

Working behind leaking valves: dilemma between safety and operational targets

When maintenance is planned on a part of the installation while the remaining plant remains pressurized and operational, the equipment in question must be safely isolated from the rest of the plant. With the DBB-SAVER, a unique solution, safe maintenance can be carried out while keeping the plant running.

By Jeroen Pronk

About the Author



Jeroen Pronk, founder and owner of Valvetight, used to be a plant manager for over 15 years of several plants in the oil and gas industry.

When he was confronted with leaking valves too often and difficulties in repairing these, he invented the vacuum-lock method/DBB-SAVER. Knowing leaking valves were a problem all over the world, he filed for patent and founded Valvetight in 2014.



In the current situation, the modus operandi is to close isolation valves, often Double Block & Bleed (DBB) or Single Valve (SV) configurations. In some occasions followed by the installation of a blind flange. But often valves are leaking, which makes safe execution of the maintenance work (or safe instalment of blind flanges) hazardous and not allowed. When valves are leaking beyond the acceptable leak rate and valve repair is not practically feasible, what are your options, and what are their consequences?

Of course it is possible to shut a valve upstream. This however will result in a large or total plant shutdown. The second option is to postpone the maintenance, which leads to higher cost, a.o. due to cancelations in maintenance crew reservations.

Injecting grease, if possible, is another option. There is a danger though that this grease will disappear and cause a sudden,

non-predictable, gas blow through. To inject a sealant could also be an option, but often renders a valve not fit for purpose anymore afterwards and often causes heavy in-line leakage when this particular valve is taken back in operation.

Finally, there is a last resort in which leakage is 'accepted' and additional measures need to be taken, such as gas detection, the use of explosion safe tools or workers wearing personal protection equipment. But these are last line of defence measures, and dependency on those should be avoided.

Creating a vacuum

None of the above options is ideal. Hence the development of the DBB-SAVER. This piece of equipment solves the problem of leaking valves at the source, without any modification or repair. The functioning principle is based on creating a vacuum in either the volume



between two block valves in a classical DB&B configuration, or the cavity between two sealing seats in the body of a single valve (ball, plug or gate). This vacuum creates a negative pressure difference towards the safe

work place and makes leakage of gas towards the safe work place physically impossible. The vacuum is automatically controlled and monitored. The DBB-SAVER is completely failsafe and in case the leak-

age exceeds the capacity of the DBB-SAVER, an alarm will go off. The alarm will be audible and visible on the location of the leaking valve, but also via remote data transfer on the safe work place and on a separate alarm monitor in the operator control room. Via the Internet of Things it can be made available to anybody anywhere, regardless of their location in the world.

Shell's view on the DBB-SAVER

"A solution is required when valve(s) are leaking beyond an acceptable leak rate and valve repair results in unacceptable outage or is just not possible without shutting down the plant", Tony Smart (Shell Global Solutions) says. "Shell worked in collaboration with Valvetight to develop a Technical Release Acceptance for deployment of the DBB-SAVER technology and was proved out on field trials successfully."

Smart (Subject Matter Expert, Valves) was responsible for coordinating a multi-disciplinary "technical development review".

"The DBB-SAVER was assessed by the Technical Experts of all involved department. After the addition and factory tests of a blocked bleed alarm functionality PTE TA1 approval was obtained to use the DBB-SAVER within our company. In certain situations, the DBB-SAVER can be really beneficial in achieving the desired level of safety when working on isolated equipment, whilst preventing the shutdown of bordering installation parts."

To create awareness within Shell globally, the report is now available on the company's intranet, describing the DBB-SAVER technology as PTE TA1 endorsed for easy acceptance and deployment in any asset.

Dilemma solved

In some cases, like older installations with outdated safety concept or installations where space and weight were important design factors (e.g. offshore installations), often there is only a single isolation valve installed whereas there would ideally be a DB&B configuration. Often these valves are ball, plug or double acting gate valves, and have a body cavity vent or drain, or a provision to make one. In case we connect a DBB-SAVER to the body cavity and create a vacuum between the up- and downstream seal of a single valve, the in-line leakage through the valve towards the safe work area



In this article, gas is referred to as the leaking medium. Also, cryogenic applications have been performed by the DBB-Saver, and a LNG model is currently being developed. Such version could easily be converted to a (simpler) liquid version, e.g. for oil applications.

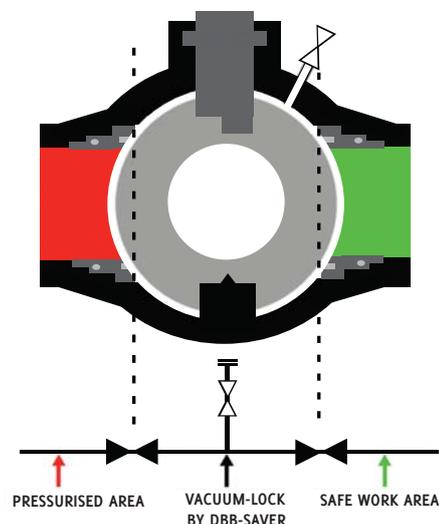


Figure: the analogy of a vacuum lock in an classical DBB configuration versus a single valve

can be 100% stopped. This creates many new isolation possibilities unthought-of ever before. In short, with this piece of equipment, all of the above dilemmas are solved: the remaining part of the plant stays operational which means that operational targets are not endangered, the same accounts for (maintenance) personnel as the equipment can certainly be isolated, the maintenance planning becomes more predictable. No greasing means no risk on sudden gas blow through, no sealants ensuring the valve stays fit for purpose afterwards and last but not least, there is no dependency on last line of defence PPE.

Experiences in the field and Shell approval

Although Valvetight, the inventor of the DBB-SAVER, is a young company, it has built

up an impressive track record already. Major companies in the oil & gas and petrochemical industry, like Shell, Air Liquide, NAM, Gascade and TAQA are relying on the DBB-SAVER already, which besides the additional safety features, also saved them lots of downtime. NAM (Nederlandse Aardolie Maatschappij, ed.), being a Shell operated company, has forwarded the technology within the Shell HQ, which after thorough reviews on Shells ultimate Technical Authority level was assigned as “approved third party technology, for use on all assets” (see box text Shell’s view on the DBB SAVER). Shell even refers to the DBB-SAVER on their intranet for promotion and easy acceptance towards their plant operators when valve repair is not feasible and work has to continue. Particularly proud is Pronk of Shell’s approval of his equipment and method, which is a huge recognition of his work. “Shell takes no shortcuts, and zero leakage is zero leakage, which can actually be enforced by the DBB-SAVER.”

Hands-on experience

Albert Kolk, operations & maintenance manager at NAM, has had hands-on experience with the DBB-SAVER in the field. Kolk, who is employed at one of the underground gas storage facilities in the north of the Netherlands, has used this tool five times during the one year test phase, after which they decided to have their own dedicated unit for future use. “The DBB SAVER is relatively easy to use and does what it is supposed to do. It takes approximately half a day to train maintenance personnel to install the unit, to set up the parameters and to start the warning system via the PLC. The basic parameters as well as certain pre-alarm parameters are already set, for example, the leak rate increase alarm level or the blocked bleed alarm, but it can be adapted to our preferences.” Kolk says the DBB SAVER he has in his possession has a design capacity of 2.000 litres/minute. “This is more than enough to handle the majority of the leak rates we experience. In case we have extreme leakage, we will try to reduce the leakage as far as possible anyway (e.g. by greasing), and we can use our DBB-SAVER to handle the remaining leakage. In case the leakage increases again, the DBB-SAVER will alarm us as soon as this occurs. The safe connection of the DBB-SAVER is an important factor also. We connect the DBB-SAVER on a bleed valve which is opened only after we have a good indication of the occurring leak rate, which must be well below the capacity of our DBB-SAVER model.”