# Case History

**Application:** Water-cooled Electric Arc Furnace Roof for Melting Stainless Steel

**Operating Temperature:** 2850-3000°F

**Emisshield® Product Used:** Emisshield® STG-2 **(US Patent 7,105,047)**

**Problem:** The roof of this furnace was water-cooled with exposed water tubes on the hot face that had seen prior service. Prior to coating with Emisshield® STG-2, the roof was used about 500 heats before it had to be removed from service for major rebuild. During service, the roof showed signs of corrosion and scaling. Corrosion was particularly severe around the water tubes, where water leaks occasionally required that the roof be taken out of service to make repairs. The cost of each repair plus the associated down time was about $25,000. A typical water-cooled roof required an average of two repairs between rebuilds. The steel manufacturer measured the temperature of the cooling water as it entered and exited the roof and reported that the process heat lost through the roof raised the water temperature by 11 to 13°F.

**Results Using Emisshield® STG-2:** The furnace roof was shot-blasted to remove slag and scale from the roof and water tubes. After pressure testing the water tubes, the roof was cleaned with DIRL-LUM 603 and sprayed with 4 gallons of Emisshield® STG-2. The coated roof was put into service and was used to melt 940 heats of steel before rebuilding was required. The input and output temperatures of the cooling water were again determined and the difference was found to be only 2 to 5°F. There were no water leaks reported during the life of the roof.

**Summary of Benefits:**

- The use of Emisshield® STG-2 increased the time between rebuilds from about 500 heats to 940 heats, lowering major rebuild cost by 88%.
- The Emisshield® STG-2 coating eliminated the four water leak repairs that would typically be expected in 940 heats of service, resulting in a maintenance and downtime savings of $100,000 during this period.
- The lower energy loss through the roof saved 2 megawatts per hour, which is valued at about $100 per operating-hour.
- The arc time required for each melt was lowered by three minutes, saving $94,000 in electric costs over the 940 heat roof service life.
- The energy loss to the cooling water did not change over 940 heats, demonstrating that the Emisshield® STG-2 remained firmly bonded to the roof throughout its entire campaign and did not lose its emissivity properties with time in service.

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