Trunnion ball valves

The how (and why) of maintenance Part 3

By Ingolf Fra Holmslet

To be able to maintain a trunnion ball valve one must have access to the interior of the valve. For that reason the valve should be equipped with lubrication fittings and auxiliary valve/s. As discussed in parts 1 and 2 in this series the number of injection points and internal seat canals needed must be seen in relation to the dimension of the valve.

If one has four injection points to the seats in a 24" class 900 valve there is the possibility to inject valve cleaner and have a good chance of success with the maintenance. But having injection points and an auxiliary valve in the cavity does not guarantee any improvement if the maintenance was performed without being in control of the situation.

There are two main ways of doing maintenance. Firstly, one can do what one thinks is right and hope for an improvement, but without knowing what happened and why it happened. Secondly, one can analyse the valve and the situation, and carry out the maintenance under control knowing what is happening and why.

Some months ago I went offshore to an installation to try and save a valve which had already undergone maintenance but had failed to show any improvement. Before starting any maintenance I spoke to the personnel that had been working with the valve to get information about what had been done with it. Normally before doing anything on a valve there are some important issues that must be clarified. Firstly, one needs the GA drawing of the valve with a blow up of the seat construction; secondly, one must know the media passing through the valve and thirdly, one has to understand the operation conditions of the valve compared to the seal quality.

The GA drawing of the seat in Fig. 11 shows the seat construction of a top entry self-relief valve. One can see the distance for seat retraction on the backside of the seat and the spring retainer also at the back of the seat.

Looking at Fig. 12, which is the seat of a split body self-relief valve, and comparing the free volume (blue) on the back of the seats one can clearly see that the volume of Fig. 11 is many times greater than the volume shown in Fig. 12.

When injecting valve cleaner in the valve, the blue volume indicated in Figs. 11 and 12 must be filled for the valve cleaner to come into the seal area of the ball and the seat.

There is a rule of thumb when it comes to injecting valve cleaner and sealant component into a trunnion ball valve, and it is this:

One should inject 1 ounce / inch bore of the valve per seat. That would be sufficient to the seat in Fig. 12, but NOT the seat in Fig. 11. Because of the large volume due to the seat retraction distance that seat needs double the volume to ensure it is filled with enough valve cleaner.

This is not the case, however, for all top entry ball valves. Looking at the illustration in Fig. 13, which is a top entry valve with seat retraction, one can see that the injection canal enters radial to the seat and there is no need to fill the retraction distance on the back of the seat. The illustrations in Figs. 11 – 13 are just some of the seat constructions on the market. So, before starting to pump any substance into the valve, one must find out how much to inject.

There are two ways of doing maintenance: do what you think is right and hope for an improvement, or analyse the valve and situation under your control, knowing what is happening and why

The case I referred to earlier in the article involved a situation in which they did not have a clue what the seat construction was in the valve and had not injected sufficient

Fig. 11

Fig. 12

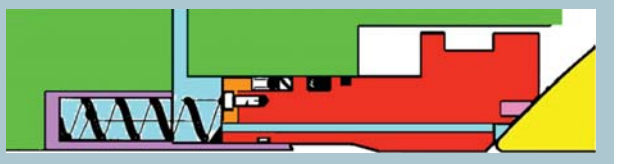

Fig. 13

Fig. 14

Fig. 15

volume to clean the seal area. Doubling the amount of valve cleaner was all it took; the valve sealed and did not have to be replaced.

When it comes to the second point, the media, there is quite a difference in the valve problems that occur in gas versus water or oil. If using O-rings as the main radial seal on the seats in a gas service, the photo in Fig 14 illustrates how ED (explosion decompression) is an important factor to consider. In fact some oil companies have banned the use of O-rings in valves used in gas service. We will look at the impact of lip seals versus O-rings on valve performance in a later article.

The third point to be considered is the operatiing condition of the valve compared to the seal qualities.

As a rule of thumb inject 1 ounce per inch bore of the valve per seat

As illustrated in Fig. 15, the worst condition for any soft sealed ball valves is a throttling situation. The first (and last) operating part of the opening / closing of a ball valve can result in blowing the soft seal out of the groove. Some companies have a restriction on valve operation with DP, which states that soft seated ball valves should not be opened with a DP higher than 20 bar and metal-seated valves should not be opened with a DP exceeding 60 bar. But 10 bar can blow the soft seat out of the groove if the valve is left 20% open over a longer period of time. The metal-seal on the seat can be totally destroyed with 20 bar DP in a liquid media, if the valve opening is small enough.

To be continued...

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