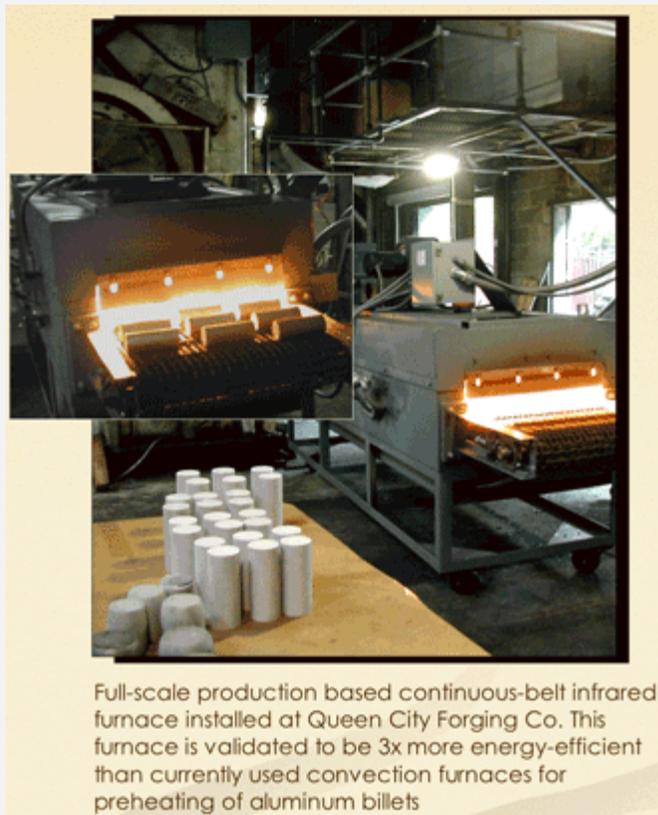


Rapid Preheating of Extruded Aluminum Billets for Energy-Efficient Production of High-Performance Forgings

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Goal:

- Increase the energy efficiency of preheating and post-process heating of aluminum billets for the forging industry.
- Attain extensive grain refinement through rapid heating.
- Establish improvement in mechanical properties produced by the grain refinement attained.

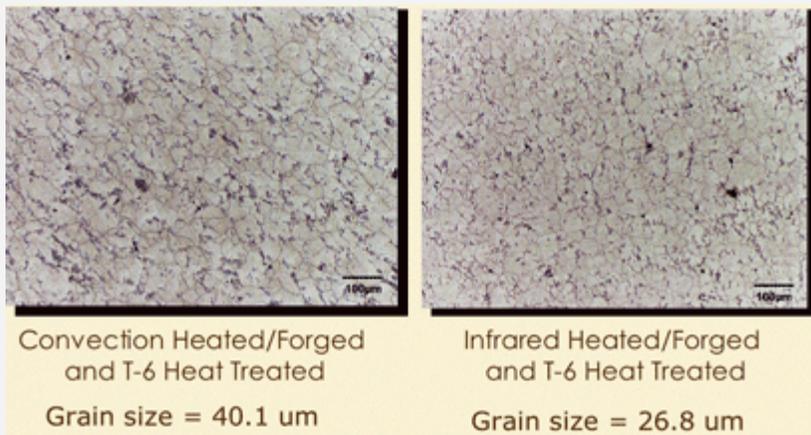


Development:

- Optimized combination of radiant and convective heating resulted in rapid and efficient heating of billets, increasing production rate by a factor of 4.
- An order of magnitude faster heating in a hybrid infrared furnace produced finer grains as compared to conventional furnace.
- Extensive grain refinement resulted in enhancement of fatigue properties. Infrared preheated and forged components were proven to survive two times longer than conventionally preheated forgings.

Benefits:

- Overall efficiency of the hybrid infrared furnace is about 30% (Conventional gas-fired furnace is about 10% efficient).
- Rapid infrared heating drastically reduces the preheating time for 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; Infrared takes ~ 1hr per unit billet).
- Estimated potential national energy savings up to 0.8 Trillion BTU/year for Aluminum.



Applications:

Various thermal processes - Annealing, Stress Relieving, Preheating and post weld annealing during Joining, Preheating prior to extrusion, forging and other similar forming processes.

Heating materials other than Aluminum - Steel, Brasses and Bronzes, Titanium alloys, Nickel and Cobalt-based alloys.

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