APPLICATION NOTE

Safety Through Efficient Gas Detection, Identification and Imaging in Oil and Gas Environments

Abstract

Safety is a major concern for oil and gas companies as the chemicals encountered in their installations are mostly toxic or present a high explosion potential. The need for a reliable gas identification and imaging system is an interesting addition to the current gas detection systems in order to take action during emergency situations. Such systems can also significantly improve on-site safety through constant monitoring and preventive inspection of the installations. Telops has recently developed the Hyper-Cam GDI, a Gas Detection and Imaging System which has the ability to detect and identify in real-time, a large portfolio of gases simultaneously from distances ranging from tens of meters to several kilometers. The use of the system in various environments related to the oil and gas industry illustrates the versatility of such tool in these environments.

Figure 1: The Telops Hyper-Cam

Introduction

Safety is a major concern for oil and gas companies as their operational environment contains many toxic industrial chemicals (TIC) and gases with a high explosion potential. Therefore, constant monitoring is crucial to preserve on-site personnel security and to prevent damage to the installations. The need for a reliable gas detection and identification system is of prime importance especially when security threatening situations like gas leaks and emissions occur. Precise localization of the leaks and identification of the chemical nature of the gases involved may help the incident response team to take actions based on relevant information. In this regard, infrared remote sensing technology offers many benefits over traditional gas detection systems as it allows monitoring and imaging of a scene from a distant and safe location. The sensor can be located at distances ranging from tens of meters to several kilometers from the scene, avoiding the need to access restricted and potentially dangerous zones in the installations.

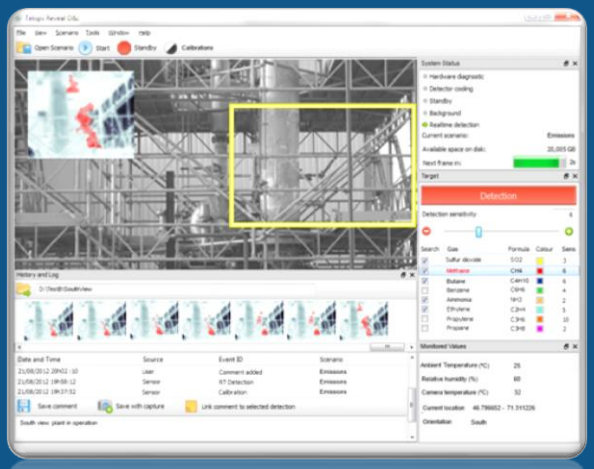

Figure 2: Hyper-Cam GDI configuration, its real-time gas detection and identification platform

Telops has recently developed the Hyper-Cam GDI, a versatile Gas Detection, Identification and Imaging System based on infrared remote sensing technology which significantly improves the ability to handle gas leaks and emissions in oil & gas installations. Methane (CH_4), sulfur dioxide (SO_2) and alkanes are among the typical gases which can be imaged simultaneously, in real-time, using the Telops remote sensing system. The versatility of this system is also demonstrated as it can successfully detect and identify gas emissions from a sulfur recovery unit smokestack and flare.

Remote Sensing Technology

The Telops Hyper-Cam is a compact hyperspectral imaging instrument using Fourier Transform Infrared (FTIR) spectroscopy. It provides a unique combination of spatial, spectral and temporal resolution for a complete characterization of the gases being monitored. The imaging system was designed to work in thermal spectral range, meaning that ambient temperature is sufficient to provide signal for accurate gas detection. Like a fingerprint, the unique spectral signature of a gas is used to determine its chemical nature. The Telops remote sensing system takes advantage of this information to provide efficient real-time gas detection and identification with a user-friendly interface for operation in an oil and gas environment. A large portfolio of gases can be detected and identified with this system including methane (CH_4), sulfur dioxide (SO_2), ammonia (NH_3), various alkanes (eg. propane and butane) and alkenes (eg. ethylene and propylene), and many more.

Gas Leaks and Emissions

Methane is among the most encountered gas in the activities related to oil and gas. It is the main component of natural gas and methane leaks occurring whether in prospection activities, at the exploitation stage or during gas distribution, which can presents a threat to on-site personnel or the surrounding community. One of the special advantages of the Telops system over conventional techniques for the detection of gases is that it can selectively and efficiently detect and identify compounds which differ from other interfering agents due to the spectroscopic feature of the system. It can also provide real-time information about the size and direction of gas clouds.

Figure 3: Simulated methane leak in an operation installation

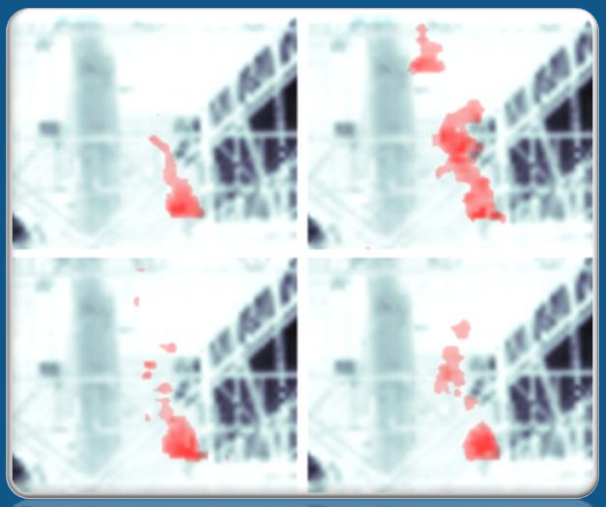

Figure 4: Simulated methane leak in an operation installation as seen with the Telops Hyper-Cam GDI System.

In order to illustrate the capabilities of the Telops system for methane imaging, a gas leak occurring in a typical installation is shown in Figures 3 and 4. Remote sensing provides clear visualization of the gas leak's origin at the second level of the structure. Such precision may be crucial in emergency situations as it helps in taking the right decisions in order to rapidly secure the site, minimize the risk of explosion and control the gas leak. Due to the unpredictable nature of leaks and emissions, incidents happening in inaccessible or hard to reach locations require special equipment, like a lift, to gain access. The time required to locate the gas leak is crucial in all situations and rapid feedback is mandatory.

The presence of a gas leak in the installations may be revealed by mean of point sensors, previously installed on the site. However, direct visualization of gas clouds allows for efficient tracking of the leak source and better understanding of the direction of propagation. The Telops gas detection system has been used to track gas emissions from gasoline reservoirs in a distribution center. The vapors emitted from a relief valve were detected, identified and followed as a function of time. The imaging provided the localization from potential ignition sources. Accurate identification of the nature of the gas provided by the Telops system confirmed detections from point sensor units.

Smokestacks and Flares

The Telops gas detection system is very versatile and can be used in a wide variety of applications commonly encountered in installations. Figure 5 presents the images obtained from a flare located in a sulfur recovery unit. Sulfur dioxide (SO_2) emissions are closely associated with these processes and their presence can be directly assessed using the Telops gas detection system.

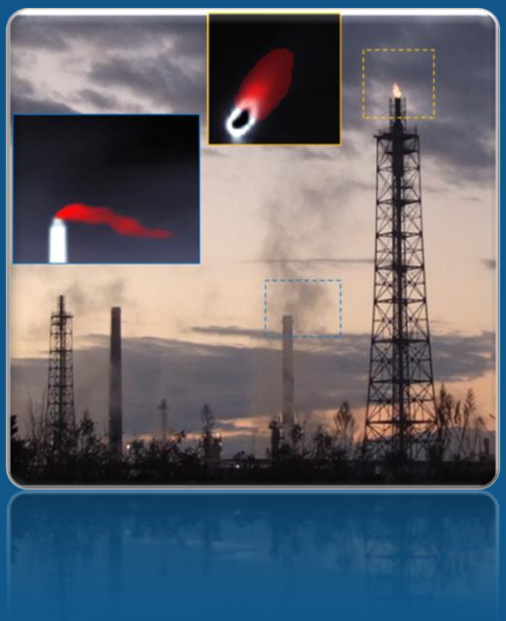

Figure 5: Sulfur dioxide (SO_2) emissions from a distant sulfur reduction unit chimney (left) as a result of hydrogen sulfide (H_2S) flaring (right), 1200 and 500 meters from the sensor location, respectively.

Conclusion

The Telops Hyper-Cam GDI, Gas Detection and Identification System can be used to monitor gas leaks and emissions of various chemical natures, simultaneously, in real-time, and coming from multiple sources. The combination of infrared imaging, spectroscopy and a user-friendly interface brings a ready-to-use solution to promote safety in oil and gas environments.

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