

Application Note

Brazing Turbine Blades with Nickel

- Objective:** To heat an inconel turbine blade in a vacuum to 2000°F and hold temperature for five minutes for a nickel brazing application.
- Equipment:** ABS Mark 2 with high vacuum option and optical pyrometer for temperature measurement, Ambrell 20 kW power supply with a remote heat station containing three (3) 0.75 μ F capacitors (for a cumulative capacitance of 0.25 μ F) and a specially-designed induction coil.
- Temperature:** 2050 °F (1121 °C)
- Frequency:** 280 kHz
- Material:** Inconel turbine blades, nickel metering plates, nickel braze
- Testing:** The ABS Mark 2 with a vacuum level of $<5 \times 10^{-4}$ torr was used for the testing. A specially designed induction coil was used to provide optimal heating (approximately 80% energy efficiency) to the braze joint area. The temperature of the joint area was measured with an optical pyrometer. RF power from the 20kW power supply was applied to the plate for two minutes. As the plate temperature reached 2000°F, the power was automatically reduced by the pyrometer to maintain the temperature for a five-minute period. A one-minute cool-down Argon quench was used for an overall cycle time of eight minutes.
- Benefits:** The metering plates were successfully brazed to the turbine blades with nickel within five minutes at 2000°F. The nickel braze flowed well and the joints were clean. Since only the braze joint area was heated, an additional braze stop-off step was not necessary.