July 26, 2017

Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector,) **Canada Gazette, Part I, Vol 151, No 21; May 27th publication**

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 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 and VOC 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 LDAR regulations. While it's clear Environment Canada is seeking a balanced, cost effective approach to reducing emissions, we believe specific areas of the rule could offer more flexibility and a less prescriptive approach to emission reductions.

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. It's important any rule allow for all technologies to be an option as every situation is different and companies require flexibility to continue to use advanced technology moving forward.

The draft rule as written states, "*Corrective action would be required if those emissions exceed.. 0.17m3 per minute for centrifugal compressors."* This language points to a specific emissions level allowed in existing compressor units and but does not point to specific technology to achieve this level. However, in the supplemental information, including the table on page 2093, as well as the cost benefit analysis on page 2096 clearly point to one specific solution, seemingly not allowing for alternate, more effective, cost beneficial options. The table states, "*Centrifugal compressors would install recovery unit on wet seal degassing system*". In addition, the compressors compliance cost section reads, "*Facilities with centrifugal compressors are expected to augment their compressors with a recovery unit that conserves the gas vented from the compressor's wet seal degassing system."*

These statements clearly direct companies to use a recovery unit to capture and reuse the gas from wet seal compressor units, in order to comply with the draft regulations. This language does not offer the producer the opportunity to examine the dry gas seal as a solution or any new

technologies that may be available over the next several years. This prescriptive approach is limiting and does not take into account the cost benefits of alternatives.

In addition, FSA believes the cost of compliance estimates portrayed only tell part of the story. The draft rule looks only at the cost of installing the wet seal degassing system and estimates this at $45,000 per unit. With approximately 90 affected units in Canada, the cost to industry is estimated at $157 million between 2018 and 2035.

However, when examining economic benefit, 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. The rule should allow end-users the flexibility to examine all technical options and determine actual costs and savings to meet the required limit of methane emissions not to exceed 0.17m3 per minute for centrifugal compressors.

In order to assist customers in these decisions, the FSA developed a *life cycle cost calculator* (LCC) tool for centrifugal compressors to analyze the relative economic merits of the various options. The web-based tool is **freely** available online to help determine what might be the best system of emission reduction. 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.

When addressing new equipment for centrifugal compressors the draft rule again seems to lack options and room for future technologies. The rule currently states, "*All new compressors installed* (after 2020) *would be required to capture gas from sealing systems*." Given that centrifugal compressors in the last decade are generally equipped with dry gas seals, this statement may be an effort to getting to zero emissions, but that is not clear. However, we believe aiming toward zero emissions in the future should be the goal. While current technology may not allow for this ability today, we believe advancements in the field can bring us near zero emissions and companies should be incentivized to reach this goal in the coming years.

The rule should also clarify that new compressors should be equipped with dry gas seals and then specify if an additional capture sealing system or other new technology is required to try to reach lower emissions. This current statement leads to the assumption of wet seals still being used

with only the wet seal degassing capture system being required on new equipment. Given modern technology and the practice of industry at this time, dry gas seals should be required on new compressor units and leave room for new sealing capture systems or other methane reducing technologies to be used on new equipment.

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.

Three emission levels have been listed and questions have been raised as to their reasonableness. They are 500 ppmv, 1 000 ppmv and 10 000 ppmv. In Section 6.3.1 the proposed LDAR Program specifies: "For the period beginning on July 1, 2019, and ending on December 31, 2024, the proposed Regulations would consider a significant leak as having a concentration of 1 000 ppmv or more for compressors and 10 000 ppmv or more for other equipment components. Beginning on January 1, 2025, the leak threshold would be 1 000 ppmv for all equipment components."

It is noted in 9.1 that "A significant leak threshold of 500 ppmv," was "under consideration by the Department at that time," however "would provide relatively small VOC release reductions (relative to a significant leak threshold of 1 000 ppmv), but would result in significantly higher repair costs."

9.3.1 Response 2 states; "This threshold would then be reduced to 1 000 ppmv after 5.5 years to encourage continuous improvement and the use of low-emission equipment components. This approach would address a large percentage of fugitive releases from equipment leaks and would also provide facilities with more lead time to prepare for the lower significant leak threshold through equipment upgrades, improved operational procedures, etc."

FSA members believe that these limits are too high and that the time period to go to the 1 000 ppmv level is too long. In general limits below 1 000 ppmv are achievable now. We would recommend that these levels be reduced to 1 000 ppmv now with the lower level of 500 ppmv in five years.

Furthermore, these limits could be for general applications, but reasonably achievable emissions levels are different for different types of 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 levels, but follows established standards and industry practices, such as prescribed in API standards 622, 624 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 or VOC service.

In Section 4.1 of the LDAR program, there is a provision for "Replacement of equipment components with repeated significant leaks: Replacement of equipment components with three significant leaks in a period of 24 consecutive months would be required, rather than repairing

them. If the equipment component is a valve, other than a control valve, replacement with a certified low-leaking valve or repacking with certified low leaking valve packing, would be required."

FSA Members do not see the rationale for allowing repeated leaks 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 existing 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 support the use of lower allowable emission levels for valves and flanges than the ones proposed. Fugitive emission levels tend to increase over time in failing components. 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.

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 4.1 the regulation does recognize the importance of training for leak detection: "Inspectors would be required to complete training in the use of leak detection instruments and in conducting leak inspections using those instruments, prior to conducting inspections." 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.

As mentioned in Response 6: "The Department remains open to exploring appropriately designed incentives that would not increase the risk of undetected leaks." A repaired piece of equipment is more likely to remain emission compliant if the repair is properly conducted. We would like to suggest that accredited training programs for repair personnel should be included as part of any leaking equipment remediation. Alternatively, the inspection frequency of

repaired equipment by trained personnel could be reduced as an incentive for the establishment of repair or maintenance training programs.

In the Financial analysis on Leak Repairs: “it is assumed that leaking pumps would be repaired by replacing the pump seals and that the cost of purchasing a replacement pump seal would be $390 per leaking pump.” The FSA believes that this number is understated. In its Life Cycle Cost Calculator for pumps, the default value is $750.00 per inch of shaft diameter per pair of seal faces, and the seal material repair cost is 50% of new. (For example, a dual seal repair for a 2 inch shaft would be $1 500.00.)

The FSA appreciates the opportunity to provide these comments and wishes to be considered as a technical resource in this important process. We stand ready to provide technical guidance for sealing systems and remain at the disposition for the Environment and Climate Change Canada.

Sincerely,

Henri Azibert
Technical Director
Fluid Sealing Association