CROWCON
Detecting Gas Saving Lives

Refining and Petrochemical

Applications

February 2021

1. Introduction

Oil and gas are the world's biggest industrial sector, in terms of both value generation and employment opportunity. It generates billions of dollars globally and employs hundreds of thousands of workers worldwide. Some oil companies' revenue exceeds that of some nations' GDP.

Closely linked to oil and gas, the petrochemicals industry takes raw materials from refining and gas processing and, through chemical process technologies, converts them into valuable products. In this sector, the organic chemicals produced in the largest volumes are methanol, ethylene, propylene, butadiene, benzene, toluene and xylenes (BTX). These chemicals are the building blocks of many consumer goods including plastics, clothing fabric, construction materials, synthetic detergents and agrichemical products.

The oil and gas industry can be further divided into:

Upstream – also called exploration and production (E&P)

Midstream – transportation, storage and processing

Downstream – refining crude oil, and gas processing

The oil and gas industry generates many workplace hazards, and management of these is critical to maintain a high level of safety and protect both people and assets. All electrical equipment must be certified according to IEC60079-0, for use in explosive atmospheres that contain flammable gases or dusts. Approval may take months and many rounds of submission. What is more, in addition to hazardous area approval, individual countries will require local certification such as Inmetro, Kosha and CCC.

2. Upstream

Process Overview

The upstream sector includes exploration and drilling for potential oil and gas fields, followed by the recovery and production of crude oil and natural gas where viable. The upstream oil and gas sector includes offshore rigs, FPSO and production platforms.

The treatment of solid waste is challenging because it may contain one of more contaminants (which may include heavy metals, explosive and flammable materials) and these must be dealt with before the waste can be treated.

Gas hazards in the upstream sector are compounded by the very harsh environments, which provide challenges for the reliable detection of flammable and toxic gases. As well as the risk of fire and toxic gases like hydrogen sulphide (H_2S), carbon monoxide (CO) and sulphur dioxide (SO_2), there is concern around the long-term health effect of volatile organic compound (VOC) exposure. VOCs are liquids that readily give off vapour at room temperature, such as solvents and fuels. At high concentrations these vapours can explode, and even at low levels they can be toxic. While the impact of exposure can sometimes be felt immediately, symptoms may not become apparent until months, even years, later. Read more about VOCs in our blog and white paper.

Gas Detection

Fixed and portable gas detectors are needed to protect plant and personnel from the risks of flammable gas releases (commonly methane) as well as from high levels of H_2S, particularly from sour wells. Gas detectors for O_2 depletion, SO_2 and volatile organic compounds (VOCs) are required items of personal protection equipment (PPE), which is usually highly visible colour and worn near breathing space. Key requirements for gas detectors are rugged and reliable design and long battery life. Models with design elements that support easy fleet management and compliance obviously have an advantage. You can read about VOC risk and Crowcon's solution in our case study.

3. Midstream

Process Overview

The main components of midstream processes are transportation and storage. Raw products are held in storage areas until they are needed for the next process, or to be transported to a refinery. Maintaining the integrity of storage and transportation vessels as well as protecting personnel during cleaning, purging and filling activities are constant challenges within the midstream sector.

Gas Detection

Fixed monitoring of flammable gases situated close to pressure relief devices, filling and emptying areas is necessary to deliver early warning of localised leaks. Multigas portable monitors must be used to maintain personal safety, especially during work in confined spaces and supporting hot work permit area testing. Infrared technology in flammable gas detection supports purging with the ability to operate in inert atmospheres and delivers reliable detection in areas where pellistor type detectors would fail, due to poisoning or volume level exposure. You can read more on how infrared detection works in our blog and read our case study of infrared monitoring in refinery settings in Southeast Asia.

Portable laser methane detection (LMm) allows users to pin-point leaks at distance and in hard-to-reach areas, reducing the need for personnel to enter potentially dangerous environments or situations while performing routine or investigative leak monitoring. Using LMm is a quick and effective way to check areas for methane with a reflector, from up to 100m away. These areas include closed buildings, confined spaces and other difficult-to-reach areas such as above-ground pipelines that are near water or behind fences. Read more about LMm in our news release.

4. Downstream

Process Overview

The downstream sector deals with the refining and processing of raw natural gas and crude oil, and the subsequent distribution and sale of the products derived from this. Such products can include jet fuel, diesel fuel, asphalt and petroleum coke.

A turnaround, or TAR, is a planned period of regeneration; a planned shutdown where part of the plant is offline whilst equipment is inspected and revamped. In contrast to TAR, shutdowns are not always planned and may arise from unforeseen events such as accidents, natural disasters, terror threats or political upheavals. Shutdown and turnaround are expensive and require the deployment of well-organised labour and equipment for a short time. During this period, many contractors and a large volume of equipment will be on site.

Gas Detection

The desire to reduce energy consumption, while increasing operational efficiency, has driven device manufacturers to innovate in terms of both detection principals and the way in which power is used. Modern gas detectors employ state-of-the-art technologies to deliver industry-leading power consumption per device.

In downstream refining, personal detectors must have a bump testing station, to ensure each detector responds to the target gas and that its alarm is still functional (you can read about the importance of bump testing in Crowcon's blog). The ongoing demand to reduce facility down-time whilst ensuring safety, especially during shutdown and turnaround operations, means that gas detection manufacturers must deliver solutions offering ease of use, straightforward training and reduced maintenance times, along with local service and support.

During plant shutdown, processes are stopped, items of equipment are opened and checked and the number of people and moving vehicles at the site is many times higher than normal. Many of the processes undertaken will be hazardous and require specific gas monitoring. For example, welding and tank cleaning activities require area monitors as well as personal monitors to protect those on site. Crowcon offers an easy-to-deploy area monitor that provides an economical solution with 36-hour battery life. Read more about area monitoring in our blog here.

Crowcon has a wide-ranging suite of products to meet refineries' needs for the detection of flammable and harmful gases; you will find information about our detectors on the next page. Every site is different, and Crowcon has the specialist gas detection knowledge to provide both portable detectors and fixed systems that ensure the best protection for each individual site. Working closely with partners to understand the exact requirements is pivotal to Crowon's approach – please contact us to find out more.

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Crowcon detectors for refining and petrochemical settings

Portable Monitors

T4

- Easy to use one-button functionality
- TWA resume function
- MED certification
- Easy servicing and quick turnaround
- Bump test station available

Gas-Pro

- Integrated pump (up to 30 m sampling)
- One-button operation
- IR sensor for wide range of hydrocarbons
- MED certified
- Confined space entry (CSE) kit available
- Bump test station available

Clip SGD

- One-button operation
- Suited for CO_2 and NH_3

Gas-Pro TK

- Easy to use one-button functionality
- TWA resume function
- MED certification
- Easy servicing and quick turnaround
- Bump test station available

LaserMethane mini (LMm)

- Long range methane detector
- Detects up to 100m with reflector
- Highly visible green laser light
- No moving parts and requires little maintenance
- Self-check and autocalibration upon start-up

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Fixed Monitors and Controllers

Xgard

- Rugged reliable detector
- Available in various gases and material
- mA or mV output

Xgard Bright

- Modbus or Hart output
- Local display
- Non-intrusive calibration
- Modbus or Hart Output
- Now available with MPS (molecular property spectrometer) for calibration free flammable gas detection

XgardIQ

- Universal transmitter for all sensor types
- Hot swap sensor module – no special tools required
- Non-intrusive calibration
- Modbus or Hart Output
- SIL_2 rated
- Remote sensor option available

Vortex

- Up to 12 configurable channels
- MODBUS compatibility
- SIL 1 (IEC 61508) validated

GM Controllers

- Up to 128 channel inputs
- Modular configuration
- Touch screen display

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ABOUT CROWCON

For over 50 years, Crowcon has been developing and manufacturing high-quality gas detection products, securing a reputation for reliability and technical innovation that continuously improves efficiency and safety. Globally respected, and part of FTSE 100 Halma, today, over 500,000 Crowcon devices are in use around the world.

Our vision is to grow a safer, cleaner, healthier future for everyone, every day, by providing best in class gas sensing solutions. The Crowcon range offers both fixed and portable gas detection equipment enhanced with Crowcon Connect, our digital solution, which protects people and places in industries including petrochemical, oil and gas, water, industrial manufacturing and food production. In every case, we combine our expertise with emerging technologies to develop process insights and protection for our customers, improving their operational efficiency and creating safer, cleaner and healthier workplaces.

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