

Industrial Heat Treatment Electric Heating Using Thyristor Units



Industrial heat treatment requires accurate and precise temperature control to ensure materials being treated comply with stringent specifications.

Heat treatment is used to alter the physical and sometimes chemical properties of a material.

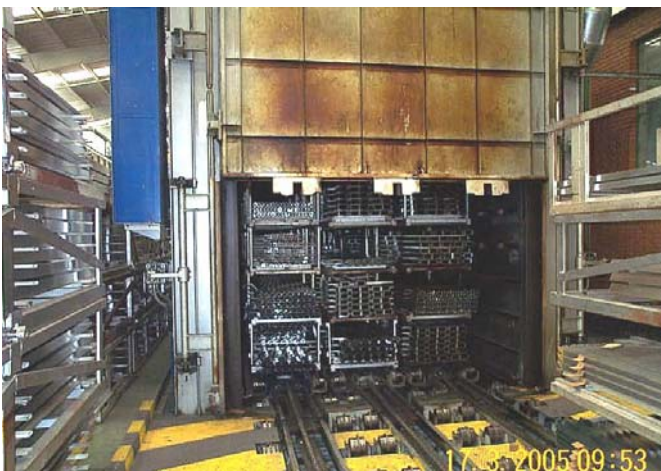
The process involves using different techniques to heat and cool a broad range of materials, which are then used to produce components and parts for industry.

Common Techniques Used:

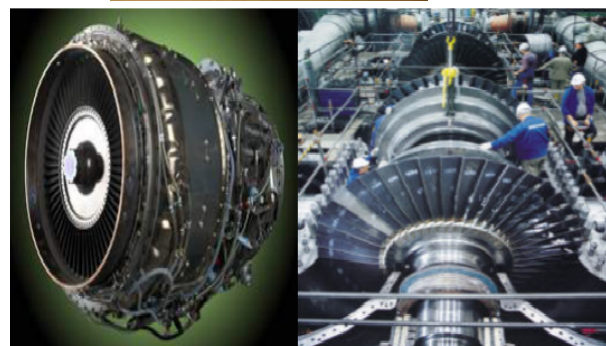
- Annealing
- Age hardening
- Case hardening
- Flame hardening
- Tempering
- Sintering
- Normalizing
- Stress relieving
- Carburising
- Nitriding
- Homogenising
- Salt Baths

Key Business Issues:

- Material quality
- Compliance to global standards
- NADCAP (aerospace)
- QS9000 TS16949 automotive
- Security and traceability
- Energy optimization
- Control system accuracy and reliability
- Control systems ease of usage
- Reduced maintenance
- Local support and training
- Thermal survey compliance
- Cost
- Reduced out-of-spec product
- Safety



Typical heat treatment furnace used to thermally process materials



Precision heat treatment of performance component is critical

Application Description

Electric furnaces use large amounts of power and operate at high temperatures. The chamber within the furnace is split into multiple zones hence providing excellent temperature uniformity, each zone is independently controlled. The furnace heating elements are supplied with power via large industrial relays called contactors. Due to the very high currents being switched the contactors are subject to extreme wear resulting in frequent failure. The cost to replace the contactors is high, when down time is taken into account and repeated loss of production due to unscheduled outages. Heating elements are also prone to failure over time due to ageing, resulting in out of spec material and costly production delays. The contactors also contribute to the ageing effect of the heating elements. To extend the life of the contactors the output duty cycle within the temperature controllers is typically set to a minimum of 30 seconds.

The heating elements are subjected to temperature fluctuations resulting in premature failure.

Heat treatment Techniques

Annealing: Process used to soften alloys and remove internal stress.

Age hardening: Process used to harden non ferrous alloys.

Case hardening: Process used to harden the surface of a metal typically carbon steel by infusing elements of a harder alloy.

Flame hardening: Process used to achieve local hardening of a material via an acetylene flame and spray quench.

Tempering: Process used to toughen alloys.

Sintering: Process used to strengthen the bonding of powder compacted components via a controlled atmosphere and temperature cycle.

Normalizing: Process used to improve ductility and toughness of previously hardened steels.

Stress relieving: Process used to remove stress from welded parts.

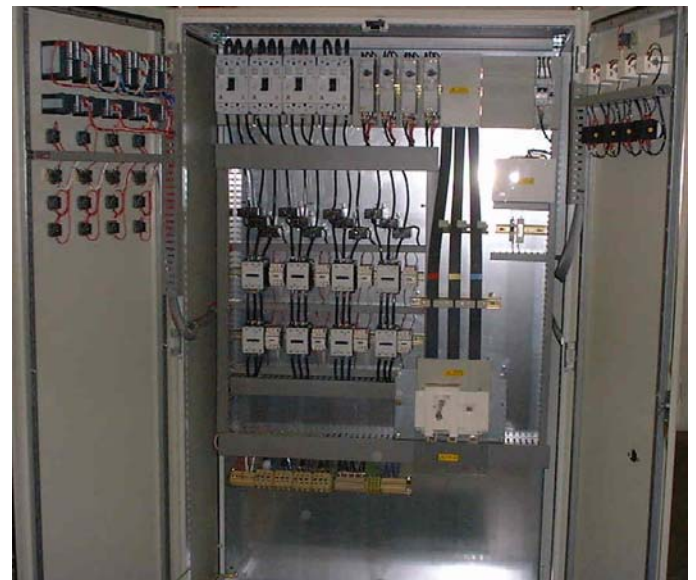
Carburising, Nitriding: Process used to harden materials via a carbon or nitrogen enriched atmosphere.

Homogenising: Process used to remove coring in cast alloys.

Salt Baths : Process used to harden and temper materials via a bath of molten salt eliminates oxidation.



Front loading electric heat treatment furnace



Contactors control the power to the furnace heating elements frequent failure is a major problem

Solution Description

Honeywell is a market leader in industrial automation and control. Everyday customer's world wide use Honeywell solutions & expertise to help optimize their processes, improve quality, reduce waste and increase productivity.

Honeywell's range of industrial solid state thyristors units can be used to eliminate the problems and issues associated with electromechanical contactors in electric furnace control applications.

Typical features include:

- Compact design
- Fuse protection
- Configurable via local key pad display unit or PC software
- Multi firing mode configuration
- Digital communications
- Feed back retransmission power, current, voltage and resistance
- Partial load failure detection with alarm outputs
- Load fault detection reset
- Soft start facility
- Memory card
- Current limiting fully configurable
- Thermal over load protection

Using the latest microprocessor based design Honeywell thyristor units provide outstanding performance and reliability even in the most demanding applications.

Honeywell thyristor units can be used to update older control systems, and enhance existing systems where legacy thyristors units are already installed and spare parts may be difficult to obtain.



Honeywell Thyristor units ensure precise power is delivered to the furnace heating elements. Heating element failure can be detected reducing out of spec product.



Vacuum furnace used to heat treat specialist alloys and materials. Thyristor controlled heating ensures maximum element life.

Benefits

Honeywell thristor units provide many benefits compared to electromechanical contactors.

- The solid state design removes the need for periodic preventive maintenance.
- Premature element ageing is reduced by the thyristor units due to optimization of the heater power requirements. Reduces cost and improves quality of heat treated material.
- Partial load failure detection helps to reduce out of spec product. Automatic alarm alerts the operator immediately if any heating elements fail.
- Honeywell thyristor units provide a power output signal that can be used to indicate actual power usage. The signal may also be connected to an external recorder to enable total furnace power usage to be calculated.
- Maintenance friendly, element protection fuses are easily changed in the field ensuring reduced down time.
- Honeywell's outstanding range of measurement and control products help to provide.

Improved material quality

Precise temperature control helps to ensure quality, and reduces out of spec material.

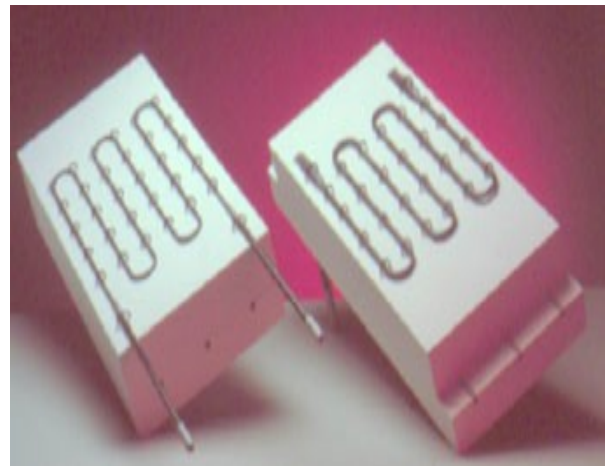
Compliance to world wide standards

- NADCAP (Aerospace)
- QS9000 TS16949 Automotive

Security & traceability

- Multi user password protection for control & recording systems
- Audit trail as standard

Honeywell can also provide local customer support and training, to ensure process plants are run safely and effectively.



More Information

For more information on thyristor units, visit www.honeywellprocess.com, or contact your Honeywell account manager.

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SO-12-04-ENG
March 2012
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