Heat Treating of Steel Tubing
Quenching and Tempering to Harden Steel Tubing

How do you accurately measure temperature in order to correctly control and monitor induction hardening of steel tubing?

Situation Analysis

Steel tubes are heat treated to achieve correct metallurgical properties. Discrete pieces of steel tubing continuously feed into an induction coil. Often the ends of the tubes will “ride up” on each other. The result is that the tubes begin to melt inside of the induction coil causing loss of production and downtime.

- Measurement temperatures (hardening) 930°C (1700°F)
- Measurement temperatures (tempering) 200 to 320°C (400 to 600°F)
- Ambient temperature up to 120°C (245°F)
- Tube movement at 2 to 4 m/min (7 to 13 ft/min.)
- Measurement distance 400 to 600 mm (16 to 24 in.)
- Tube size 6 to 10 mm (0.25 to 0.375 in.)
Solution and Improvements

To avoid production downtime, a Raytek MM3MLVF1LW is mounted outside of the process area. The sensor is aimed directly onto the surface of the steel tube in between the induction coils. In this location, the sensor is able to accurately measure the process temperature. When tubes back up, the sensor will see the rising temperature and send a signal to the controller to prevent the tubes from becoming molten and jamming in the coil. The accurate temperature measurement also allows for ISO 9001 documentation and closed loop process control. The short wavelength of the MM3ML reduces errors due to variable emissivity of the steel tube. The variable focus VF1 optics are flexible for the different focal distances. The laser and through-the-lens sighting facilitate correct aiming of the sensor through the induction coils. The Raytek MM sensors allow to control the process more precisely. The heat is being shut off before the tube goes into the molten state. So due to less broken coils, the downtime can be reduced.

Raytek Product
- Raytek MM3MLVF1LW
- Raytek MR1SBSFW
- Raytek FR1SBSF003

Accessories
- Power Supply
- USB/RS485 Converter
- DataTemp MultiDrop Software

Benefits
- Saved man-hours
- Reduced scrap
- Increased production
- Reduced damage to coil
- ISO 9001 certification

References
- MacSteel
- Maverick Tube
- Tenaris Tube