

FLIR

APPLICATION STORY



Keeping the flame burning: Infrared thermography at refineries

Oil refineries are places where the black gold is heated up and cooled down in order to produce its pricey derivatives. Production installations have to be kept up and running to ensure a stable production and to satisfy the current high demand for oil products. Moreover, safety and plant reliability are important issues, enhanced by tight environmental prescriptions.

A refinery plant is a rewarding object for thermographic inspections. It exists of powerful heating and cooling installations, such as fired heaters and air coolers, electrical installations, pumps and compressors, vessels, and endless piping, thus offering opportunities at every step to deploy a non-intrusive instrument such as an infrared camera for inspection purposes.

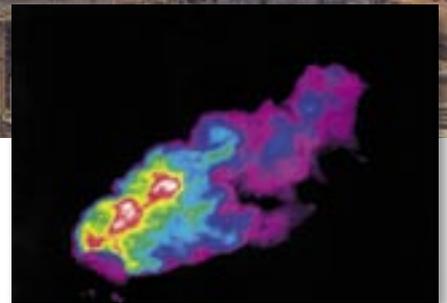
HOW TO GET ON SUCCESSFULLY

There is general consensus about the huge pay-back of the application of infrared thermography at refineries and petrochemical production plants. Including the results of thermal surveys in the maintenance and shutdown planning processes has been proven to bring significant cost savings. Some corporations have worked out guidelines to unify and streamline the multitude of different applications and diverse

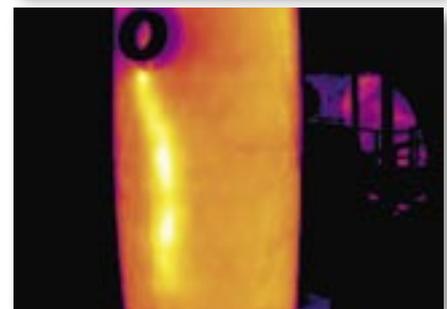
infrared camera equipment.

The corporation bp, for example, has worked out the following recommendations for a consistent thermography policy at its plants and production sites :

- standardize on one equipment manufacturer and software
- identify and provide appropriate training courses
- generate in-house thermography procedures and specifications (including severity criteria, frequency etc...)
- permanently investigate new thermography applications and techniques
- provide guidance to plants interested in implementing an infrared thermography program



Infrared image of a flare in daylight



Failure in internal refractory lining

FLIR



What are the most important applications of infrared thermography in the business and where does the infrared camera excel as a pro-active maintenance star and an operation cost killer?

SURVEYING ELECTRICAL INSTALLATIONS

"Electrical fault detection, transformer condition, distribution lines and substation inspections have saved millions of dollars in cost savings and cost avoidance", says John J. Nyholt, Inspection specialist at bp, Houston, Texas (US). Nyholt points to the term cost avoidance, which is usually underestimated in cost calculations and relevant decision-making. Cost avoidance is determined by the likelihood of a failure to develop in a worst-case scenario, such as an unscheduled shutdown, which may have happened if the fault had not been detected.

Andy Whitcher, Senior Consultant of UK-based infrared thermography consulting company Tecpinions, and an expert in thermographic inspection of refineries, reports how his surveying of a substation air conditioning system, not the most vital of functions at a refinery, identified a potential annual saving for his client of USD 20,000 on his electricity bill.

DETECTING HEAT TRANSFER AND HEAT LOSS

The distribution of heat across coolers and heat exchangers is an indicator of the condition of equipment. Thermography uncovers poor heating and cooling, thus indicating a waste of energy and improving the efficiency of process operations. Infrared thermography is also a valuable tool to detect heat loss from steam traps and leaks.

Fugitive emissions of process liquids and gases are a major concern for both the industry and national or supranational regulation bodies. Calibrated FLIR Systems P-series cameras measure temperatures of up to 2,000°C. In addition, FLIR System's GasFindIR, a camera which rapidly detects fugitive gas emissions, delivers real-time thermal images of gas leaks.

CONTROLLING REFRACTORY LINED EQUIPMENT

Refractory is an inner lining, consisting of high-temperature resistant materials which protect the outer shell of piping, vessels, and process furnaces from hot gases and fluids circulating inside the plant. It is vital to a safe production process: if the refractory lining fails, the steel-

made shell will quickly be weakened by heat and internal pressure. This poses a significant threat of failure of the equipment resulting in loss of containment, environmental contamination and a significant risk of fires. Many experts advise to inspect on a regular basis: "a long-term monitoring of refractory lining, based on a regular inspection every week or two weeks, leads to a detailed account of the refractory "behavior pattern" and its resistance features. This allows to manage the scheduling of planned shutdowns to renew the lining, and to avoid costly unplanned shutdowns," says Andy Whitcher. Regular observation also enables plant engineers to improve the quality of the employed refractory material.

TRACING SOLIDS BUILDUP

Buildup of solids is a result of refractory remnants or changes in process conditions. If ash or other residues in furnaces or piping are not detected they can result in unplanned shutdowns with lengthy and expensive searches for the cause.

CONCLUSION: IR INSPECTION POTENTIAL NOT USED TO CAPACITY

Thermal imaging is a very good indicator of material, process and mechanical conditions at refineries and petrochemical plants. "However", says Andy Whitcher, "thermographic examination of fixed refinery equipment appears to be under-utilized in the industry" - and trending the results over time adds to the huge cost savings: it increases the refiner's knowledge of the condition of his equipment, allowing him to make more accurate and informed decisions."

IR might look expensive in terms of equipment, training, condition monitoring program development and setup. But if used in conjunction with a consistent infrared thermography program and appropriate professional and reliable equipment, it will reach its full potential.

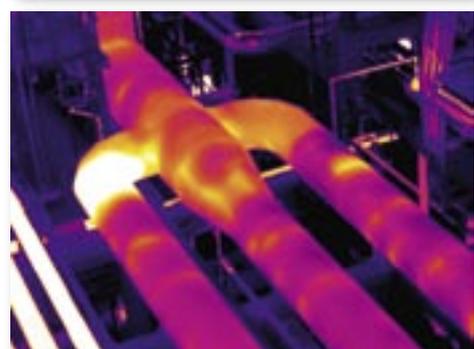
REFERENCES

NYHOLT, John J. *Infrared Thermography in BP Amoco - Petrochemical Applications in: InfraMation 2001 Proceedings, Infrared Training Center, Billerica, MA, USA*

WHITCHER, Andy *Thermographic Monitoring of Refractory Lined Petroleum Refinery Equipment in InfraMation 2004 Proceedings, Infrared Training Center, Billerica, MA, USA*



Growing buildup of deposits can be traced



Refractory lining breakdown in an air line

For further information contact:

FLIR SYSTEMS AB
 World Wide Thermography Center
 Rinkebyvägen 19
 SE-182 11 Danderyd
 Sweden
 Tel.: +46 (0)8 753 25 00
 Fax: +46 (0)8 753 23 64
 e-mail: sales@flir.se
 www.flir.com

