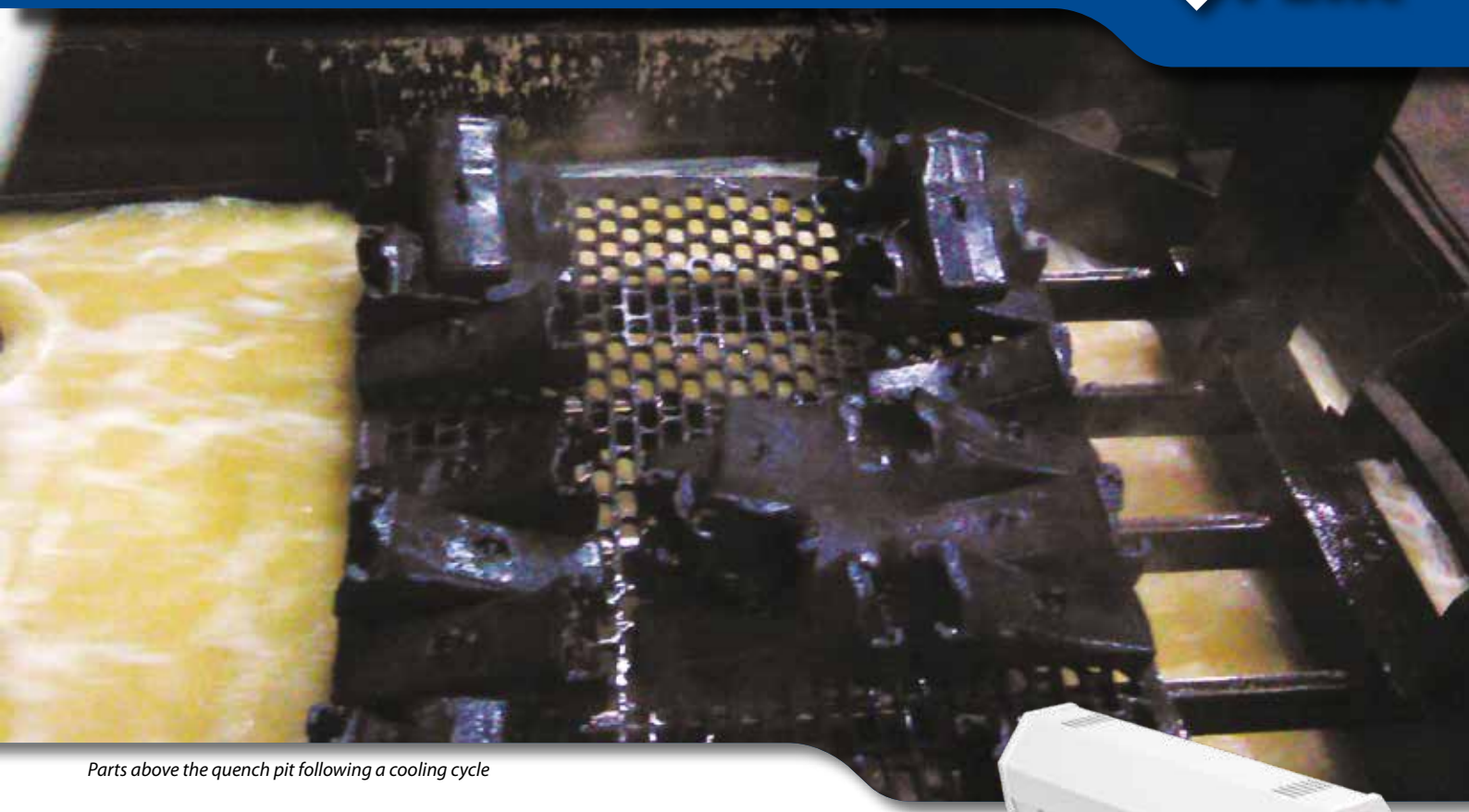


Parts above the quench pit following a cooling cycle

Thermal imaging system with FLIR cameras inspects metal parts after cooling treatment

FLIR A310f thermal imaging camera

Heat treatment is used in metal manufacturing to alter the chemical and physical properties of the resulting metal parts. Careful application of a specific sequence of heating and cooling cycles for pre-determined time intervals enables metallurgists to control the hardness or softness of the resulting parts. Thermography specialist MoviTHERM developed a dedicated thermal inspection system with cameras from FLIR Systems in order to monitor the temperature of metal parts after leaving a cooling bath, also called 'quench pit'.

MoviTHERM is a developer of turn-key thermography inspection solutions. The company offers engineering expertise, free initial consultation, knowledgeable product evaluation and selection, and reliable client support in all aspects of imaging technology. Its software and hardware engineers are experts in systems integration, allowing them to build full custom solutions to any client's specific application.

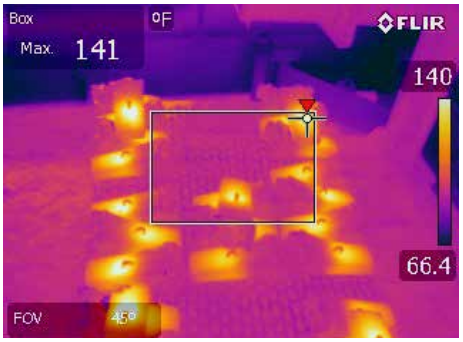
Heating and cooling cycles

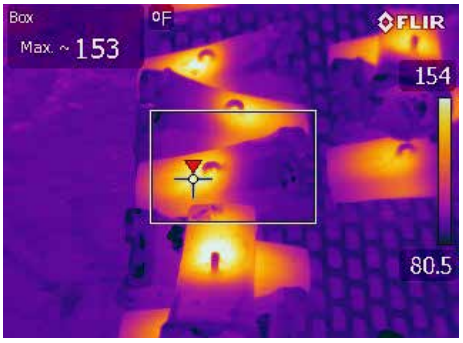
Maintaining tight control over heating and quenching sequences is very important to companies that manufacture wear parts for industrial applications. By controlling heating and cooling cycles, manufacturers can regulate the relative hardness of machine components, making easily replaced "wear components" softer, while critical mechanical parts can be harder. Wear parts help to prolong the life of machines, and reduce service and maintenance costs in the field.

FLIR integration partner MoviTHERM (Irvine, CA) was approached by a prominent manufacturer of wear parts to design and deploy a thermal imaging system to inspect parts immediately following a critical quenching process.

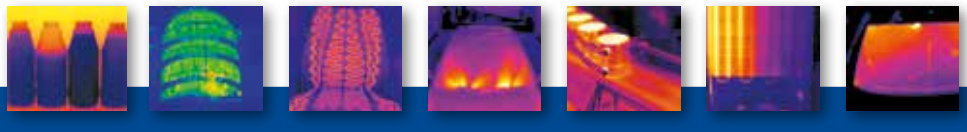
Process sequence

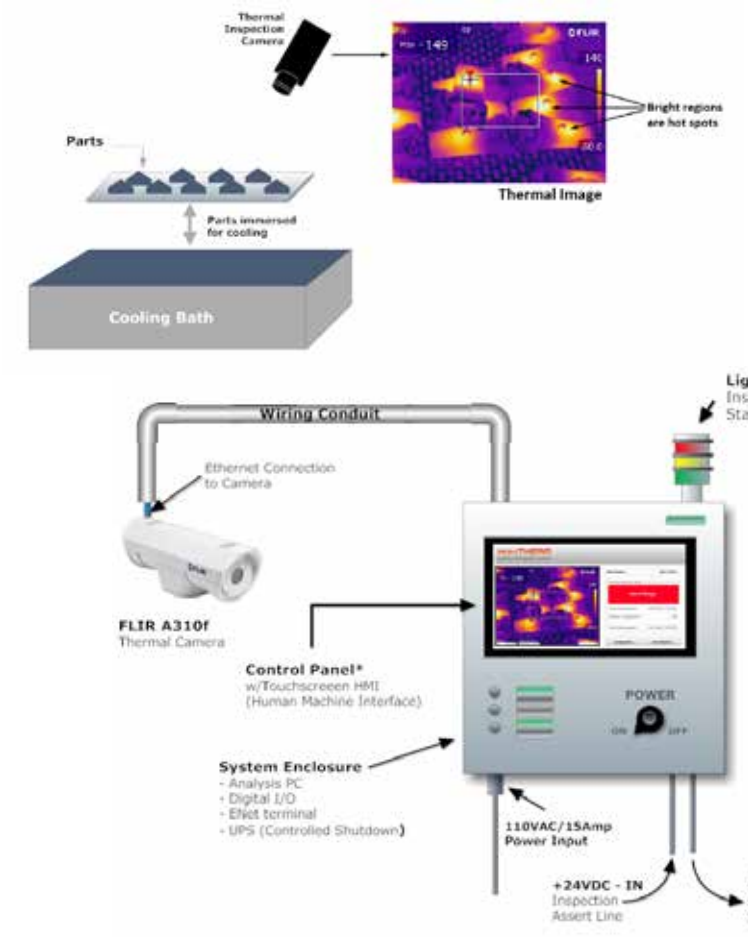
The parts to be inspected are first heated in a kiln to temperatures approaching 2,000 °F. After heating, the parts are transferred to a liquid cooling chamber or "Quench Pit", for quenching. After some time has elapsed, the parts are removed from





Parts above the quench pit following a cooling cycle



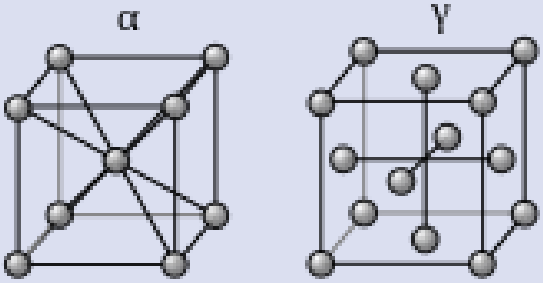


FLIR A310f thermal camera specifications

- *The FLIR A310f has an environmental housing protecting the camera unit against dust and water. The housing increases the environmental specifications to IP66, without affecting any of the camera features.*
- *45° Lens*
- *High sensitivity to < 50 mK*
- *16 bit image resolution*
- *100Mb Ethernet*
- *PoE (Power over Ethernet)*

Heat treating: how does it work?

Metallic materials consist of a microstructure of small crystals called "grains" or crystallites. The nature of the grains (i.e. grain size and composition) is one of the most effective factors that can determine the overall mechanical behavior of the metal. Heat treatment provides an efficient way to manipulate the properties of the metal by controlling the rate of diffusion and the rate of cooling within the microstructure. Heat treating is often used to alter the mechanical properties of an alloy, manipulating properties such as the hardness, strength, toughness, ductility, and elasticity.



Iron elements showing the differences in lattice structures between alpha iron (low temperature) and gamma iron (high temperature).

the cooling chamber, and the temperatures of the parts are measured by a FLIR A310f thermal imaging camera. Hot spots in the image are examined to see if additional cooling cycles will be necessary to bring all parts below a pre-defined temperature limit.

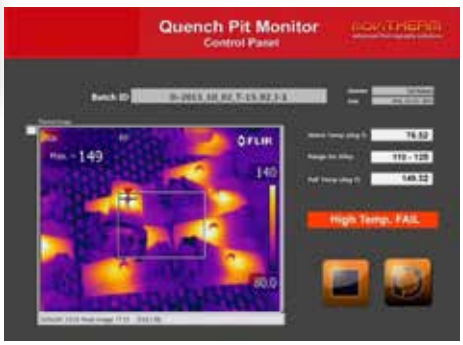
Software user interface

The system is controlled via a touchscreen, which is mounted on the front face of the electrical panel. The operator configures the inspection at the start of the sequence, and the inspection system tracks the motion of the parts into and out of the cooling chamber.

The FLIR A310f camera passes an image to the Analysis PC at the completion of the quench cycle. The brighter regions in the thermal image reflect higher temperatures, with the whitest areas being the hottest. Black areas are the coolest, with purple and eventually orange areas representing increasing temperatures from 80°F to 140°F. In this instance, the parts are still above the target temperature range, so the operator can repeat the quench cycle by selecting the looping arrow button in the lower right-hand corner of the touch-enabled screen.

MoviTHERM contact: Markus Tarin
info@movitherm.com

moviTHERM
advanced thermography solutions



The Quench Pit Monitor HMI panel

For more information about thermal imaging cameras or about this application, please contact:

FLIR Systems
Luxemburgstraat 2
2321 Meer Belgium
Tel. : +32 (0) 3665 5100
Fax : +32 (0) 3303 5624
e-mail: flir@flir.com

T820231 {EN_GB}_A