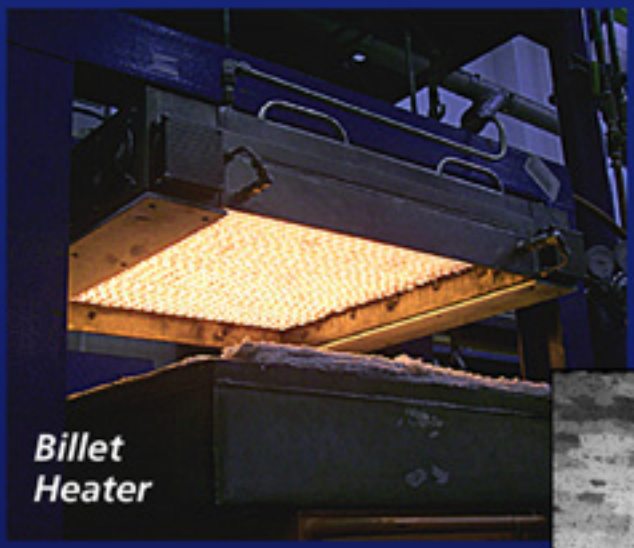
Infrared Heating of Forging Billets and Dies Leads to Energy and Quality Improvements

Infrared Insert Heater Benefits:

- Better forgings
- Longer die life
- Reduced energy consumption

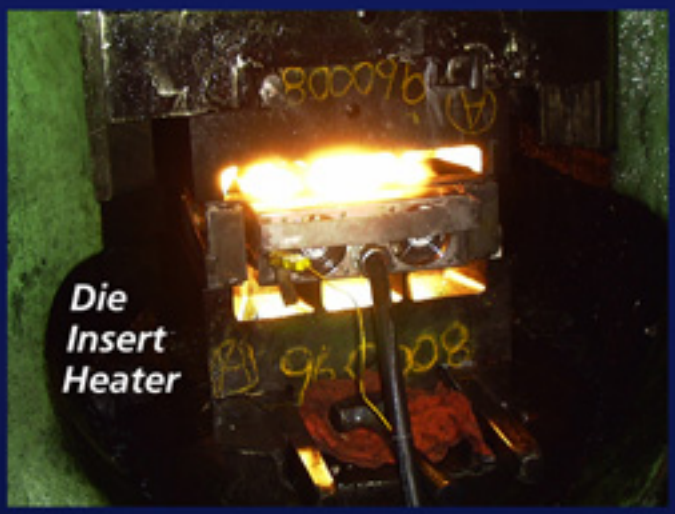


Results:

- Aluminum billets heated in 1/10 the time
- Utilize heating systems as needed
  - Less than 1 second to full power
- Forgings with 3 times finer grain size
- Forgings with 3 times fatigue life

Conventional Technology

New Technology



Results:

- Industrially robust
  - Evaluated in a forging environment for 12 months
- Heats dies to temperature in 1/12 the time of conventional technologies
- Decreases heat checking of dies

DOE National Laboratory Partner

ornl — UT-BATTELLE

Industrial Partners

KomTek — Scientific Forming Technologies Corporation — Queen City Forging Co.

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Infrared Heating of Forging Billets and Dies

Large savings of energy and forging quality are achieved by use of infrared heating of forging billets and dies.

Goal: The goal of this project is to develop infrared heating technology for preheating of dies and billets for the forging industry with projected benefits of improving die life and enhancing the quality of forging with savings in energy.

The infrared heating technologies of this project use the tungsten halogen lamps as the heating source. The tungsten lamp, enclosed in a quartz tube containing iodine, is heated to temperatures of 2200°C (~4000°F). The radiation from the heated element provides the heat flux, which is used in die and billet heating. Patented designs have been developed for die and billet preheaters. The prototype systems have been used for die and billet heating under production forging conditions with expected results. The key findings include:

Die Preheater Results:

- Prototypes have proven to be industrially robust under forging conditions.
- Heats the dies to 400°F in 1/12 the time of a gas infrared system.
- Forgings of improved tolerances.
- Die and trimmer life are improved.

Billet Preheater Results:

- Heats the Al-billets in 1/10 the time of conventional heating technology.
- Utilize the system as needed because it can be brought to full power in less than one second.
- Al forgings have approximately three times finer grain size and a factor of three improvement in fatigue life.

It is a joint project between **ORNL, Forging Industry Association (FIA), KOMTEK, A. Finkle & Sons Co., Queen City Forge and Scientific Forging Technologies.**

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