Case study: **Use of fluoropolymer Sealing elements in the Oil and Gas industry**

There is no other chemistry available to replace the performance that Fluoropolymers provide for chemical, thermal, plasma and radioactive resistance as seals. By definition any chemical that could withstand those situations would also be considered persistent.

A ban, or a class regulation, of polymeric PFAS materials and their raw materials will have a profound impact on global industry and everyday lives. The following case study is given to showcase just a tiny fraction of the uses of PFAS sealing materials where no alternative technology exists.

Key facts:

- Fluoroelastomer seals are critical for sub-sea Oil and Gas exploration and production
- Sour Oil and Gas fields (containing hydrogen sulfide) with high operating temperatures are dependent on sealing systems manufactured from Fluoroelastomers [i]

- Natural Gas is a critical commodity with forecast increase in demand [ii]
- Liquefied natural gas (LNG) is natural gas that has been cooled to a liquid state (*liquefied*), at about -260° Fahrenheit, for shipping and storage. The volume of natural gas in its liquid state is about 600 times smaller than its volume in its gaseous state [iii] [iv]
- Reports vary that between 20 to 43% of the global gas reserves are Sour [v] [vi]

Exploration and production of Oil and Gas requires the use of seals for well head equipment. Exploration and production is risk averse with extensive regulation of equipment and components, and requiring expensive product and system testing. Fluoroelastomer seals are the only option available for many wellhead applications. Combinations of Sour Oil and Gas with carbon dioxide or water are highly corrosive and which chemically attack other grades of polymer seal. For high

temperature application FKM, and FFKM Fluoroelastomers are specified by the industry as the only available materials suitable for sealing.

Handing of Sour Gas and transport of Liquefied Natural Gas requires sealing materials that can withstand the hydrogen disulphide and/or extreme low temperature applications yet retain excellent fugitive emission performance. Fluoroplastics such as PTFE retain sealing compliance at cryogenic temperature because of their very low glass transition temperature. PTFE lip seals for cryogenic valves, and PTFE gaskets for cryogenic storage tankers are essential.

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[i] Elastomers for fluid containment in offshore oil *MERL, Research Report 320, Health and Safety Executive, UK, Campion et al, 2005, pp 29*

[ii] Gas 2020. 2021-2025: Rebound and beyond

[iii] Liquefied natural gas - U.S. Energy Information Administration (EIA)

[iv] Introduction to Natural Gas *A.T. Kearney Energy Transition Institute, 2014 Oct, pp 49*

[v] Introduction to Natural Gas *A.T. Kearney Energy Transition Institute, 2014 Oct, pp 15*

[vi] The Global Sour Gas Problem | Stanford Energy Journal