

# Flaring Near the Fo'c's'le



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- FPSOs and FSOs are well-established technologies
- Specific risks apply to these types of vessel
- Specialised processes and features have been designed to manage and mitigate these risks.

FPSO (Floating Production, Storage and Offloading) and FSO (Floating Storage and Offloading) units have become well-established technologies, with numerous units installed around the world. With the search for hydrocarbons going into ever deeper water, the number of FPSOs is sure to increase.

Transport of hydrocarbons by sea has always been considered a hazardous activity requiring special precautions, with the level of risk increasing with the size and volatility of the cargo, for example, liquefied gas cargoes being considered more hazardous than liquid cargoes.

This risk increases for FPSOs and Floating LNG (FLNG) production units as a consequence of the processing activities.

## **Risk management**

Features of the FPSO are designed to help manage the risks:

- A helideck is an essential feature for an FPSO. The helideck is located near the accommodation area to facilitate evacuation in an emergency. Care is necessary in the design to ensure that helicopter routes are away from air turbulence associated with the flare and the hot exhaust gases from the gas turbines.
- Limited storage space is allowed, necessitating frequent visits from supply boats using cranes to deliver food, spare parts, etc. Sometimes materials are stored in inappropriate locations, for example, flammable liquids in non-explosion proof rated areas.
- Flare stacks are used as a source of ignition in the event of a major gas release. Under most conditions, the flame from the flare is limited, but during emergency depressurising, very high levels of thermal radiation can occur. This sometimes requires radiation protection or shielded escape routes in areas near the flare.
- In addition to the flare, FPSOs have low-pressure vents for routine discharge of gases. Under certain wind conditions, hydrocarbon gases can be blown back to deck level. When this happens, releases are usually detected by installed gas detection systems. Detectors are set well below the lower explosive limit

### Specialist vessels, specialist skills.

As a result of the increased risk, the management of the vessel is significantly different from that of a tanker:

- An offshore Installation Manager (OIM) manages the FPSO
- The production team, including maintenance personnel, will greatly outnumber the marine personnel on board
- Centrifugal compressors and gas turbines require sophisticated condition monitoring for optimum performance
- A comprehensive asset integrity programme is necessary to ensure that internal corrosion from the process fluids, as well as external corrosion, does not reduce pipe and vessel-to-wall thicknesses to unsafe levels.

(LEL) of discharged gases and spurious alarms may occur. The design of the gas detection system must therefore be robust to ensure that minor, localised, detections of gas, well below the LEL, does not lead to an unnecessary shutdown of the process facilities.

- Associated gas from many oil fields contains toxic hydrogen sulphide (H<sub>2</sub>S). The behaviour of H<sub>2</sub>S after a release is very different to that of natural gas. H<sub>2</sub>S, being heavier than air, will migrate to lower levels, often enclosed spaces. Therefore, in some cases, a separate detection system specifically for H<sub>2</sub>S might be necessary.
- Fire protection philosophy is also very different from common marine practice, with widespread application of water deluge systems to protect process equipment, plus gaseous extinguishing systems to protect electrical rooms. Main fire pumps, which will often be of larger capacity than those found on tankers, are generally diesel-driven to be independent of the electrical power supply.

### Conclusion

The design of FPSOs is still evolving, with some newer vessels being custom designed as FPSOs rather than converted crude carriers – a trend that is likely to continue with offshore LNG and other complex processes being undertaken.

