

# A refined solution

## Double block and bleed valves in downstream processing

**In this article, the benefits of cartridge-style double block and bleed valves in refinery applications are discussed. In addition to this, the article also explains who these valves can help to prevent accidents.**

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For oil and gas operations right along the supply chain – from extraction through to delivery to the end user – safety is the number one concern. However, nowhere is it more important than in refinery operations, which require large numbers of personnel and a great deal of infrastructure investment to be placed in a highly volatile environment – often in close proximity to residential areas.

For this reason, petrochemical companies have been investing heavily in safety advances to minimise the possibility of dangerous situations occurring, and specifying the most reliable valves available is a key aspect.

When inline repairs or emergency maintenance are being carried out on any pressurised piping system containing flammable process media, it is essential that the valves used to isolate the sections being worked on provide a guaranteed and long-lasting 100 per cent tight seal.

In the world of offshore drilling, this is achieved by ensuring that all isolation valves are double block and bleed (DBB) systems – with two separately operated valves and a bleed valve between them. The specification of these systems is now growing in the downstream processing arena as refinery owners begin to realise the safety benefits. However, there are barriers to the installation of traditional double block and bleed configurations.

### Space constraints

Conventionally, in order to achieve a double block and bleed system, engineers would install two standard isolation ball valves and a separate facility for bleeding the cavity in between.

Space is usually at a premium in the refinery environment, and this approach – requiring an additional valve unit to be installed as well as a T-junction to allow the cavity to be bled – more than doubles the space required compared with a single valve system.

This increase in size can often make the installation unfeasible, especially where multiple valves along the line are to be upgraded.

### Leak paths

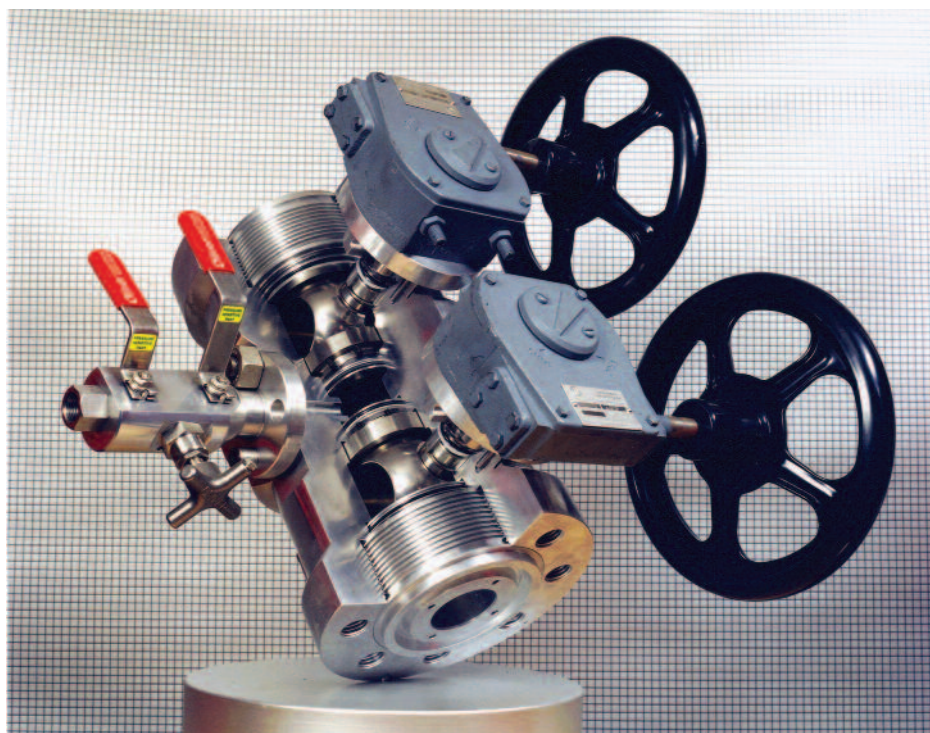
Tackling fugitive emissions is high on the agenda for the downstream oil and gas sector. The problems presented by these emissions are multiple – not only does losing valuable media through leaks carry an economic cost, but the emissions are also a significant contributor to air pollution and climate change. As well as

this, emissions of volatile compounds such as benzene from refinery systems can lead to long term health risks for employees and local communities, and escaping flammable substances can increase the risk of explosions.

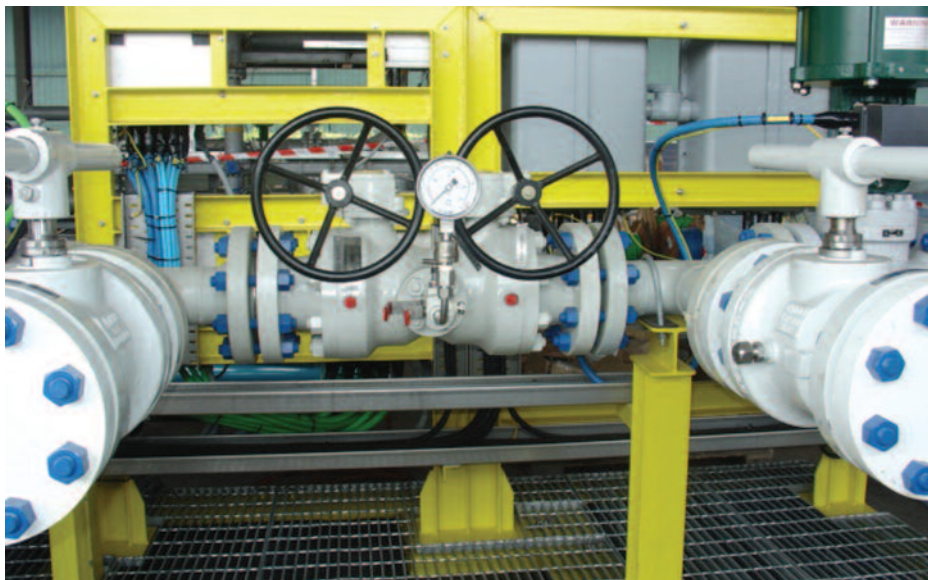
While the volume of medium escaping from any given leak may be very small, the cumulative effect across a large facility can add up to a significant proportion of the plant's total emissions. Any seal between two separate pieces of material represents a potential leak path and therefore increasing the number of different sections of pipe required for a valve installation significantly increases the likelihood of media escaping from the system.

In response to these issues of increased size and additional leak paths, Oliver Twinsafe patented the Twinsafe valve – a double block and bleed system housed within a single forged steel unit – in 1995.

Originally developed for use in oil extraction operations, these systems are now increasingly being used in refineries.



*A Twinsafe double block and bleed valve with cut-away section to show the unit's internal construction.*



A Twinsafe valve in situ, demonstrating the reduced face-to-face length required for installation.

### Enhanced safety

Incorporating the three valves into a single housing increases the safety of the system by removing connections between separate units, resulting in fewer potential leak paths.

The unit incorporates two separate ball valves, delivering 100 per cent tight shut-off using either plastic soft seats or heavy duty metal-to-metal seats coated with a tungsten or chrome carbide-based coating. The volume of the cavity between the valves is also significantly reduced, allowing operators to evacuate the space and establish a safe isolation more quickly – a major benefit in emergency scenarios. The reduction in volume of the material removed from the valve also means less waste, reduced handling, lower costs and easier disposal.

Another key advantage of the Twinsafe design is that the whole system has the same face-to-face length as a standard



A Twinsafe double block and bleed valve.

single isolate valve, as specified in API 6D and ANSI B16.10.

Not only does this mean the system can easily be installed into an existing pipeline without any re-working of the surrounding pipes, but also that the space required for a double block and bleed system is reduced by more than half, freeing up space for other equipment.

In addition, because the valves are full bore, they offer a negligible pressure difference when open, thereby maximising efficiency.

These benefits make the 'cartridge style' double block and bleed valve ideal for the refinery environment, and the industry is beginning to realise the benefits.

### Milford Haven

In 1998, Murco was looking for 12 replacement valves to control the flow of fuel to the cogeneration facility at its Milford Haven refinery in Pembrokeshire, Wales.

The firm wanted a way to upgrade the existing single ball valves to double block and bleed systems with the minimum of disruption to operations. Space was also at a premium, as the existing layout had been designed with standard length single block valves in mind, so installing a second row of single block valves was not an option.

After consulting Oliver Twinsafe, the firm ordered 12 6" cartridge-style double block and bleed valves that were built to the same standard length as the existing single block valves. This meant that no

modification of the existing pipe work was required, and the new valves could simply be installed in the same position as the existing equipment.

The Twinsafe valves also offered the most economical overall installation because the extra work required to install a non-standard length single unit system meant significant additional cost.

### Accident prevention

Unfortunately, high profile accidents are arguably the most powerful driver of change in introducing enhanced safety measures and this was the case with the introduction of double block and bleed valves in oil extraction processes. They became mandatory for all isolation valves used on British drilling operations following the Cullen Report into the Piper Alpha disaster of 1988, an oil rig explosion in which 167 people were killed.

The downstream processing industry is benefitting from this advance, as refinery owners increasingly recognise the safety benefits double block and bleed valves. This is being supported by the valve industry as it continues to deliver innovative solutions such as the cartridge style system to help overcome the barriers to double block systems being adopted.

### About the author

Mr Shillito joined Oliver Valves Ltd in 1991 with a wealth of valve design experience gained while working in the nuclear energy sector. He is responsible for the design and development of Oliver Valves' range of subsea gate, needle, ball and check valves and designed and patented the small and large bore Twinsafe double block and bleed valves. Mr Shillito is a fellow of the Institute of Mechanical Engineers.

