

Application**brief**

Eclipse Product: SER v5 Burners

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Application: Continuous Heat Treatment Furnace, Hot Roller Type

Description: JSC Pervouralsk New Pipe Plant is a tube manufacturing company located in the Ural Region (Russia) and is part of the Chelpipe Group, one of the largest pipe manufacturers in Russia. JSC Pervouralsk New Pipe Plant produces a wide range of steel pipes which need to go through heat treatment processes to improve their quality. The company planned a modernization of its 45 year old heat treatment furnace which used water cooled rollers. Due to the global network of Eclipse distributors, the company, together with Gas-Engineering Ltd. (design, installer and commissioning company) came in contact with Eclipse's Russian distributor Gas-Komplekt Ltd.

A major part of the refurbishment included the replacement of old Russian designed U-type radiant tubes with burners using high efficiency Eclipse SER v5 burners with metallic outer tubes.

The furnace operates with a protective atmosphere of N₂/H₂ (95%/5%) at continuous temperatures of 650 to 960°C (1202 to 1760 °F), depending on the pipe types to be treated. Metallic radiant tubes were mounted to radiate on 3 sides and could easily resist the furnace temperature.



Before: Old Russian U-type burners with radiant tubes and water cooled rollers.



After: By converting the furnace to high efficiency SER v5 burners, the customer has improved their process and lowered their gas consumption.

The internal width of the furnace is 1980 mm (78"). To achieve optimum temperature uniformity, 35 Eclipse SER v5 burners were mounted horizontally below and above the rollers. The radiant tubes have a 1900mm (75") effective length. The fuel is Russian natural gas 35.6 MJ/m³ LHV (1066 BTU/ft³HHV). The furnace is divided into 8 control zones. Each control zone is equipped with an air butterfly valve and a control motor. Each burner is equipped with a gas/air ratio regulator. The control method is a combination of on/off and modulation under PLC monitoring. At low capacities (idling, drying up, low temperature soaking, etc.), on/off control is used. At high capacities, modulating control is used. The gas input per burner in the first control zone is 65 kWLHV (246 500 BTU/hrHHV). In the last control zone, the gas input per burner is 35 kWLHV (132 700 BTU/hrHHV). At actual furnace temperatures, the average net tube output is 27.3 kW (93 300 BTU/hr).

The SER v5 burners were supplied with extended mounting flanges. Thanks to this flange, Eclipse was able to use the standard, more efficient integrated recuperator length. The flange also improved ease of mounting the burners on the furnace. All 35 burners are ignited by a direct spark ignition. Each of the burners is equipped with a UV scanner to meet the European EN746-2 and Russian regulations for flame safeguards.

By replacing the burners, eliminating the water cooled rollers and improving the furnace tightness, the customer has achieved the following results:

- The contemporary control system and high efficiency SER v5 burners allow the customer to improve the quality of the heat treatment to produce higher quality grade pipes more profitably.
- Dramatically decreased rejects and reduced costs by eliminating repeated heat treatment and additional etching processes.
- Significant reduction in gas consumption. The customer is now saving over 1.150.000 m³ (39 MM CF) in natural gas per year.
- Lower annual NOx and CO emissions.

The result: a 2 year investment payback

Parameter	Before modernization	After modernization	Savings %
Water flow for roller cooling, m ³ /hr	40	-	100
Protecting atmosphere flow, m ³ /hr	1000	400	60
Gas consumption furnace idling, Nm ³ /hr	180	20	89
Average fuel consumption per product unit made, Nm ³ /tn	107	36	66