May 28, 2018

Alberta Energy Regulator (AER) Comments: ***Draft Directive 060: Upstream Petroleum Industry Flaring, Incinerating and Venting.***

Fluid Sealing Association Response:

On behalf of The Fluid Sealing Association, an organization comprised of sealing device technology manufacturers who make devices used to contain fluids and air emissions to prevent harmful, toxic, or otherwise dangerous products escaping into the environment. FSA's technologies are used in every aspect of oil and gas production, gathering, boosting, processing, transmission and storage, and generally in all industrial activity around the world. These devices are often overlooked and their function is not generally well known or understood, yet they fulfill an essential role in support of our customers in the oil & gas sector to maintain a clean environment, insure safety, and prevent product waste, while allowing industrial growth and profitability.

FSA members manufacture the following products that we believe will be helpful in achieving the goals to significantly reduce methane emission from the oil and gas industry.

- Mechanical Seals which are used to seal rotating shafts as they enter the housing of a centrifugal compressor. The seals prevent gases from escaping in the space where there is relative motion between the shaft and the housing. Various mechanical seal technologies are used, dry gas seals or wet oil seals with significantly different emission characteristics.

- Gaskets are used to provide a static seal between two stationary components. They are used on flanges that connect piping, valves, compressors, pneumatic driven pumps, instrumentation, and many other types of equipment. Due to the high number of flanges and equipment connections subject to the thermal and mechanical stresses associated with centrifugal and reciprocating compressors, the proper use of high performance gaskets can significantly contribute to reduced fugitive emission levels.

- Compression Packing is most commonly made of braided fibers, and is used to seal valve stems and shafts of reciprocating compressors. Valves have been identified as a major contributor to emissions, primarily due to their extremely high usage. Modern fibers and construction methods allow sealing at extremely low emission levels.

- Expansion Joints for Piping are used to provide a flexible connection between pipes and their joining to other equipment. The expansion joints are typically bolted to flanges of piping or other process equipment. The use of expansion joints can reduce the number of piping connections, eliminate stress on a pipe that can create leaks in bolted joints, and reduce stress on rotating equipment that could affect seal or bearing wear, thereby significantly contributing to the reduction of emissions in piping systems.

These sealing technologies are extensively used in the oil and gas industry to help contain emissions, save our customers money and maintain safe and reliable operations. Their specific function is to prevent leakage to the atmosphere. The proper selection and use of the appropriate type of sealing products can significantly lower methane emissions.

We all agree that containing methane emissions is critical in efforts to prevent climate change, improve public health, and prevent the waste of domestic energy resources. The FSA recognizes that many of our members' end-customers in the oil and gas sector have played a leading role to improve operations to safely and economically maximize the recovery and capture of methane emissions. The oil and gas sector strives to develop technologies that are broadly used thanks to collaboration with Alberta Energy Regulators, Environment Canada and Environment Protection Agency in the U.S. While oil and natural gas production has surged, much progress has been made to reduce methane emissions.

FSA appreciates the opportunity to comment on the recently published draft regulations regarding reducing methane emissions. We have a unique perspective and ability to be a technical resource in several areas of the rule including, reducing emissions from centrifugal compressor units and leak detection and repair.

Centrifugal compressors are the fourth leading source and approximately 9% of methane emissions in Canada. Reducing emissions from existing units can be achieved through multiple methods including, capturing and reusing the gas with a gas recovery system or retrofitting older equipment with a dry gas seal. As technology continues to advance, new methods of further reducing emissions may also be available in the coming years. In short, technology is commercially available and economically viable to support AER's goals for the draft regulation.

They AER has established limits for new and existing equipment respectively. Beginning January 1, 2022 new equipment must limit the vent gas rate to 3.4m^3/hr/compressor, or .0566m^3/min/compressor, or less. While this limit is more stringent than the federal rules of Ottawa, it is achievable with current and developing technology. Using a dry gas seal with recovery system will meet this rate and the technology is readily available today. In addition, FSA companies are currently developing new sealing technology which will meet and emit lower than this flow limit with the use of just the new seal. It is expected prior to 2022 new equipment will have the option for a zero emissions seal, upon the purchase of the new compressor unit. Technology advancements will make this limit easily achievable for new equipment after January 1, 2022.

In addition, the rule calls for a limit of 10.20m^3/hr/compressor, or .17m^3/min/compressor for all existing equipment measuring over this rate by January 1, 2023. While measurements will begin in 2019, there is an opportunity to determine the most economical and effective method for reaching the flow limits permitted. Centrifugal compressor units with older wet seal technology, will have the opportunity to capture and reuse the gas or retrofit to newer, more efficient dry gas sealing technology.

In an effort to assist customers as they look to meet the AER requirements, FSA has developed a tool to assist. This *Life Cycle Cost Calculator* (LCC) is a free, web-based tool which AER could reference and make available to industry looking to examine options. When evaluating the

economic benefit of each potential solution, there is more than just the upfront cost and the economic value of reduced emissions to be considered. In the case of the centrifugal compressor units it is important to take a broader look at the upfront cost, the value of the reduced emissions and the value of additional operational savings that may result from the implementation of the technology to mitigate the emission. In the case of the technologies available to address methane emissions from Centrifugal Compressors the solutions have very different economic profiles. As this rule rightly allows for the flexibility to examine all technical options, the LCC can help determine actual costs and savings to meet the required limit of methane emissions not to exceed $0.17m^3$ per minute for centrifugal compressors.

The *life cycle cost calculator* tool for centrifugal compressors will analyze the relative economic merits of the various methane reducing options. It takes into consideration the annual operating costs including maintenance costs, the value of leaked gas, consumables, the cost of all the energy consumed, and the cost of lost production resulting from seal failure which is quite considerable in wet seal systems. This comprehensive tool calculates, amongst other factors, the energy consumed by the seal and support system, the compressed gas energy released and the pipe friction from oil contamination. Taking into account one-time costs such as total retrofit costs, it calculates payback period, the present value of the annual operating costs over the lifespan remaining, and the total life cycle cost.

The *life cycle cost calculator,* developed by FSA Mechanical Seal Division members can be tailored to local conditions for individual cases and thus help our oil and gas customers confirm the economic and environmental value propositions between re-routing the gas or retrofitting the centrifugal compressors with dry gas seal technology. This tool has been used by governments and customers alike and could be a great resource to AER in working with industry to implement the regulations.

Leak, Detect, and Repair (LDAR) programs have been in use for quite some time now, in petroleum products refining and chemical processing, and have proven to be extremely effective to reduce emission levels.

The Federal Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) published on May 9, 2018 defines leaks in section 31 (1) as:

> "A release of hydrocarbons from an equipment component is a leak if
>
> (a) the release consists of at least 500 ppmv of hydrocarbons, as determined by an inspection conducted by means of an eligible portable monitoring instrument in accordance with EPA Method 21; or
>
> (b) the release is detected
>
> (i) during an inspection conducted by means of an eligible optical gas-imaging instrument, or
>
> (ii) by means of an auditory method, an olfactory method or a visual method, including the observation of the dripping of hydrocarbon liquids from the equipment component."

Accordingly, a repair is achieved when emission levels are below the 500 ppmv level:

> "Repair (3)

> A leak in an equipment component is considered to be repaired if the release is determined to consist of less than 500 ppmv of hydrocarbons based on an inspection of the equipment component by means of an eligible portable monitoring instrument in accordance with EPA Method 21 that is capable of measuring hydrocarbon concentrations in ppmv.

Among other methods, the Alberta Draft Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting (April 2018), requires in section 8.10.2.2 that fugitive emissions surveys be conducted with various detecting methods including:

> "a) an organic vapour analyzer that detects hydrocarbons at a concentration of 500 ppm and is operated in accordance with the United States Environmental Protection Agency's (EPA's) Method 21: Determination of Volatile Organic Compound Leaks,"

Section 8.10.2.3 1) a) includes "equipment components" within its scope. Once a leak is detected it must be repaired within the time frame specified in section 8.10.4. 1) or 2). However, a major exemption is granted in section 8.10.4 2) b) if

> "The fugitive emissions, measured using US EPA Method 21, have a hydrocarbon concentration less than 10 000 ppm."

This 10 000 ppmv exception level could be acceptable for some applications, but reasonably achievable emissions levels are different for different types of equipment. FSA members believe that this limit is too high in the case of sources of emission from certain equipment components such as valves and flanges which are ubiquitous in gas processing equipment.

Thus, in the case of valves, (other than control valves), it is the opinion of the FSA members that the leakage level that is reasonably achievable from the stem seal is less than 100 ppmv. This is significantly lower than the listed level, but follows established standards and industry practices, such as prescribed in API standards 622, 624, 608 and 641, that specify allowable emission levels from what is considered a low emission valve (containing methane or VOCs). This emission level is current practice in facilities using LDAR programs in refineries and chemical plants. This level of emission performance should be the standard practice for any new or repaired valve that is used in methane service.

The experience of FSA Members is that a valve leaking at a level of 10 000 ppmv has failed and is in need of timely repair. The expectation is that such a high leakage level can only increase at a rapid rate from the time of detection to a point that it will most likely present a safety issue before the next survey. Even a medium level leak is one that will eventually turn into a massive leak if not attended to. Furthermore, the cumulative impact of small leakage levels results in high release of harmful gases to the environment.

We do not see the rationale for allowing elevated leakage levels when existing technology is available to reduce leaks in valves. A requirement of repacking with certified low leaking valve packing could easily be implemented for any valve found to be leaking above the 500 ppmv limit. If permissible leakage level is not achievable with low emission packing, then the replacement with a certified low-leaking valve can be contemplated. There should not be any delay in repairing a valve with low leaking packing.

And for flanges, the reasonably achievable leakage level is even lower than for valve stems. Although there are many variations in the type and size of flanges, it is generally recognized by FSA members that a level of 50 ppmv or lower is reasonably achievable and, absent any special circumstances, it should never exceed 100 ppmv.

For these reasons, we do not think that the exclusion in section 8.10.4. 2) b) is reasonable nor that is should be included in the regulation. A 500 ppmv or greater fugitive emission leak from valves or flanges should result in a repair.

FSA members do recognize that there are pieces of equipment that are very specialized and that may not be able to meet the general guidelines. There should always be an exception for equipment where there is no readily acceptable commercial solution available.

In Section 8.10.3.3 the regulation does recognize the importance of training for leak detection: "The duty holder must ensure that individuals completing fugitive emission screenings are trained to identify common sources of fugitive emissions." There is no mention of training for repair of leaking equipment and the FSA would like to point out that large emitters of fugitive emissions are not necessarily due to the equipment design, technology, or end of life. The problem often resides in improper installation or misapplication of the sealing products. Monitoring, maintaining, and repairing equipment properly requires highly trained engineers and maintenance personnel. Sealing technology is a very specialized field, and not part of general technical education. As the experienced workers retire, new generations of recruits need to be instructed in how to specify, use, and implement effective sealing technology. Without rigorous training programs, the result can be a significant lack of knowledge of how to properly apply readily available technology. The FSA and other organizations provides generic training material and information.

The FSA appreciates the work of AER to reduce methane emissions and the opportunity to provide these comments. We stand ready to be considered as a technical resource in this important process and provide guidance for sealing systems for the Alberta Energy Regulator.

Sincerely,

Henri Azibert
Technical Director
Fluid Sealing Association