

Rapid Preheating of Extruded Aluminum Billets for Energy Efficient Production of Forgings

Goal

- Increasing the energy efficiency of preheating and post-process heating of aluminum billets for the forging industry

Development

- Developed a Super Energy Efficient Furnace (SEEF) for heating aluminum billets
 - Hybrid infrared system enables rapid heating
 - Rapid preheating prevents grain growth leading to greatly improved mechanical properties
- Validated the new furnace system on a forging shop floor by preheating and processing over 2,000 billets of aluminum (1.3 kg/billet)

Benefits

- SEEF overall efficiency is ~30% (Conventional convection furnace is ~10% efficient)
- SEEF drastically reduces the time to preheat billets (Conventional 6 hrs; Infrared 18 minutes per unit billet)
- It also improves energy efficiency of heat treating aluminum parts (Conventional heat-treating furnaces take 10hrs; SEEF takes ~1hr per unit billet)
- Estimated potential national energy savings up to 0.8 Trillion BTU/year for Aluminum forgings (plus similar savings for Cu, Brass and Ti for a total ~1.6 Trillion BTU/yr).



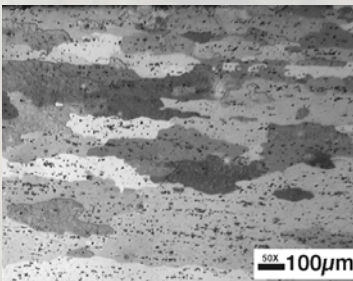
Super Energy Efficient Furnace is validated to be 3x more energy efficient than currently used convection furnaces for preheating of aluminum billets

Applications

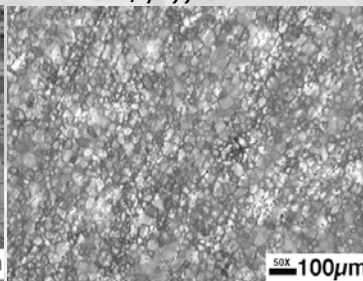
- Forging
 - Preheating of extruded billets (Al, Ti)
 - Heat-treating of forged parts (Al, Ti)
- Heat treating
 - Annealing, normalizing
 - Stress Relieving
 - Solutionizing
- Joining Industry
 - Preheating and post weld annealing

Additional R&D

- Investigate other aluminum alloys, brass, copper, and titanium for evaluation of full market penetration
 - Preheating and heat treating
 - Properties of alloys



Al Convection Heated/Forged and T-6 Heat Treated



Al SEEF Heated/Forged And T-6 Heat Treated

Rapid Heating greatly improves the microstructural and mechanical properties of aluminum forgings

Project Partners



KOMTEK



Northeastern UNIVERSITY

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In plant trial with new rapid heating furnace