

# Thermal Imaging from a UAV to Spot Gas Leaks from the Air

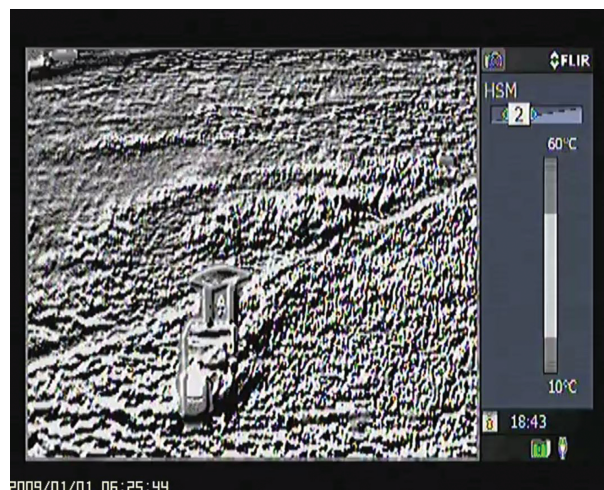
Natural gas processing plants, such as the Al Hosn Shah Plant in Abu Dhabi, purify raw natural gas by removing certain contaminants. These contaminant gases are often very dangerous for human exposure and therefore, gas pipelines and other infrastructure need to be carefully monitored for leaks. An innovative combination of UAV and optical gas imaging technology was tested and turned out to be a very efficient way of monitoring vast gas fields.

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The Shah sour gas field is located around 180km southwest of Abu Dhabi, in the UAE. The new Shah Gas Processing Plant is designed to process 1,000 MMSCFD (million metric standard cubic feet per day) of sour gas. The plant is located in three adjoining low flat areas on the East-Central side of the Shah Field with an East to West span of about 6 km. The processing of sour gas with a high concentration of dangerous hydrogen sulfide (H<sub>2</sub>S) gas – the so-called sweetening process – is confined to the Western Area.

“Some gases are very poisonous, corrosive, flammable, and explosive,” says John Rennie, Operations Director at Inspectahire, a leading inspection company and supplier of specialist remote visual inspection technology. “The company had been using so-called sniffers to detect gas leaks, but this is not an efficient way to cover such a vast network of pipelines, and it is very unsafe for the operator. That’s why Al Hosn Gas reached out to us to find a more efficient way to scan the area for leaks.”

The sniffer is a hand probe that produces an audio-signal when in proximity of a leak. Although this is a relatively affordable detection method, the sniffing test requires the operator to approach closely to the leak source, which can be dangerous. Sniffers do not allow operators to see a leak, so there is always some guesswork involved and time lost in the search for the source. Inspectahire has a long history of working with thermal imaging cameras from FLIR Systems, so the company knew that the solution for Al Hosn Gas had to be sought there.



During a UAV test flight, a leaking gas bottle was placed on the ground and the FLIR G300a was able to monitor it very accurately from the air (top: thermal mode, bottom: HSM mode).

## Monitoring for dangerous gases

In spite of the many safety measures for the Al Hosn Shah Plant staff, the Western Area, marked as the red zone, still presents a significant health and safety risk for maintenance professionals and other operators.



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## Thermal imaging on a UAV

At an Infrared Training Center (ITC) session in October 2014, Inspectahire met with the team from Swedish UAV integrator Sky Eye Innovations. This company has been working with FLIR for several years by building dedicated UAV systems around FLIR cameras, such as the T-Series and GF-Series. While discussing the Al Hosn Gas project, both companies decided to bundle their knowledge in the field of optical gas imaging and aerial inspection. They came up with a joint solution based on the FLIR G300a camera.

"A lot of companies have been integrating FLIR camera cores on their UAV systems," says Daniel Sällstedt, CEO at Sky Eye Innovations. "We take a different approach, because we start by looking at a complete FLIR camera system and then build a UAV system around it. In addition, we pay attention to building in extra fault tolerance features, like redundant flight control, in order to make sure that our customers' investment is safe."

"In the presence of some members of Al Hosn Gas's integrity management team, we organised a demonstration with the Sky

Eye UAV and a FLIR G300a optical gas imaging camera near the FLIR offices in Sweden," says John Rennie. "The test flight went very well and the Al Hosn Gas team decided to have another test flight at the Abu Dhabi plant to further convince the management team of this solution. Also here, the test was very convincing. We placed a leaking gas bottle on the ground and were able to monitor very accurately from the air with the FLIR G300a. This convinced the management team to have a test flight over the red zone too. And although we did not actually find a gas leak there, we can call this flight a success."

## Cooled detector makes the smallest temperature differences visible

Optical gas imaging cameras from FLIR can visualize and pinpoint gas leaks that are invisible to the naked eye. With an optical gas imaging camera it is easy to continuously scan installations that are in remote areas or in zones that are difficult to access. The FLIR G300a optical gas camera contains a cooled Indium Antimonide (InSb) detector that produces thermal images of 320 x 240 pixels. With its low F-number (quantitative measure of lens speed) and high sensitivity, the G300a detects the smallest of leaks. The camera also has FLIR's High Sensitivity Mode (HSM) which further enhances the detection level of the camera so that the smallest gas leaks can be detected. The FLIR G300a is very easy to control from a safe distance over Ethernet and it can easily be integrated in a TCP/IP network.

## Ideal gas camera for UAV integration

"The combined expertise from FLIR, Inspectahire and Sky Eye is truly unique. The FLIR G300a is really an ideal



camera for our Sky Eye OGI UAV system," says Daniel Sällstedt. "The G300a is very light and compact – in fact the first optical imaging camera that is so light – which makes it extremely suited for extended UAV flights. We have made it possible for the operator to control the camera remotely from the ground with a joystick and operator screen. The FLIR camera's connectivity is what makes it truly unique in the market. The image quality is what you can expect from a world leader in thermal imaging. Especially the High Sensitivity Mode is very useful when you need to see moving gas fumes."

"The gas market will really be able to benefit from this technology. Gas plants are usually very wide, so with our UAV solutions you are able to scan these large areas very efficiently and also to provide a good overview. They can take you to places that are hard to reach or that would take a lot of effort to go to. Gas processing plants usually have risky areas, like the red zone at the Al Hosn Shah Plant. Optical gas imaging cameras like the FLIR G300a can scan these hazardous areas without any risk for human operators."