

# OPTICAL GAS IMAGING (OGI) INSPECTIONS

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## BACKGROUND:

OGI  
INSPECTIONS  
USING IR  
CAMERA  
TECHNOLOGY

**OPTICAL GAS IMAGING (OGI) INSPECTIONS USING INFRARED (IR) CAMERA TECHNOLOGY IS BECOMING MORE PREVALENT IN THE PETROLEUM AND NATURAL GAS INDUSTRY. SAGE RECOGNIZES THE VALUE OF OGI MONITORING FOR ENVIRONMENTAL, ECONOMIC, AND SAFETY PURPOSES. HOWEVER, WE ADVOCATE FOR THE PRAGMATIC IMPLEMENTATION OF INSPECTION PROGRAMS AT THE DIRECTION OF THE CLIENT TO FULLY REALIZE ITS BENEFITS AND MAXIMIZE EFFICIENCY.**

### **IR CAMERA TECHNOLOGY USES**

Infrared (IR) camera technology presents a countless number of uses. Sage primarily utilizes FLIR™ GF320 IR cameras during refinery and offshore platform turnarounds and startups. The FLIR™ GF320 IR camera is currently the “top of the line” IR camera for hydrocarbon leak detection. During turnaround and startup events, equipment can incur many changes when shutting down and starting up due to maintenance, and pressure and temperature changes, etc. These physical changes, which can be extreme at times, can negatively impact various connections, gaskets, seals, and other leak interfaces.

Equipment that has been modified or replaced can have similar issues. Therefore, when a unit is put back online, new leaks are created. These leaks pose not only environmental hazards, but also safety and efficiency issues. IR cameras help prevent these issues in a timely manner before they become more serious, leading to major environmental expedencies, safety hazards (e.g., H2S exposure, explosions), and serious loss of efficiency within the process.

## BACKGROUND:

### OGI INSPECTIONS USING IR CAMERA TECHNOLOGY

The camera can be used to detect gas leaks by using the different heat absorption/reflective nature of hydrocarbons-in-air versus background concentrations. Leaks are seen as a plume of vapor in the FLIR infrared image display. Since numerous equipment items can be accurately scanned from a safe distance, actual leaks can be detected and repaired much quicker. Leaks that are found in this manner will be immediately repaired or scheduled for repair at the earliest and safest opportunity.

The FLIR Infrared Camera can scan large areas rapidly and pinpoint leaks in real time. It is ideal for monitoring components that are difficult to reach with contact measurement tools. The camera is designed for use in harsh industrial environments and operates in wide temperature ranges; it includes a personal video recorder for easy archiving and documentation. It is capable of measuring temperatures from -40°C to 350°C with  $\pm 1^\circ\text{C}$ . The  $< 25$  mK thermal sensitivity (@ 30°C) captures the finest image details and temperature difference information.

The camera is able to detect many chemicals including, but not limited to, the following:

Benzene	Butane	Ethane	Ethanol	Ethylbenzene
Ethylene	Heptane	Hexane	Isoprene	MEK
Methane	Methanol	MIBK	Octane	Pentane
1-Pentene	Propane	Propylene	Toluene	Xylene

## OUR SERVICES AND APPROACH: :

### SAGE'S LEAK DETECTION EXPERTISE

Sage has a team of expert IR camera operators who are able to find the smallest leaks with the IR camera. We provide IR camera surveys on an annual and semi-annual basis and in turnaround/startup situations. Inspection teams consist of two operators, typically a chemical engineer and a technician, to ensure proper inspection of each unit. Sage engineers and technicians are savvy with the equipment they view in the field and know where leaks can be typically found and missed.

### EXAMPLES OF LEAKS

**Exchanger Leaks:** Sage has found numerous issues with exchangers during surveys. One exchanger had a 1-inch hold in the side of its shell. The process had to be immediately shut down until it was replaced. In addition, two exchanger flanges were leaking on nearby exchangers, causing an extremely dangerous environment. Fortunately, through the IR camera survey, these issues were immediately found, and the process could be shut down before a catastrophic event.

**Compressor Leaks:** Compressors have a high tendency to leak. Sage typically finds several leaks in any given compressor area. These leaks include flanges and plugs. In some cases, Sage finds compressor seals severely leaking, which would cause harm if hot work were being performed nearby. In addition, it kills the efficiency of the compressor.

## OUR SERVICES AND APPROACH:

### SAGE'S LEAK DETECTION EXPERTISE

**Fuel Gas Filters:** On any survey, areas with fuel gas are hot spots for leaks. Fuel gas filters leaking can pose a serious threat. They are usually squeezed in around a lot of equipment and at different levels that personnel can access. One fuel gas filter was severely leaking, and the fuel gas was going directly up to a platform where personnel could be working. If this leak was not found and attended to, it would have created significant health and safety issues.

**Pressure Relief Valves:** When pressure relief valves fail, they tend to cause very large leaks. They are typically in cramped spots or high up in areas that are often overlooked. Many times, they are found in high areas above towers, where, if personnel were to go up there, it could cause them extreme harm or death in some cases when H<sub>2</sub>S is involved. They have also been found in compressor areas, where chances of personnel being exposed are very high.

### **OPPORTUNITY TO BENEFIT FROM OGI INSPECTIONS**

Sage has identified three niche areas where the client benefits tremendously from OGI inspections: (1) immediately following the installation of a facility (e.g., onshore O&G production facilities), (2) during and immediately after turnaround activities (e.g., refineries and offshore platforms), and (3) annually at facilities that do not currently have a Leak Detection and Repair (LDAR) Program (e.g., offshore platforms).

- 1. Installation Inspection** Fracturing technology has significantly increased the number of onshore oil and gas production facilities and the speed at which they are built in many of the Shale plays across the country. Sage performs OGI inspections at these types of facilities as they come online in order to determine if the facility is operating in a leak-free environment. In one field in South Texas, Sage identified a systematic issue where tubing systems were incorrectly installed at compressor operating panels, which allowed gas to continuously blow onto electrical systems.
- 2. Turnaround Monitoring** Similar to above, during turnarounds, facilities generally work on and/or replace a significant amount of equipment. There is a heightened risk of resulting leaks anytime lines are broken. Sage performs OGI monitoring during turnarounds and startups to help turnaround personnel bring the asset up and operating in the safest manner. In several instances, Sage immediately found leaks that operating personnel were completely unaware of, which allowed the client to safely mitigate the leak before coming all the way back online.
- 3. Best Management Practice Annual Inspections at Non-LDAR Facilities** Many onshore domestic mid-stream and downstream facilities must comply with environmental regulations that require the facility to maintain a Leak Detection and Repair (LDAR) program. These facilities are also required to perform OGI monitoring due to other regulations. While these monitoring types of inspections are reliable ways to find leaks, the requirement to perform both reduces the cost effectiveness of both leak detection methods. Sage has determined that pragmatically implementing an annual OGI monitoring program at facilities without existing LDAR programs (e.g., offshore or non-U.S. facilities) helps clients realize the safety and environmental benefits of an inspection program at a cost that is generally offset by the amount of product recovered through the repairs. In fact, the captured product can actually provide a 200-300% return on investment of the inspection.