Ball valves

The how (and why) of maintenance Part 4

By Ingolf Fra Holmslet

As one can understand, valve maintenance is not as easy as many tend to believe. It is not, as claimed by some, 'just inject some diesel or kerosene, if that does not work replace the valve with a new valve'.

In the last 3 years I have performed valve maintenance on quite a lot of valves in onshore plants or offshore installations.
On all the ball valves I have worked on, this goes from 3" up to 42", only 10% of the valves were mechanically damaged and beyond inline repair, or the valves were not equipped with sufficient lubrication fittings to perform maintenance on them. As an example: I was involved with a 38" class 900 split body valve with only one lubrication fitting to each seat, placed diagonally opposite each other. How much valve cleaner do you think must be used if one had to inject a sufficient amount to cover the whole 2.8 metres of the circle of the seat from one fitting on one side? And the answer is: Too much. It is impossible to perform a proper maintenance on that valve. Of the remaining 90% of the valves we were able to make the valves work and seal. These were valves that were on the list for replacement.
To illustrate how important it is to use a semi-liquid valve cleaner I use two pictures from a 36" valve on export gas service. Figure 16 shows the thin layer of hardened hydrocarbons on the ball which prevents the seat from performing a good seal.
In Figure 17 I have applied some semi liquid valve cleaner, left it on for 15 minutes and gently rubbed in the centre. As one can see, the steel of the ball is now shining and the deposits have been dissolved. If not enough solvent is used to cover the whole circle of seal contact, the result will not be satisfactory.

Fig. 16

Fig. 17

To get the best result when cleaning the valve it is an advantage to maintain the valve in a pressurized situation. You can use the differential pressure and the leak path on the seats/ ball to your advantage, to direct the solvent around the sediments/ deposits and dissolve them. I won't tell you all my secrets here as then they would not be secret any more.
After cleaning the valve, if there is a major leak that must be treated with sealant component it is important to inject the proper amount and on the right seat.
Figure 18, which is a 36" class 900 valve with only 6 canals, illustrates how much sealing component is needed to seal from one seat canal to the next. This is the seat canal covered in Part 2 illustrated in Figure 8. This photo was taken on the up-stream side of the valve after the job was done, but before the valve was operated. One can see where the jet stream has passed the seat when the upstream side was depressurised.
When using sealant component to seal a valve it is important to control the leak rate into the valve cavity. As stated in Part 3 of this series there are two ways of doing maintenance: You can try and hope for the best (miracles rarely happen), or analyse and do everything under control, and now we come to the tricky part; How to be in control? The answer is: Cavity control with an auxiliary valve in the cavity. That valve could

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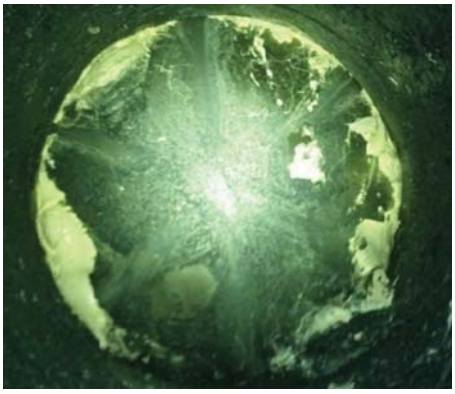

Fig. 18

Fig. 19

Fig. 20

be like the one in Figure 19, which is a standard ball valve where one must install a T-piece with a gauge and an extra valve on the outside of the gauge, or one can use a specially made auxiliary valve with a test port for installation of the gauge, illustrated in Figure 20.

When starting with a leaky valve, before cleaning, one should test the leak rate into the cavity. With a fully pressurized system the leak into the cavity can be from both seats or from one, which you don't know. After cleaning the valve, test the valve again. Now you can compare this with the first test to see if the cleaning process has brought about any improvement. There can be three results from this comparison:

1: No improvement, same as before cleaning.

The reason for this could be a mechanical failure in the valve due to erosion, cavitation, aspirated soft seals on the seat or seat rings locked in the seat pocket. In this case analyse the use of the valve, medium, soft or metal sealed seats - - - -

2: Reduced leak rate after cleaning.

Seats may have loosened, deposits dissolved and the seats are forming a better seal towards the ball.

3: Increased leak rate after cleaning.

If the seats and ball are full of scratches that was filled with deposits partly creating a seal, that seal is now less effective due to dissolving the deposits in the scratches.

On ball valves, only use sealing component on the upstream seat

Remember that both seats are tested as upstream seats. When reducing the downstream pressure you may obtain a much better seal, in fact you may have a valve that seals completely in that direction, but leaks in the other direction.

Now it depends on the purpose of the valve. If the valve is an ESD valve you are not allowed to use sealing component to reach the valve's leak rate, but if the valve is a block valve to be used for isolation in order to perform a job, sealing component may be used to seal the valve to create isolation. *If using sealing component you must never use any component that may dry out and block the canal and lock the seat in the seat pocket.*

When using sealing component in ball valves there are several factors to be considered. But first of all: On ball valves, only use sealing component on the up stream seat! You should NEVER use sealing component on the downstream seat. You might just as well pour it straight in the trashcan.

To be continued…

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