomous (utilization) mode	2.83-2.48	4.5 2.6	2.5 2.78
Heating surface, m <sup>2</sup>	1585.2	8368	15721
Weight, t	42	350	260
Dimensions, mm	12520 x 7320 x 8630	15650 x 13765 x 18600	26100 x 10230 x 12100
Application with GTE, model	AI-20 (2.5 MW)	DJ59 (15 MW); NK-16-18ST (18 MW)	GE LM 6000-PD SPRINT (45 MW)



15 MW + HRSG (70 t/h of steam) + 6 MW (steam turbine)  
CHP Plant at "Rubezhanskiy Cardboard and Paper Mill", Ukraine



# WASTE HEAT RECOVERY BOILERS



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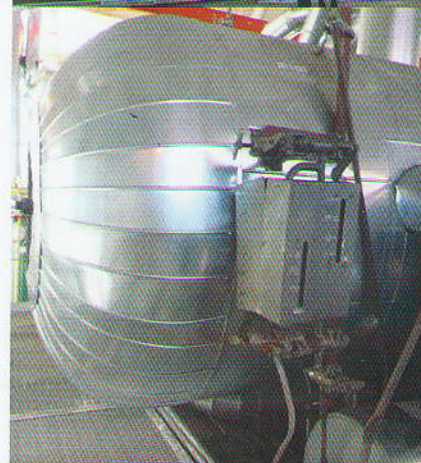
## Waste Heat Boilers (Water Heating) Specifications

Parameters	KUV-5.3	KUV-30	KUV-33
Heating capacity, MW (Gcal/h):			
- in combined mode		(30)	
- in utilization mode	6.0 (5.3)	(5.0-20)	33 (28.37)
Water outlet pressure, MPa (kg/cm <sup>2</sup> )	0.8 (8)	1.6	1.6
Water inlet temperature, °C	70	80	130
Water outlet temperature, °C	115	160	170
GTE exhaust gas temperature at boiler inlet, °C	404 - 520	360 - 450	487.3
Exhaust gas flow rate per boiler, kg/s	18.995	98	123.78
Natural gas consumption per boiler, m <sup>3</sup> /h:			
- in combined mode	1450	850	-
- in utilization mode	0	0	0
Efficiency, %:			
- in combined mode	-	75	-
- in utilization mode	74.3	70	51.2
Flue gas temperature, °C			
- in combined mode	-	110	-
- in utilization mode	98.4	100	239
Heating surface, m <sup>2</sup>	1116	4280	2428
Dimensions, mm	7500 x 2400 x 3350	11680 x 8100 x 20740	5280 x 6000 x 9170
Weight, t	21	100	112
Air-flow resistance of boiler gas path, kPa	1.67	1.9	1.44
Application with GTE, model	AI-20 (2.5 MW)	DJ59 (15 MW); NK-16-18ST (18 MW)	GE MS5001 (26 MW)

PJSC "Yuzhtransenergo" manufactures different types of waste-heat boilers and heat recovery steam generators subject to individual requirements and project of the Customer.



8 waste heat boilers (KUV-33) after 8 General Electric MS-5001 (26 MW) at 200 MW power plant, Vankor Oil Field, Russian Federation







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# AUTOMATIC CONTROL SYSTEMS

PJSC "Yuzhtransenergo" develops and makes Automatic Control Systems (ACS) with higher level for gas turbine and CHP plants using high-technology products supplied by B&R, Advantech, Siemens, Moeller, Rittal, Widemuller, Druck, ABB, Compressor Control Corporation, SIIF, etc.

ACS with higher level are based on controllers manufactured by "Bernecker und Rainer Industrie-Elektronik", Austria, that was the first company in the automation industry to receive ISO 9001 certification and meet the following international standards and certificates: CE Sign (European Standards), UL and C-UL Sign (North America), IEC 61131, ISO 9001 and GOST-R.

B&R controllers do not require a separate ground loop and a standard industrial ground loop can be used. This improves the control system's safety and reduces installation and construction costs.

B&R equips processor modules with a multitasking operating system which is their advantage at the automation equipment market.

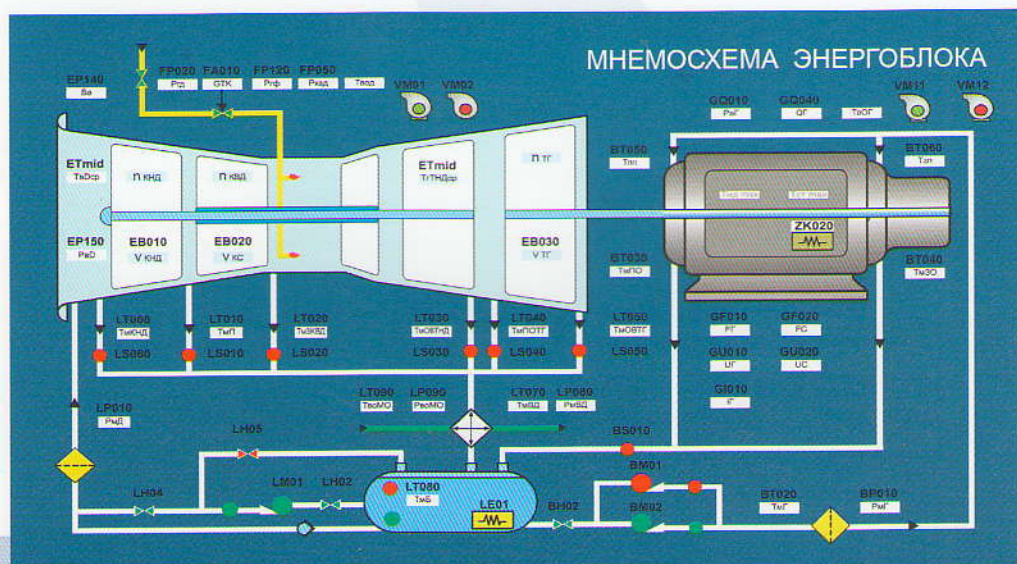
The main R&B features at the software segment of the automation equipment market are:

- Proprietary software products for the development and runtime environments;
- State-determined multitasking operating system;
- Modular software architecture;
- Error log file feature;
- I/O module check-up function;
- System configuration parameters;

- Exception handling subroutines;
- Flexible communication architecture;
- A number of library functions.

To program the whole equipment range, universal Windows-oriented Automation Studio™ programming environment is used. Here you can fully configure input-output, information processing up to visualisation. As to a SCADA system, B&R offers its proprietary Apron System that integrates all the equipment features to the maximum extent possible.

B&R is one of the automation market leaders in terms of price-quality ratio. Given the competitive price of the I/O channel, the prices are further reduced thanks to innovative approaches to the electrical isolation of channels and interfaces, increased number of channels per module, internal controller bus layout. Total cost of B&R automation solutions is also reduced due to organisational methods. Each module is supplied with electronic design descriptions of module dimensions, electrical signals and functions. These macros are loaded directly into well-known ECAD systems. Connection schemes are created automatically by the configuration and programming Automation Studio™ system. Controller design and any changes made to it are automatically reflected in the documentation at all development stages. That saves time for more important tasks and prevents design flaws at the control system development stage which helps improve its quality and competitive ability.



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