

- Eclipse Product:** TJSR v5 Self-Recuperative Burners
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- Application:** Box Type and Car Bottom Heat Treating Furnaces
- Description:** In 2011, Fengdong Special Furnace Co. Ltd installed two new batch furnaces at one of the world's largest manufacturers of mining equipment, located in China. The customer uses more than (20) batch style, direct fired heat treat furnaces in the manufacturing of undercarriage and frame components for construction equipment. The customer justified the new furnace costs with the anticipated energy savings and improvements in their product quality with the new furnaces.

### The Eclipse Solution:

Fengdong selected Eclipse to supply all the burners for the two new furnaces. Eclipse recommended TJSR v5 burners to replace the current configuration in the plant in which high velocity burners are paired with separate recuperators. The new control method is high/low firing with a pulse control feature. Eclipse supplied the burners, valve train parts, and T410 flame controllers for the project. Eclipse also performed the engineering and supplied formal drawings for the valve train P&ID to Fengdong. From that point forward Fengdong took the responsibility to install the burners and assemble the valve trains using the P&ID supplied by Eclipse. Fengdong also designed and assembled the control panel, and designed the exhaust system.



Box type normalizing furnace.

### Furnace #1: Box Type Normalizing Furnace

- Operating chamber temperature: 900°C
- Net load weight: 3.2 tons
- Heat up recovery time: 1.5 hours from ambient temperature up to 900°C
- Chamber size: 1.5m (width)\* 2.0m (length)\*1.2m (height)
- Chamber wall: lightweight fiber modules
- Temperature uniformity requirement:  $\pm 7.5^{\circ}\text{C}$

Based on the burner capacity required for the box type normalizing furnace, Eclipse determined that just (5) TJSR060 v5 burners were sufficient to deliver the heat required. TJSR v5 burners feature an advanced design

that combines a high velocity flame with an integral recuperator to deliver significant fuel savings and improved furnace efficiency. In order to obtain better temperature uniformity in the chamber, the burners were installed on both sides of the furnace with an offset configuration. The flue gas stirring action combined with the high exit velocities of the TJSR v5 burners delivered outstanding temperature uniformity.

## Furnace #2: Car Bottom Temper and Quench Furnace

- Operating chamber temperature: 900°C
- Net load weight: 12 tons
- Heat up recovery time: 1.5 hours from ambient temperature up to 900°C
- Chamber size: 3.0m (width)\* 3.3m (length)\*1.5m (height)
- Chamber wall: lightweight fiber modules
- Temperature uniformity requirement:  $\pm 7.5^{\circ}\text{C}$

For the car bottom temper and quench furnace, it was determined that Eclipse TJSR100 v5 burners would be the best solution. The TJSR100 v5 burner had just been released at the time of this project, so this was the first installation using the new burners. In order to promote superior exhaust recirculation around the workload in the furnace, the TJSR100 v5 burners were installed above the heat load on one side, and below the heat load on the other side.

The TJSR v5 burners exceeded the customer's rigorous requirements for improved temperature uniformity, fuel savings, and performance in both furnaces. With the Eclipse TJSR v5 burners, the temperature uniformity achieved  $\pm 2.5^{\circ}\text{C}$  in the box type furnace, and approximately  $\pm 5^{\circ}\text{C}$  in the car-bottom furnace. This performance level exceeded the original requirement of  $\pm 7.5^{\circ}\text{C}$ . In addition to the outstanding temperature uniformity, the Eclipse TJSR v5 burners achieved a 25% fuel savings compared to other similar furnaces in the facility. With successful installations in both furnaces, Eclipse was able to clearly

demonstrate the technical advantage of TJSR v5 burners over competitive burners.



Car bottom temper and quench furnace.