

Ingolf's insight

Do end-users really care about fugitive emission, or do they only want cheaper valves?

Part 1

Maybe this is a provocative question – it's meant to be.

In recent years miles and miles of articles and recommendations have been written, tests have been performed and new products have been developed. So far so good. If we take a step back in time and look at the tests carried out in the 1990's it can be seen, as shown in Figure 1, that 60% of all fugitive emission was related to valves. On a valve there are two types of seals; there are static or dynamic seals. The flanges and the bonnet are static, and the spindle is dynamic because it is moving. With regards to the valves leaking in Figure 1: Which seal is most likely to be the main leak-source of the leaking valves? Right – the dynamic seal on the spindle.

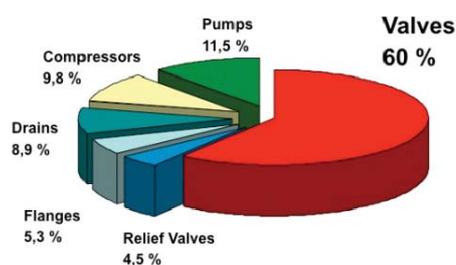


Figure 1.

The graph in Figure 2 shows that, out of 1,000 valves leaking more than 1% (10,000 ppm), only 2% were ball valves, 24% control valves, 32% gate valves and 42% globe valves. How come? Let's take a look at how the valves are operated. Which valve type has most spindle movement, when the valve is operated? **The globe valve** – since the movement is usually rotating and rising. The next in line is the gate valve, where the spindle movement is normally rising and not rotating. The control valve is rising

but usually does not move all the way up and down as the gate valve does. And the ball valve has the least spindle movement of all with only 90° back and forth. Which

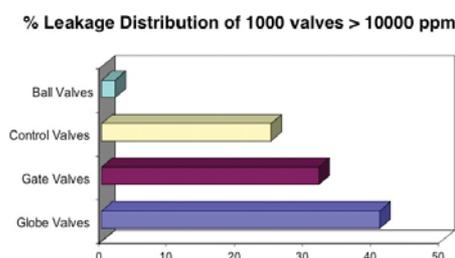


Figure 2.

valve seal is exposed to most wear and tear due to operations? You don't have to be a scientist to come to the right conclusion.

Now we ask the question: Is the situation different today, than back in the 1990's? The answer is: Yes and No. Yes, the leak rates are reduced due to better quality of packings, (when they are used), but no, the globe valve spindle area is still the number one leak source on valves, with the gate

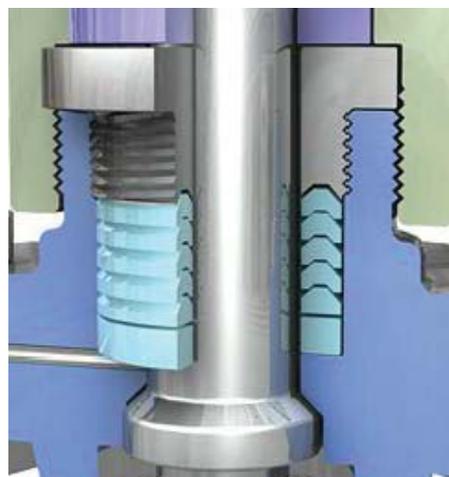


Figure 3.



valves a good second – the ball valves are still in front.

Now we have to take a look at how the different spindle seals are functioning. There are two main categories of spindle seals: 1) sealing by means of pressure from the media, and 2) seals due to compression of the packing material. The first



Figure 4.

category are Chevron rings or Lip-seals, (O-rings are not taken into consideration). The difference between Chevron rings and Lip-seal are that Chevron rings are usually a stack of rings on top of each other as shown in Figure 3, but Lip-seals are normally only one ring as Figure 4 shows, where there are, in this case, one ring inside (spindle seal), and one on the outside (bonnet seal). Both seal systems need a preload on the seals to function. The Chevron rings get the preload from



Figure 5.

the compression ring above the chevrons when installed. The preload of the Lip-seals comes from the spring between the lips, inside the ring. So much for the pressure activated seals, for now. Over to the compressed packings. There is a range of different material used, but we will deal with graphite, since that is the most commonly used material in compressed packings for the hydrocarbon industry. There are two basic ways of producing graphite spindle packings. Figure 5 shows braided packings that normally come as lacing on a role, and



Figure 6.

Figure 6 shows die formed packings that are normally produced in rings.

To be continued in next issue.

About the author

Ingolf Fra Holmslet's career in the world of valves began in 1972 as a production operator on the first production platform on the Norwegian continental shelf in the North Sea. From 1975 to 1985 he went onshore, working for a valve repair shop, after which he developed his first valve training course. In 1986 he started Klyde Consultants AS and for the last 27 years has been working as a valve consultant and instructor to Norwegian oil companies including Phillips Petroleum Co., BP, Shell, Norsk Hydro, Elf and Statoil, moving his valve training operation to Statoil's training centre in Bergen in 1994. Ingolf has also written 2 books, both due for release in 2013.

Outside work, his spare time is taken up with looking after his menagerie consisting of 3 borzois, 4 alaska huskies, 2 american paint horses and 2 african gray parrots.

Ingolf can be contacted on ingolf@valve.no