DBB and DIB Valves: Not the Same Thing

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INTRODUCTION

In recent years, the phrase "double block and bleed" has been incorrectly used by many engineers when referring to the philosophy of double isolation and bleed. Looking into a process engineering working scenario, in a maintenance line, engineers would not want to shut off the entire process line. Instead, they will only block off and depressurise the section (installed with a typical DBB valve) that they are working on.

It can be easily assumed that it will be safe to carry on working after a shutdown but it is a major mistake which in some cases could lead to a disaster. Engineers should not take for granted that a DBB valve provides a double positive isolation. This is not true. One should understand the capabilities of DBB and DIB valves before operating it. Moreover the design could also vary from one manufacturer to another.

DIFFERENCE BETWEEN DBB AND DIB VALVES

DBB valves are used to block the flow and transfer the pressure source to an upstream and downstream valve. DIB valves are used to isolate the pressure source from both end of the valve.

For a DBB valve, assuming an engineer works in the downstream section of a line, and if the first seal leaks, the second seal would not seal in the same direction, meanwhile in a DIB valve, the system has two seals whereby both seals block in one direction. If the first seal leaks and the valve bleed, the second seal provides a barrier and thus saves the engineer working downstream from danger. If we are looking into double positive isolation, well, DIB valves serve a better purpose compared to the DBB valve. DIB valves provide double security whereas the DBB valve, although the name implies double security, it provides security in two different directions using a separate seal.

THE PHILOSOPHY

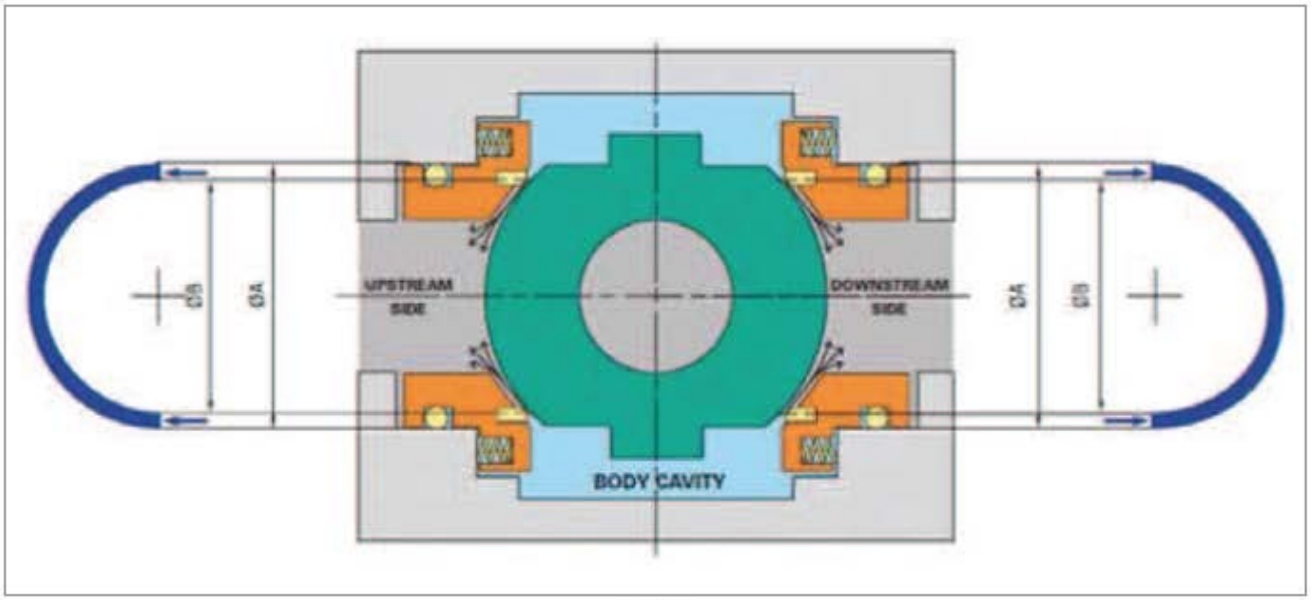
DBB Valve

API 6D / ISO 14313 defines that

Double-Block and Bleed Valve (DBB) – A single valve with two seating surfaces that, in the closed position, provides a seal against pressure from both ends of the valve with a means of venting/bleeding the cavity between the seating surfaces. This does not provide positive double isolation when only one side is under pressure.

Under normal conditions, there is pressure on the upstream seal, which keeps it energised (with an internal spring). There is no pressure on the downstream side, so the only thing energising the seal on that side is a spring. The bleeder valves are open, and the cavity in the ball is at atmospheric pressure. If the system starts to leak at the upstream seal, it won't be a problem because the leakage will be carried away by the bleeder, except when the bleeder is not working. The pressure in the valve cavity can then possibly reach very high levels and overcome the spring on the downstream seal, forcing it off its seat, discharging fluid downstream to where the engineers may be working.

Generally, DBB valves contain two unidirectional seats which isolate the pressure in the piping from the body cavity between the seats while energised. In practice, trunnion mounted ball valves are designed for upstream sealing, so that the double-block and bleed features are automatically built-in. Spring loaded floating seats maintain contact with the ball and provide tight shut-off even at low pressure differential. Independent sealing of upstream and downstream side facilitates draining of fluid from the body cavity, thus the double block and bleed operation. The load generated by the line fluid on ball is absorbed by the trunnion bearings and is directly transmitted to the valve body. The valve stem is hence free from any bending load which leads to reduced stem friction torque and enhanced stem seal life. The seat rings are allowed to float in the flow axis against a fixed ball so that the line pressure assists in pressing the spring-loaded upstream seat against the ball. Thus, the operating torque and wear on the seats are relatively low, enhancing seat life.



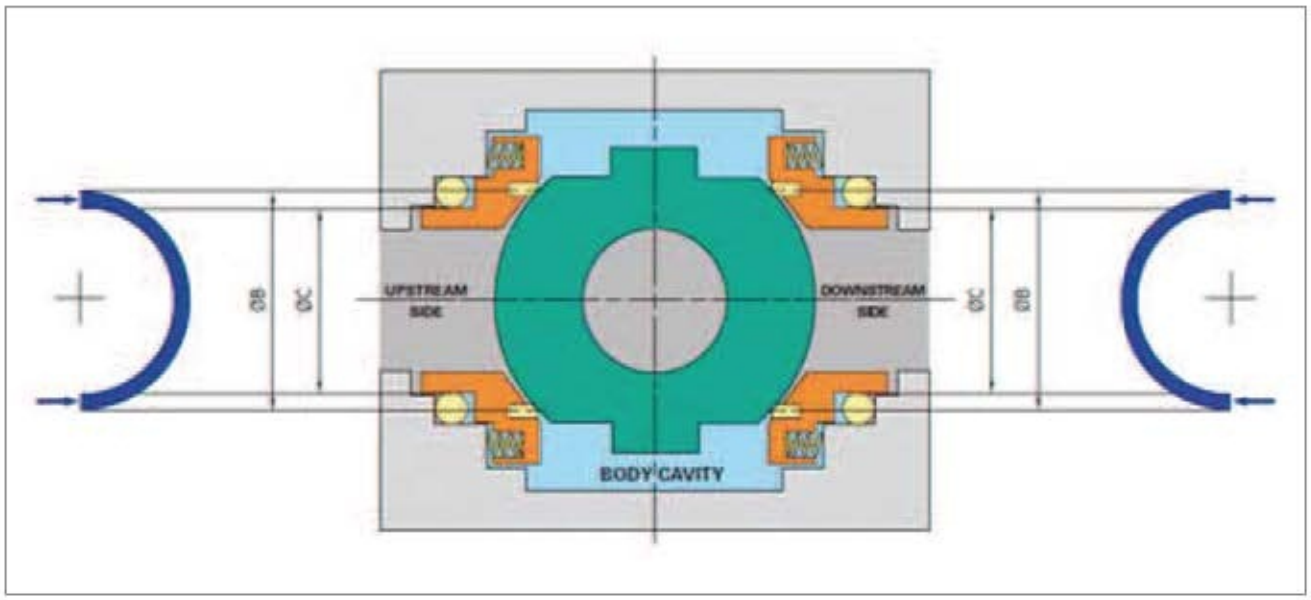
DBB Valve

DIB Valve

API 6D / ISO 14313 defines that

Double-Isolation and Bleed Valve (DIB) – A single valve with two seating surfaces, each of which, in the closed position, provides a seal against pressure from a single source, with a means of venting/bleeding the cavity between the seating surfaces. This feature can be provided in one direction or both directions.

DIB valves include one or two bidirectional seats. When two bidirectional seats are used, the valve provides double isolation from pressure at either end of the valve. Since it can't relieve body cavity pressure past the seats, an external relief piping system must be used to allow any pressure build-up in the body cavity to release to the upstream piping. This means that DIB design utilises double piston effect seats either in the downstream end or both



DIB Valve

ends. Double piston effect (DPE) seated ball valve work by having a seat design such that both line pressure and body cavity pressure (if the first seat should leak) will force the seat seal onto the ball. The valve body incorporates a drain plug, located at the bottom of the cavity, and a bleed valve for vent purpose, located at the highest possible position of the cavity. When in a closed position, the drain plug is opened to monitor any leakage into the cavity. If there is no leakage, this means the primary seal is good. If there is leakage, depending on the amount, the bleed can be piped away and work can continue.

APPLICATION

DIB can be used in chemical injection lines, closed or open drain lines, instrument pressure transmitter connections and sample connections. DBB can also be a normal ball valve that is used in all places of the plants. Some functions require the second pressure barrier to seal independently of the primary pressure barrier. This is due to the operational safety requirements or the nature of services such as gas service, low tolerance for leakage and cleanliness of the produced fluid. In these cases, DIB valve suits better. DIB valve can be in a single direction or in both directions with appropriate seat design. Where safety is the driving force, DIB has the advantage over DBB. ■