Butterfly valves have been used for many years in sealing applications where tight shut-off was not a requirement and operating pressures were relatively low – after years of development and testing the Butterfly valve of today is a precision engineered product capable of being used effectively in applications that were previously only considered suitable for gate, globe or ball valves – and at a fraction of their cost.

The state-of-the-art butterfly valve is considered to be the metal-sealed triple-offset design, which is capable of sealing at both high temperatures (+426˚C as standard) and low temperatures (-196˚C) and with fully rated pressures up to ANSI Class 1500#.

The triple-offset design is so called because the valve shaft is offset from the sealing element in two planes and the seal profile is a segment of a cone whose apex is offset from the pipe centre line, giving three offsets. This geometry allows the use of metallic seals since the camming action resulting from the three offsets ensures that the metal seal and seat are never in contact with each other while the valve is stroking. Contact is made between the seal and seat only as a final shut position is reached.

New design
A further development of the triple-offset design is to provide two sealing elements mounted on a single butterfly disc giving a double block and bleed (DB&B) facility. DB&B valves are needed to ensure safe working conditions for personnel during maintenance or repair work. The assembly consists of two seals mounted on the butterfly disc, which are separated from each other by an annular space.

The annular space is connected to an externally mounted bleed valve via drilled drain galleries in the valve body. Prior to any repair or maintenance work being carried out the valve is closed and the external drain (bleed) valve is opened to ensure that the flow of the fluid has been stopped. This check guarantees a safe working environment for personnel who may have to cut and enter into the pipeline and, therefore, need to be 100 per cent certain that it is safe.

Alternatively, the space between the two seals can be pressurised by injecting an innocuous fluid through the bleed valve. Provided that the pressure in the space between the seals is maintained at a higher value than the pressure of the hazardous substance in the pipeline, there can be no leakage of that substance downstream of the valve.

Single-seal butterfly valves have major commercial advantages compared with alternative ball and gate valves as they are now significantly lighter and less bulky. This not only means that they are cheaper to manufacture, but also there is a secondary saving for the customer because they are easier to install. Of course, cost savings become increasingly significant where more precious metals are used. These commercial benefits are, however, eroded where traditional DB&B assemblies are required, as currently two butterfly valves are required to provide such an assembly.

The latest DB&B triple-offset design of valve overcomes this disadvantage by having two seals mounted on a single butterfly disc and, hence, combines the degree of safety of two separate valves but with a cost and space requirement that is more like that of a single valve. This design is capable of bi-directional sealing; is fire safe to API 607 and BS.6755 Part 2 and can be supplied to a very wide range of flange dimensional requirements.