



OIL AND GAS INDUSTRY

Solutions for extraction, production,
transportation, and refining

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FINDING SOLUTIONS TO COMMON INDUSTRY PROBLEMS

The oil and gas industry faces many maintenance challenges. Pipes fail—releasing fugitive emissions or liquid leaks into the environment. Motors, pumps, and valves break down. Invisible oil and gas leaks are difficult and time consuming to detect using traditional inspection methods, especially when there are many components to inspect. If problems aren't discovered early, they could lead to millions of dollars in financial or equipment losses, negative environmental impact, or safety issues for personnel.

FLIR optical gas imaging (OGI) cameras enable inspectors to detect leaks faster and pinpoint the source immediately, leading to prompt repairs, reduced industrial emissions, and greater conformity to regulations. FLIR offers a complete range of thermal imaging, gas detection, and test equipment for diagnosing potential problems before they turn into expensive failures. By using FLIR OGI technology to its full potential, the industry can create a safer and more efficient environment for its staff and clients alike.



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EXTRACTION AND PRODUCTION

Offshore Drilling

Inspect aging offshore platforms with optical gas imaging

The offshore oil and gas industry faces unique challenges. Due to advances in geology and drilling techniques, many older, aging platforms are forced to extend beyond their designed lifespan and continue production. The industry is urged to meet methane emissions reduction targets and measure fugitive methane releases to determine a baseline measurement that future reductions can be assessed against. Through regular thermal imaging inspections, offshore drilling companies can rapidly detect and quantify fugitive gas leaks that could cause a potential platform shutdown.

SOLUTIONS



FLIR Gx620



FLIR Cx5

Natural Gas Compliance

Meet regulatory compliance requirements with optical gas imaging

In many parts of the world, government influence on the natural gas industry requires companies to meet federal or local regulations in order to reduce emissions. These regulations necessitate that natural gas companies perform regular inspections for leaks. Various technologies and methods are available to complete routine checks, including toxic vapor analyzers—or “sniffers”. But these solutions can be labor intensive as there are often hundreds if not thousands of components to inspect at numerous locations. FLIR OGI cameras can help natural gas industry professionals inspect locations up to nine times faster than with other technologies, precisely identify the leak location, and successfully maintain regulatory compliance.

SOLUTIONS



FLIR G300A



FLIR Gx320

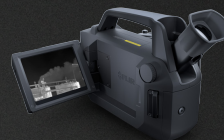


Natural Gas Separators

Inspect sand levels and emissions with thermal imaging

In the fracking process, gas is separated from oil and water and sent to a meter while the oil and water is collected and hauled away by trucks. Through this process, sand can build up in the heating element, causing damage to the separator. If this build-up is not promptly removed, it may result in a catastrophic failure of the unit—which can cost nearly \$100,000. Thermal imaging cameras provide a healthy return on investment by helping maintenance professionals determine which separators require cleaning and which are operating efficiently. Adding thermal imaging to routine inspections also allows companies to easily verify tank pressures and liquid levels, detect leaks from the separator, resolve anomalies to restore compliance, avoid adverse environmental impact, and prevent safety risks to equipment or personnel.

SOLUTIONS



FLIR Gx620



FLIR E8-XT

Upstream and Midstream Security

Protect extended and near perimeter security for gas co-locations

Many oil and gas companies manage miles of gas lines within their operations and have an extensive portfolio of real estate. This can be challenging to manage and secure effectively. Using a FLIR thermal security solution, companies can receive early warning of gas flow issues through pipes, perimeter protection, and push the perimeter further away from the fence line. Unique analytics allow companies to expand perimeter protection without a large investment in additional fence and or hardware.

SOLUTIONS



FLIR FH-Series ID



FLIR Elara™ PT-Series



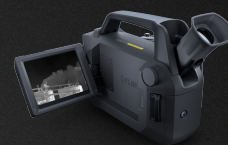
TRANSMISSION AND TRANSPORTATION

Natural Gas Compressors

Locating gas leaks with optical gas imaging or visual borescope inspections

Compressors can fail because of poor packing seals, internal component issues, and extensive wear or thermal stress on components, resulting in downtime or gas leaks. Inspecting a compressor externally can be time consuming and labor intensive, while internal component inspections are challenging without the ability to directly see inside the equipment. Compressors are specifically designated as inspection components in regulations like the US EPA 0000a, so it's important that they are functioning optimally. Incorporating a borescope or OGI camera into a routine maintenance plan can help natural gas companies improve safety, reduce costs, and extend the life of compressors, which in turn will reduce downtime and maintain regulatory compliance.

SOLUTIONS



FLIR Gx620



FLIR VS80

Tank Level Gauging

Using thermal imaging to see liquids, solids, and foam levels inside a tank

Tank level gauging is a necessity for various applications in the oil and gas industry. Maintenance teams need to ensure there is no overflow and to know when to empty the tank. In order to do so, they must determine the tank's current level. If they are recovering fracking fluid, they may need to calculate tank flow rates, which can be dictated by tank capacity. Thermal imaging, both handheld and continuous fixed monitoring, allows oil and gas companies to gauge tank levels without direct contact; it can also help them distinguish small changes in temperature between liquids or solids of varying densities with specific heat characteristics.

SOLUTIONS



FLIR E76



Elara™ FB-Series



Inspecting Compressed Air Systems, Motors, Pumps, and Valves

Prevent downtime and save energy with thermal and acoustic imaging

A motor breakdown, pump failure, or valve leak is always a critical issue in the oil and gas supply chain. They can result in pollution, product or energy loss, and shutdown of equipment or a production line. That's why motor, pump, and valve inspections using FLIR thermal imaging technology are a vitally important part of predictive maintenance programs for so many businesses. Up to 30% of electricity usage in compressed air systems is lost to leaks. Inspecting and fixing these issues lowers energy bills and reduces compressed air equipment capital costs.

Pipeline Inspections

Detect gas leaks from pipelines with optical gas imaging

Oil and gas pipelines often stretch long distances carrying a variety of materials. Sometimes the pipes fail, releasing fugitive gas emissions or liquid leaks into the environment. Pipeline leaks often start small, making them challenging to detect until it's too late. Oil and gas companies need the flexibility to clearly identify pipeline leaks using both automated, remote inspections and onsite, live inspections. Companies can easily identify gas emissions day or night using FLIR handheld thermal imagers or drone-mounted payloads – stopping leaks before they become unmanageable.

SOLUTIONS



SOLUTIONS





PROCESSING AND REFINING

Fired Furnace Inspection

Measure furnace tube metal temperatures through a gas flame

Tubes on a firebox can overheat and rupture, starting an uncontrolled fire and other collateral damage. Refractory damage and improper burner alignment can also cause overheating and breakdown, resulting in downtime and a personnel safety issue — especially near inspection ports and ladders. That's why it's crucial to routinely inspect and assess the condition of the external steel firebox, tubes, and supports using a furnace inspection camera with thermal imaging capabilities. This kind of camera allows inspectors to look through gas flames and determine whether localized internal coking is occurring, or if it's external scaling. Inspectors can accurately measure the true hot spots and make recommendations to the operations team to reduce the firing rate in the furnace and avoid an unexpected tube rupture.

SOLUTIONS



FLIR GF309



FLIR T865
with FlexView™
Dual Field of View Lens

Electrical Inspections

Prevent distribution system failure and breakdown with thermal imaging

Electrical distribution boards are typically housed inside cabinet enclosures, making them difficult to inspect for impending failures. When electrical connections and components break down unexpectedly, the result may be unplanned downtime, costly repairs, production loss, and an increased risk of fire. That's why it's important to perform routine checks of electrical distribution systems for signs of overheating, as this may signal a potential failure. Conducting electrical inspections using FLIR thermal technology will help you to pinpoint any stressed elements before failure and break down. Thermal imaging technology can provide key information that the eyes alone cannot detect. This gives them the opportunity to solve electrical issues as part of planned maintenance before it causes a serious and costly problem.

SOLUTIONS



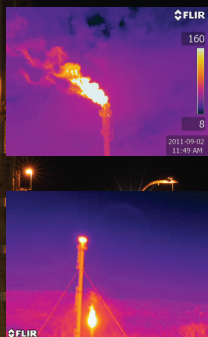
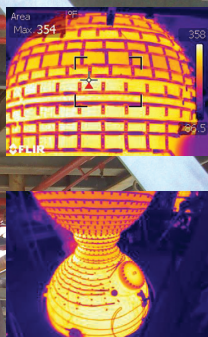
FLIR E96



FLIR DM285



FLIR CM275



Critical Vessel Monitoring

Automated and continuous monitoring with thermal imaging

Critical vessels (such as gasifiers) can reach temperatures in excess of 500°C internally and must be kept stable in this process. If temperatures are not kept under control the rising heat could result in a hazardous explosion. The vessels are recorded and controlled to ensure the skin (often made of iron) doesn't rise in temperature and become ductile. Thermal imaging technology is an ideal way to continuously monitor critical vessels in order to catch problems before a failure occurs. FLIR technology provides a full picture of potential problems, as well as the areas between thermocouples that are often missed.

SOLUTIONS



FLIR A310ex

Flare Stack Monitoring

Using automated infrared cameras to monitor flare stacks

Flare systems are often a last line of defense in preventing dangerous hydrocarbon pollutants from entering the atmosphere. Various technologies have been used to monitor flares, but they are often ineffective at minimizing smoke from stake combustion — which is an important indicator of burn efficiency. Flaring without the pilot flame releases gas into the air, increasing the risk for explosions and negative environmental impact. Thermal imaging technology can help inspectors recognize the difference between the heat signature of a flare stack flame and the surrounding background (usually the sky or clouds).

SOLUTIONS



FLIR A700f



FLIR T840



FLIR PORTABLE INFRARED AND ACOUSTIC CAMERA SOFTWARE

FLIR helps you work more efficiently and boost productivity with a robust software suite, routing plugins, and cloud storage.

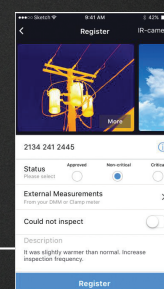
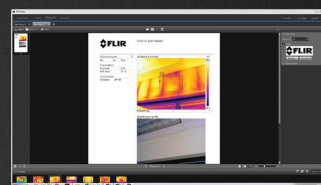
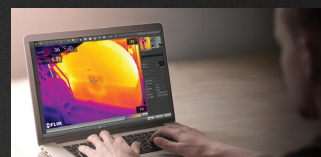
SOFTWARE AND CLOUD SOLUTIONS

FLIR Thermal Studio Pro, FLIR Ignite Cloud storage, and FLIR route management provide the total solution your team needs to streamline inspections, analysis, and reporting.

FLIR Thermal Studio Pro: Build an efficient survey roadmap with the FLIR Route Creator software plugin, then download and run it using the Inspection Route feature on your camera. Once your inspection is complete, bring the images back into FLIR Thermal Studio for processing, analysis, and reporting.

For acoustic imaging, the FLIR Si124 comes with a software plugin for FLIR Thermal Studio Pro that allows you to calculate critical decision-making data such as leak rates, costs, and level of threat from partial discharge.

FLIR Ignite: Upload images wirelessly to this cloud-based service, which automatically manages the safe and secure back-up of your data and instantly shares the content with authorized team members.



FLIR SOFTWARE DEVELOPMENT SOLUTIONS

FLIR's Software Development Kit (ATLAS SDK) allows companies to use their own Computerized Maintenance Monitoring Systems (CMMS) to support read-out of thermal measurements as well as inclusion of METERLiNK® data, GPS, compass, and other important parameters embedded within the image.



THE INFRARED TRAINING CENTER

Thermal and Optical Gas Imaging Value

The greater your knowledge of thermal and optical gas imaging, the greater the dividends you'll realize for your company and your career. That's why the Infrared Training Center (ITC) offers classes for many industry applications—from free, online courses to advanced certification training.

ITC courses include:

- *Optical Gas Imaging Certification Course*
- *OGI Fundamentals Online Course*
- *Level I, II, and III Thermography Courses*
- *Electrical Inspection and Level I Electrical Thermography Courses*

WORLD-CLASS INFRARED TRAINING

ITC thermography certification courses help prepare you to take a leadership role in an infrared or optical gas inspection program. Level I certifies that you know how a thermal camera or optical gas imager works and how to use it. Level II cranks up your credibility with more in-depth concepts and intensive labs. Level III asserts that you have the knowledge and skills to develop and administer your company's thermography or optical gas imaging program. These certifications offer strong validation to support the work you do.

ITC offers classes at training centers around the globe, at locations within your country, at your company's facility, and even on-line. On-site training is encouraged if your company needs to certify a group of 10 or more. ITC's on-site training courses are the best way to accommodate a large group on a limited budget. Our instructors will travel directly to your facility to limit your travel costs by keeping staff on site, reducing downtime and short staff issues.



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NASDAQ: TDY

