Originally appeared in:
March 2018, pgs 19-20.
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Consider stainless steel tubing for mechanical seal connections

If, in days past, you have questioned why hard piping was used for mechanical seal flush lines and seal support configurations in process pumps, you are certainly not alone. Chances are that this hard pipe requirement carries over from the days when pumps were packed with rope, horse hair, cotton and other materials.

More recently, however, American Petroleum Institute Standard 682 (API 682) began to endorse the use of tubing for some seal piping plans. Regrettably, tradition-bound purchasers still opt for hard pipe; we are asking them to reconsider.

API 682 (4th edition) now specifies seal support system connections almost interchangeably. The Fluid Sealing Association's Technical Director, Henri Azibert, graciously gave us an update on this topic, and agreed to pass our strong preference for tubing along to the API Task Force. Mr. Azibert pointed out that the API 682 (4th edition) text now offers considerable leeway:

> "Seal auxiliary systems shall include tubing, piping, isolating valves, control valves, relief valves, temperature gauges and thermowells, pressure gauges, sight flow indicators, orifices, barrier/buffer fluid reservoirs, and all related vents and drains, as shown in Annex G (8.2.2)."

The latest standard then notes, "Tubing shall be fabricated by bending and the use of compression fittings (8.2.12)."

The mechanical seal data sheet gives users the option of tubing or piping for connections to the seal.

Moreover, in some sections, the default selection is tubing rather than piping. This is also the case in section 8.2.8, which reads, "Unless otherwise specified, lines connecting the barrier/buffer fluid system to the mechanical seal shall be tubing in accordance with 8.1.7, Table 4."

For API Plans 52, 53, 54 and 55, the default is tubing due to its lower friction losses, particularly since radii can be used instead of elbows. Finally, Annex F gives information on both tubing and piping friction losses.

A seal manufacturer's experienced input. With change and innovation on our mind, we enlisted the thoughts of another seal expert. We asked AESSEAL's Richard Smith how he would attempt to steer pump users in the right direction. He answered by elaborating on an effective, multi-step approach.

When trying to persuade a user-purchaser to adopt tubing, Mr. Smith first separates the risk pump groups by piping plan. He then points out that tubing is universally accepted on instruments because the fluid is normally a non-hazardous gas, which should be a sufficiently convincing observation. Many AESSEAL user-purchasers have switched to tubing and no longer require hard pipe for non-hazardous liquids.

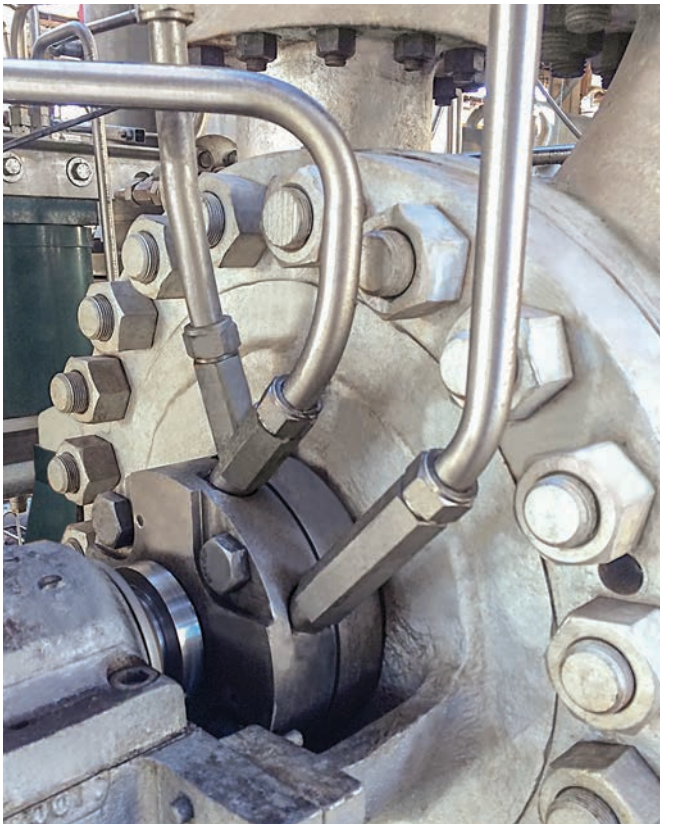

FIG. 1. Stainless steel tubing on mechanical seal. Photo courtesy of Swagelok Company.

Getting into detail, Mr. Smith reminded us that API Flush Plans 72 and 74 normally use pressurized nitrogen as a fluid. It is, therefore, non-hazardous; alarms are activated only in the event of failure. Plans 53 and 54 generally use fluids that are hazardous and will activate alarms in the event of failure. Plans 52, 75 and 76 are connected to flare, regardless of alarm setup and alarm status.

In all other flush plans, there will be contact with the process fluid—but stainless steel is available for use here, as well. Stainless steel tubing is extensively used in the critically important hydraulic lines of various aircraft, motor vehicles and marine equipment. We find hydraulics in mining and construction equipment, and throughout different indus-

tries. These industries stress safety and reliability, which are of equally great importance to engineers in the hydrocarbon processing industry (HPI).

Standards need updates and improvement. Consider now as the right time to more widely use tubing for mechanical seals and their support systems. A compelling case can be made for users to seek closer cooperation with prominent and knowledgeable manufacturers of hydraulic tubing and fittings. The combined competences of reliability professionals in the HPI and innovative manufacturers of sealing products will undoubtedly cause mechanical seal lines to gravitate more toward hydraulic tubing, which will benefit all parties.

Invoking relevant API standards is commendable, but understanding the limitations of these standards is equally important. As we consult these standards, we should always keep in mind that API clauses cover minimum requirements and represent general guidelines—not regulatory requirements or laws. Look for a decades-old disclaimer right under the top cover of any API standard. It likely states that if the user-purchaser knows a better way of accomplishing safe operation and enhanced reliability, then the vendor-manufacturer is encouraged to offer an upgrade that exceeds minimum requirements.[1]

Having spent many years with a best-of-class corporation, I recall how our engineers made frequent use of this paraphrased disclaimer. My colleagues and I made it a habit to communicate our rationale to plant management. We followed up by placing explanatory notes in the company's technical files to not only fend off bureaucrats and detractors, but also so that future generations could understand our well-researched decisions.

We were aware that by the time certain standards committees got moving with their updates, revisions and legal reviews, reliability-focused organizations had already moved forward. As the thinking went, if some products were good enough for critical aerospace use, then they would prove highly advantageous for HPI plants in almost every case. High-pressure stainless steel tubing and double-braided metal hose will rank high among these better-than-before products (**FIG. 1**); please consider using them. HP

LITERATURE CITED

[1] Bloch, H. P., *Petrochemical Machinery Insights, Elsevier Publishing*, Oxford, UK and Cambridge, Massachusetts, 1st Ed., 2016.

HEINZ P. BLOCH splits his time between Houston, Texas and Westminster, Colorado. His professional career commenced in 1962 and included long-term assignments as Exxon Chemical's Regional Machinery Specialist for the US. He has authored or coauthored more than 700 publications, among them 20 comprehensive books on practical machinery management, failure analysis, failure avoidance, pumps, compressors, steam turbines, oil mist lubrication and practical lubrication for industry. Mr. Bloch holds BS and MS degrees (cum laude) in mechanical engineering. He is an ASME Life Fellow and was awarded lifetime registration as a Professional Engineer in New Jersey.