DOUBLE POSITIVE ISOLATION WITH TRIPLE OFFSET VALVES

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AGENDA

- INTRODUCTION
- THE CONCEPT OF POSITIVE ISOLATION
- CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION
- USING TRIPLE OFFSET VALVES IN DOUBLE POSITIVE ISOLATION
- FUTURE DEVELOPMENTS

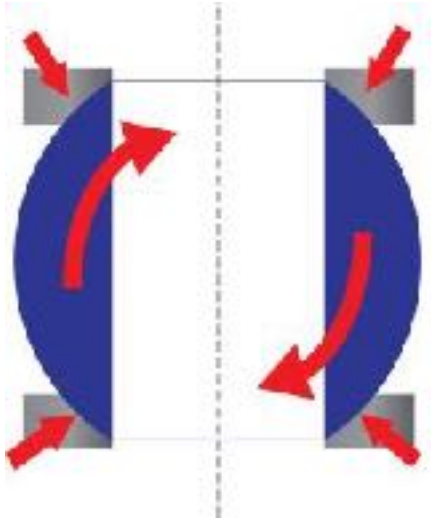
INTRODUCTION

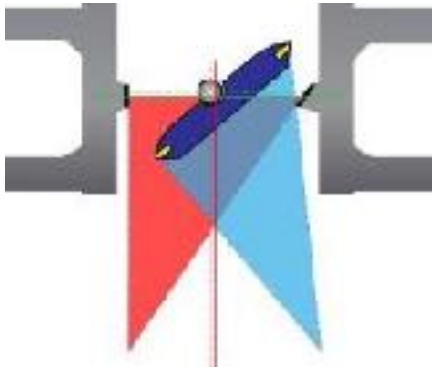
INTRODUCTION

- Positive and double positive isolation?

- Single soft-seated ball valves
  - Design weaknesses in high safety risk scenarios

- Triple Offset Valves (TOVs)
  - A non-symmetric design to maximize inherent safety





THE CONCEPT OF POSITIVE ISOLATION

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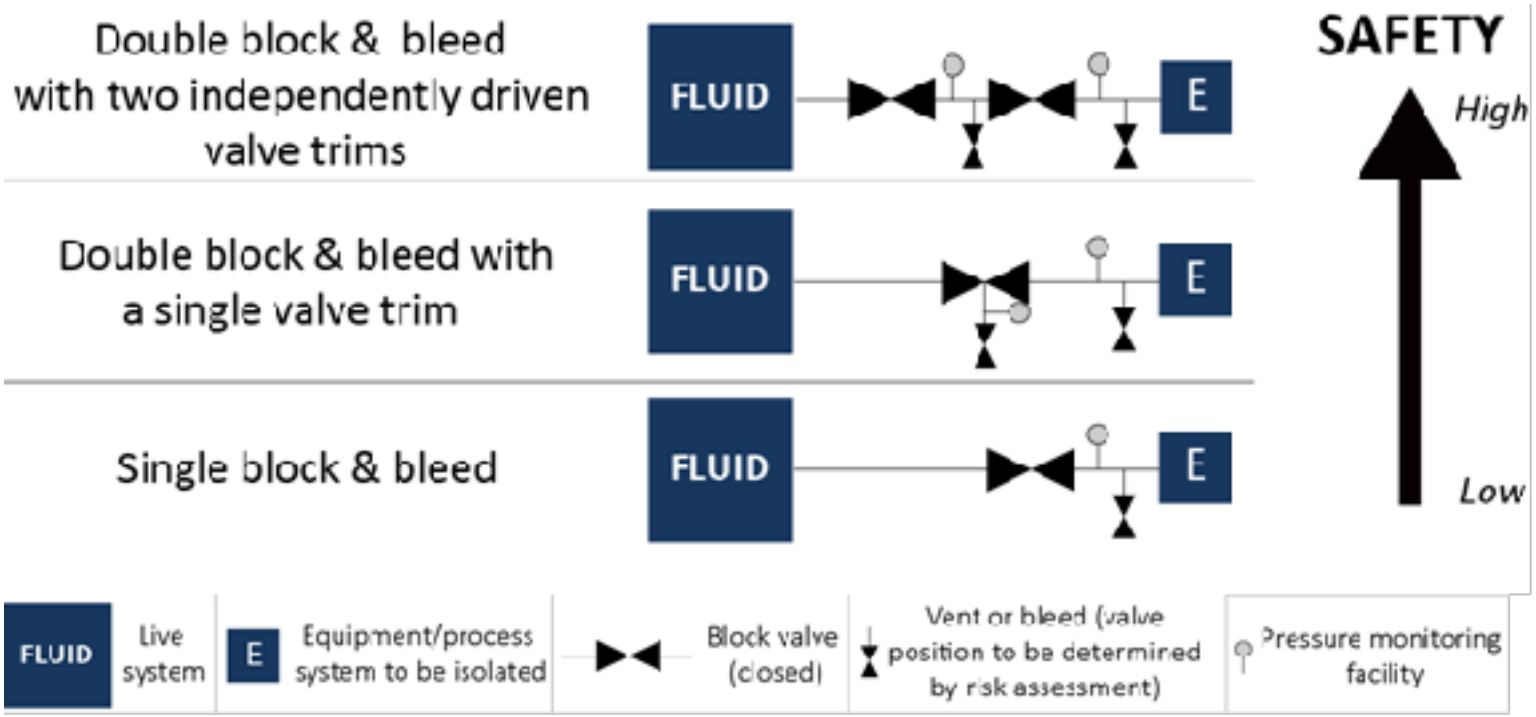
- Linear (multi-turn) movement valves such as gate valves have been used in process isolation for centuries
- Over the past few decades, there has been a surge in the use of soft-seated quarter turn ball valves for “positive” isolation
- Environment, Health & Safety (EH&S) regulation has recently become more stringent

- Revision of the design concept behind the idea of “positively” isolating a line

THE CONCEPT OF POSITIVE ISOLATION

- “Positively” isolating a line means no admissible leakage downstream so that equipment can be safely removed & maintenance/inspection can be carried out without shutting down the entire facility

THE CONCEPT OF POSITIVE ISOLATION



DOUBLE POSITIVE ISOLATION WITH TRIPLE OFFSET VALVES

CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION

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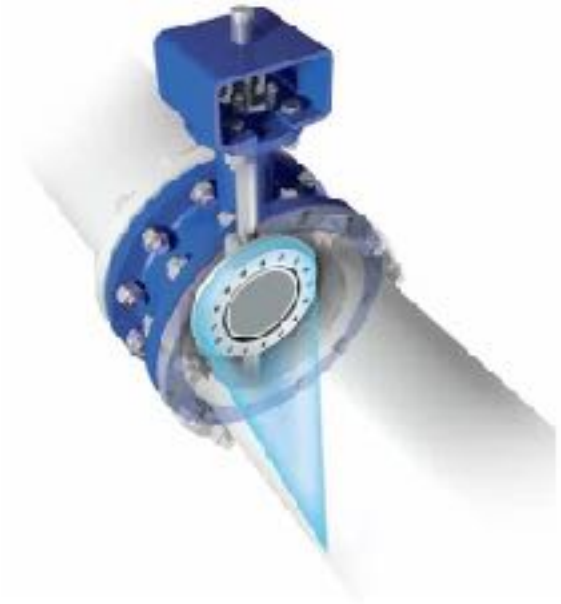
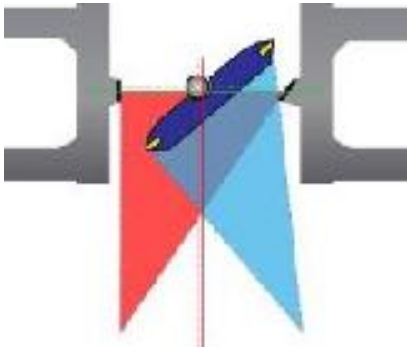


TOV – ROTATIONAL MOVEMENT

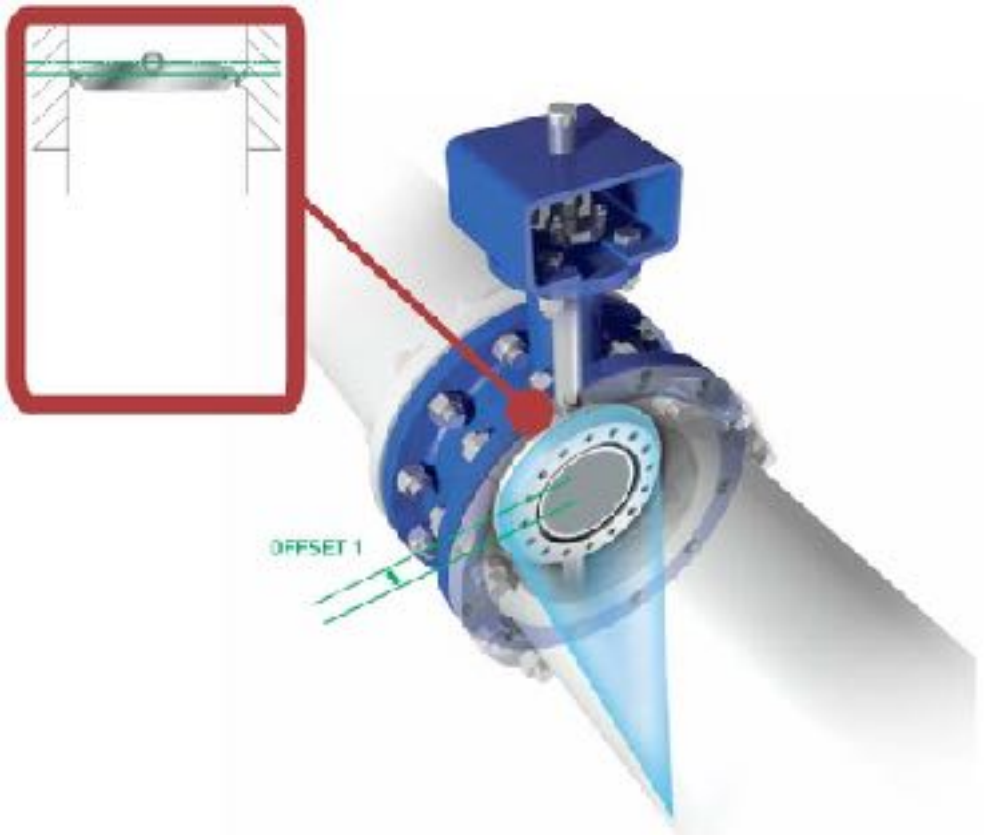


Seal Seat

GLOBE VALVE – AXIAL MOVEMENT

- TOVs use a sealing system consisting of a stationary seat and a rotating sealing surface sharing an identical shape: an inclined conic section (cone-to-cone principle)

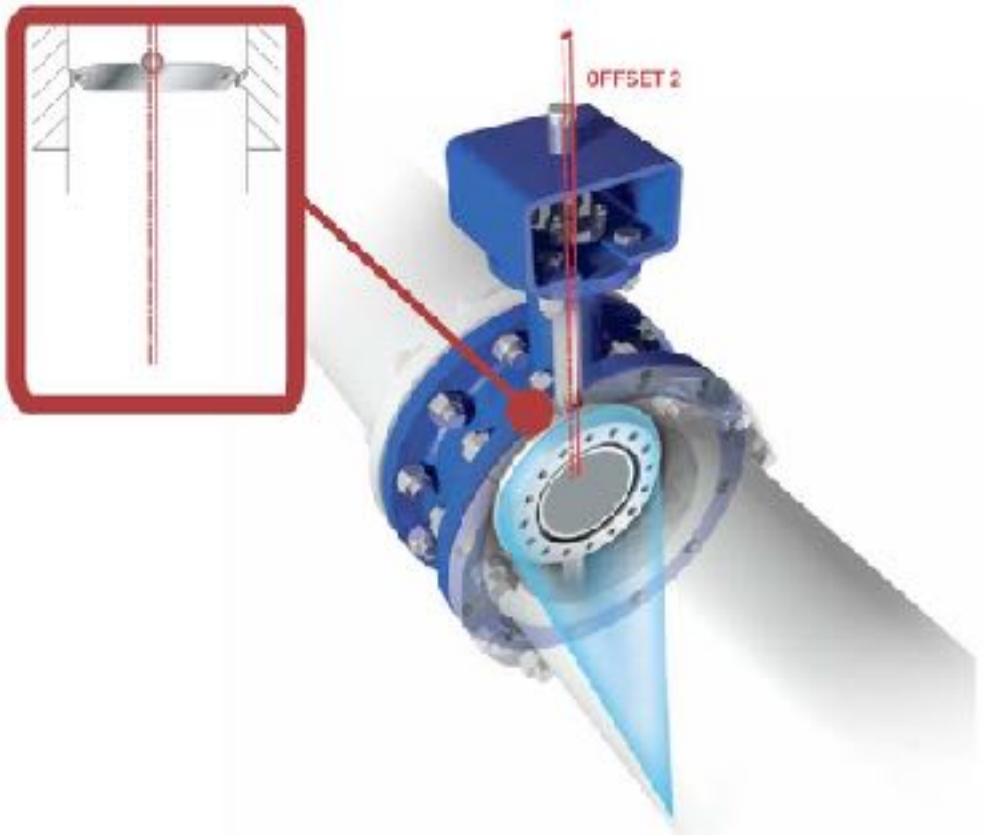
CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION



OFFSET 1

DOUBLE POSITIVE ISOLATION WITH TRIPLE OFFSET VALVES

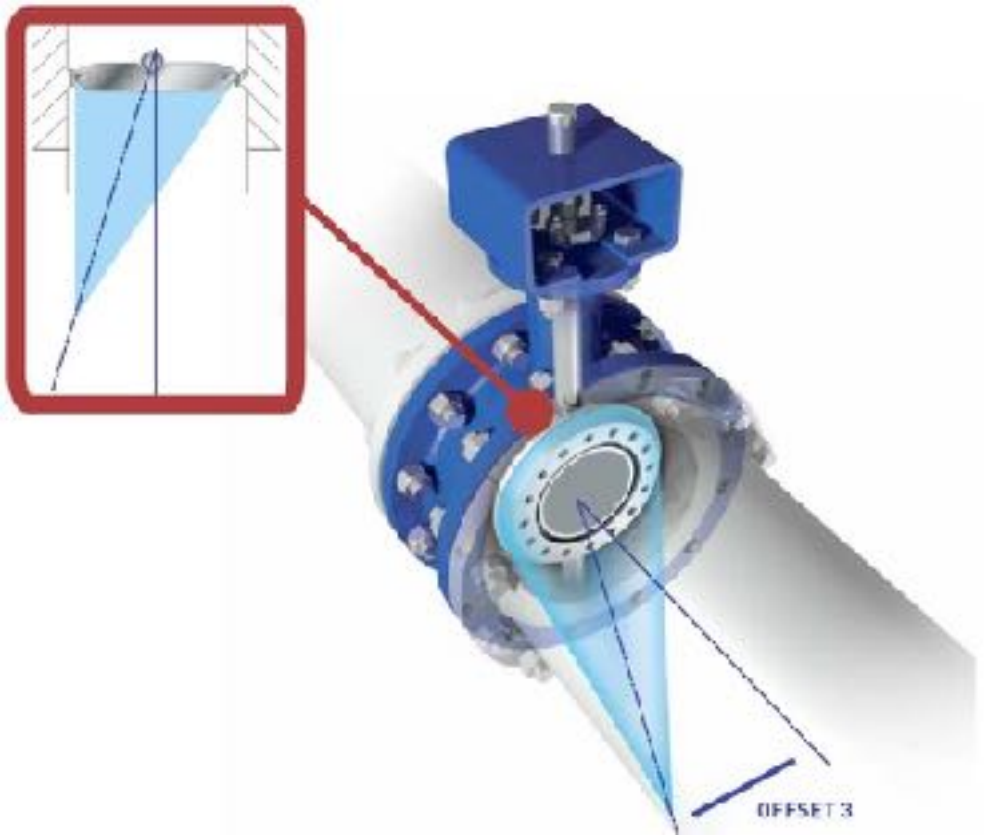
CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION



OFFSET 2

DOUBLE POSITIVE ISOLATION WITH TRIPLE OFFSET VALVES

CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION



OFFSET 3

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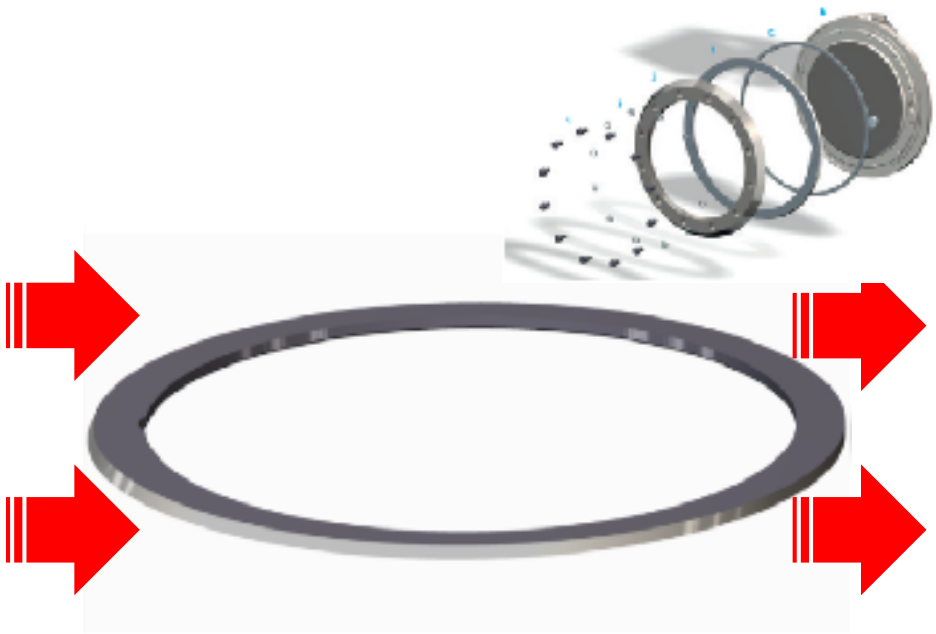
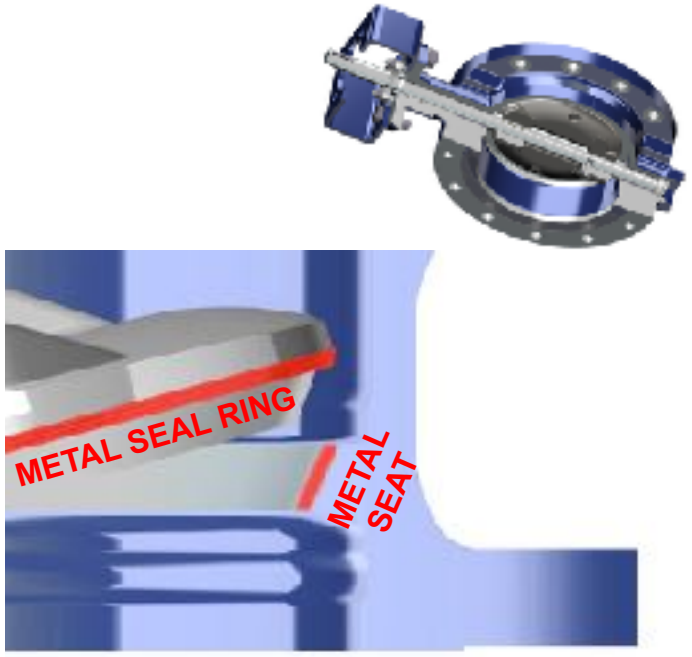


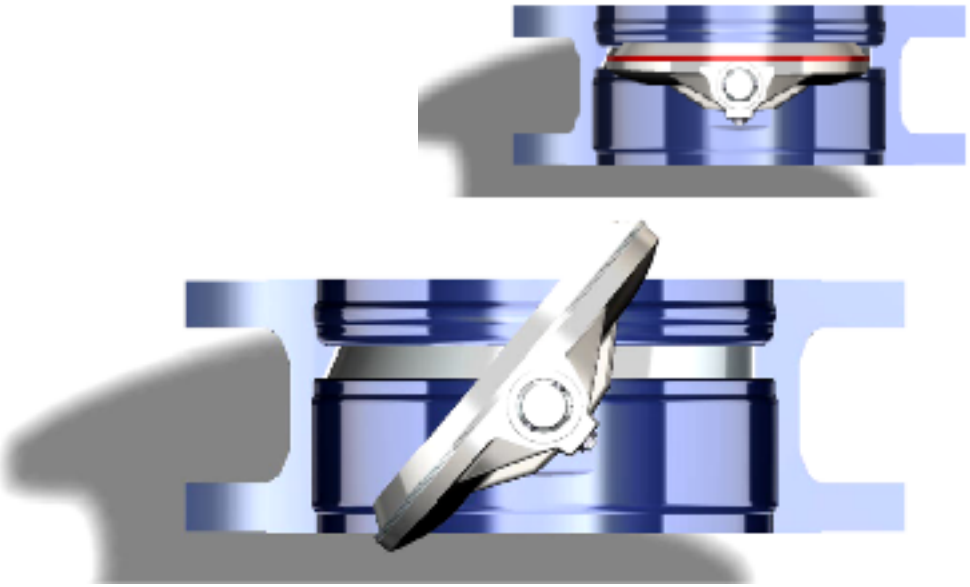


TORQUE SEATING

METAL-TO-METAL SEATING

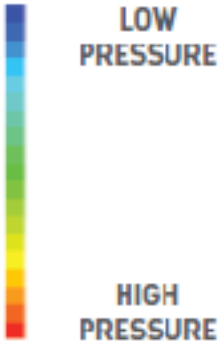
CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION

QUARTER TURN ROTATION

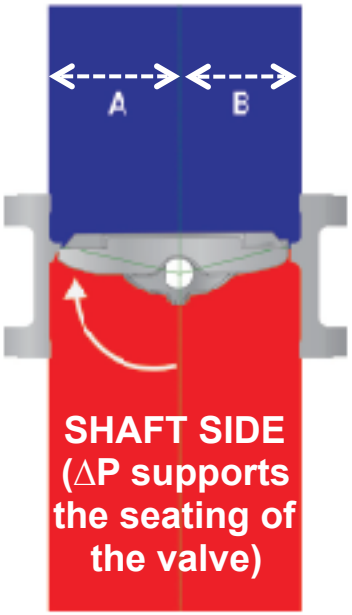


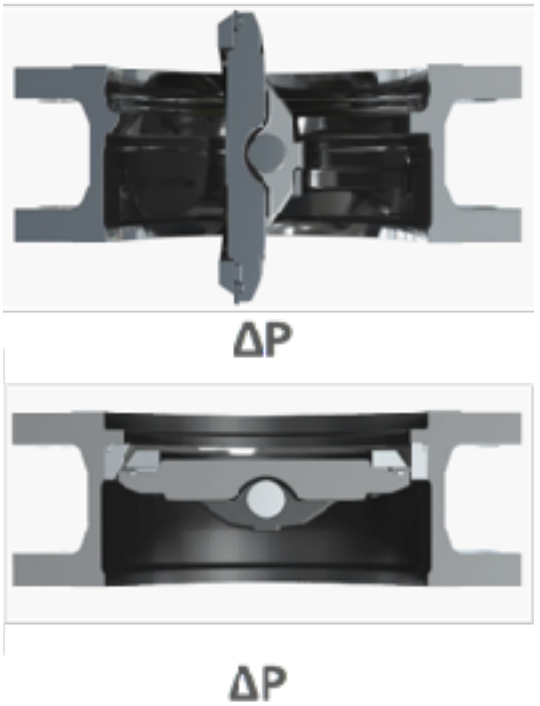
NON-RUBBING ROTATION

CHOOSING INHERENTLY SAFER VALVES FOR POSITIVE ISOLATION



A > B





TOV (POSITIVE) SHAFT SIDE INSTALLATION

DOUBLE POSITIVE ISOLATION WITH TRIPLE OFFSET VALVES

USING TRIPLE OFFSET VALVES IN DOUBLE POSITIVE ISOLATION

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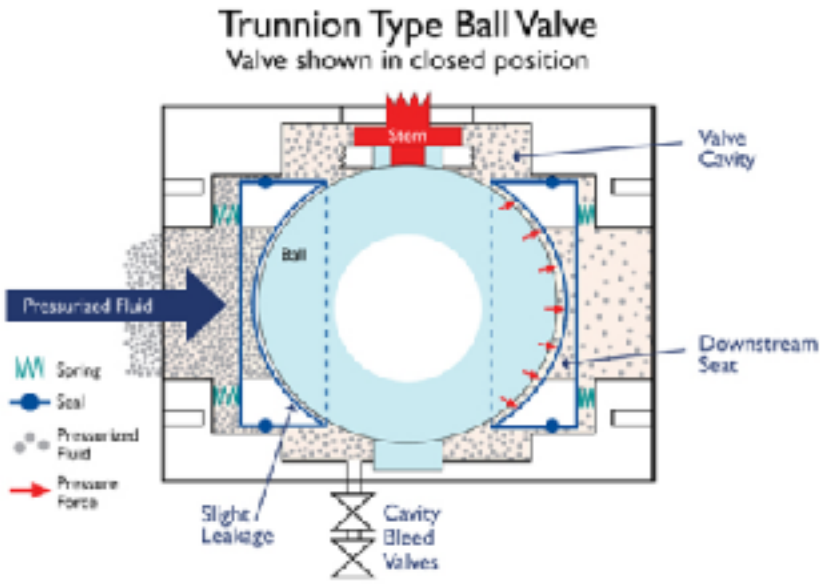
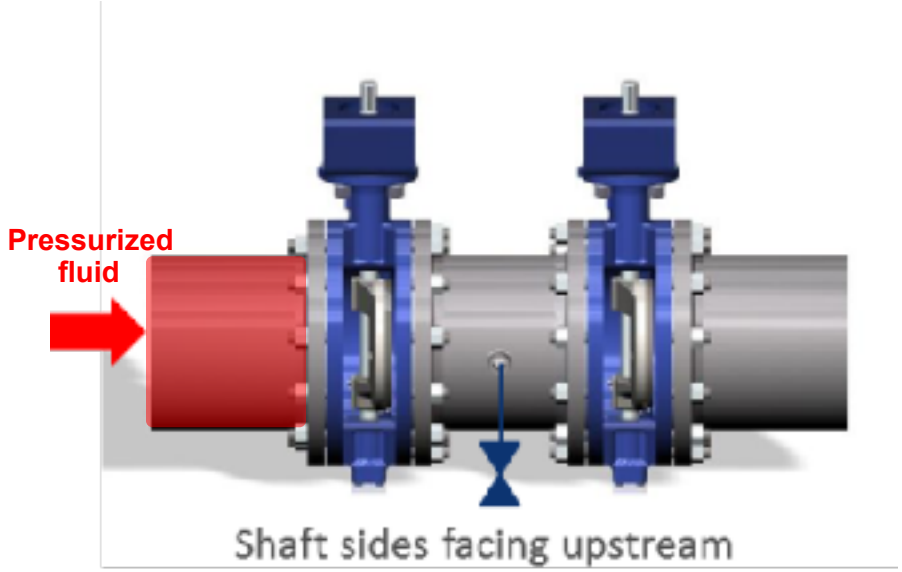


- API 6D defines a double block and bleed valve as a "*single valve with two seating surfaces that, in the closed position, provides a seal against pressure from both ends of the valve with a means of venting/ bleeding the cavity between the seating surfaces.*"
- A note in 2008 points out that <u>this valve does not contribute towards double positive isolation when only one side is under pressure</u>

Whenever pressure comes from one side only, there is a risk that the second seat may not seal in case of leakage from the first seat. i.e.: should the cavity bleed valve fail, the valve cavity pressure itself may push the second seat away from the ball.

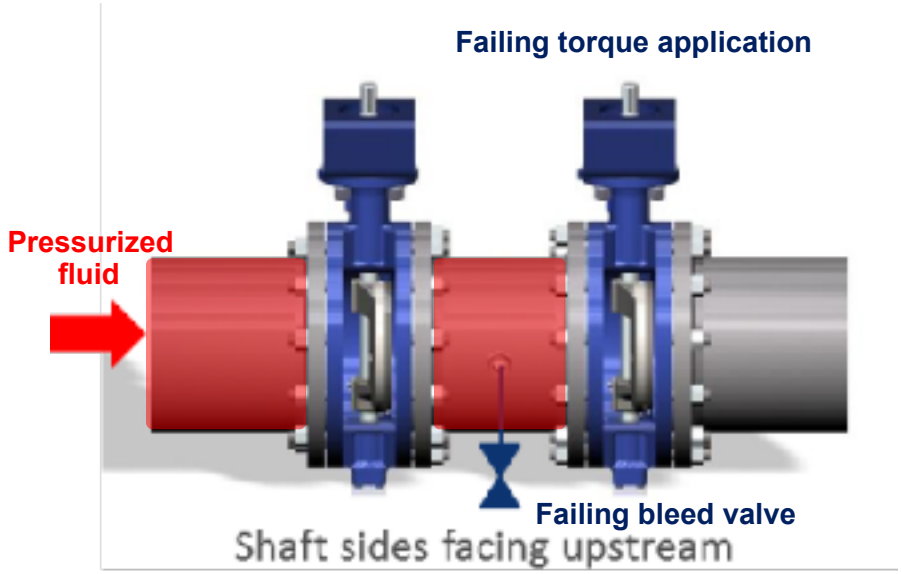
USING TRIPLE OFFSET VALVES IN DOUBLE POSITIVE ISOLATION



This combination has been officially approved by major O&G end users

- With two separate valves with distinct trims, TOVs ensure versatility and optimal torque/ tightness performance
- Absolute tightness performance is provided by using two independent bodies which easily adapt to required face-to-face (possibly including a spool piece)
- Both valves are installed with the shaft facing upstream ensuring double positive isolation
- The differential pressure supports the first valve tightness.

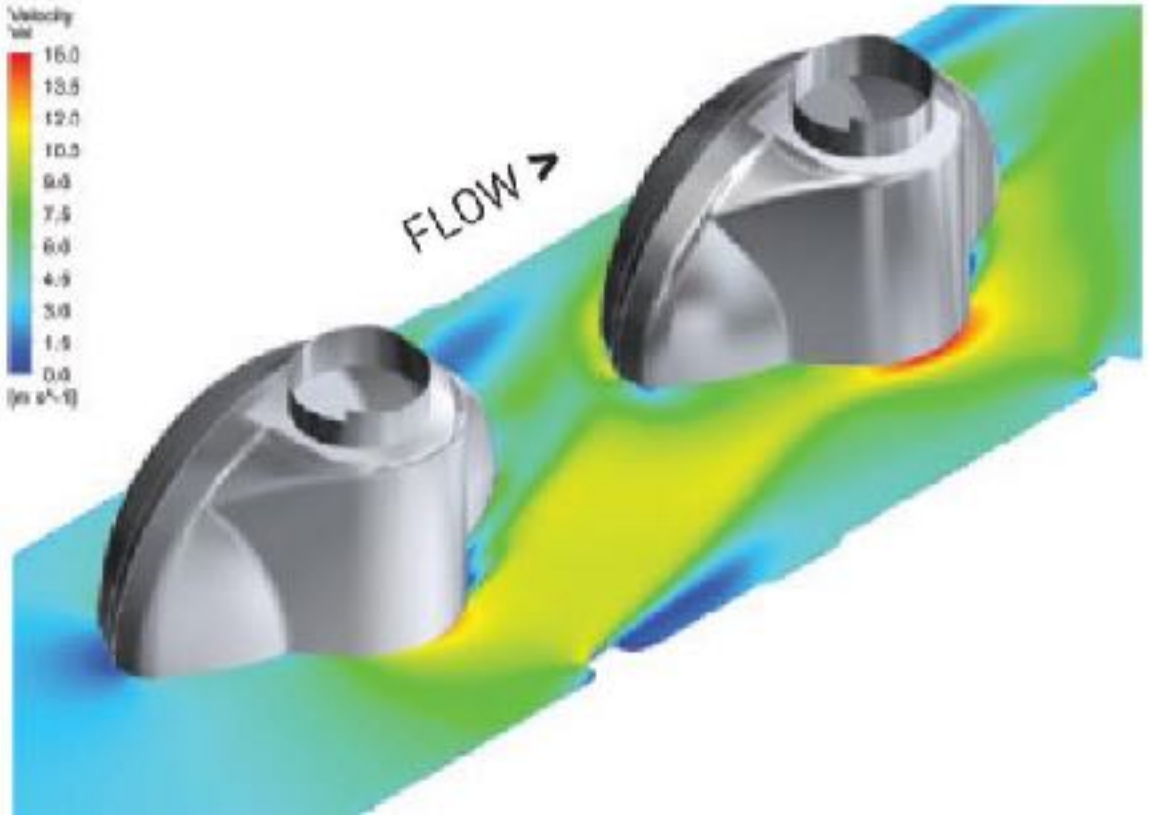
USING TRIPLE OFFSET VALVES IN DOUBLE POSITIVE ISOLATION



- Differently from the example provided on ball valves, the higher the cavity pressure is between the two TOVs, the more support is provided to the second valve seating even in the remote case of torque application failure.

Whenever pressure comes from one side only, in case of leakage from the first seat, the second seat will provide sealing. In fact, even in case of torque application failure and cavity bleed valve failure, the valve cavity pressure itself will push the second seal against the seal.

FUTURE DEVELOPMENTS

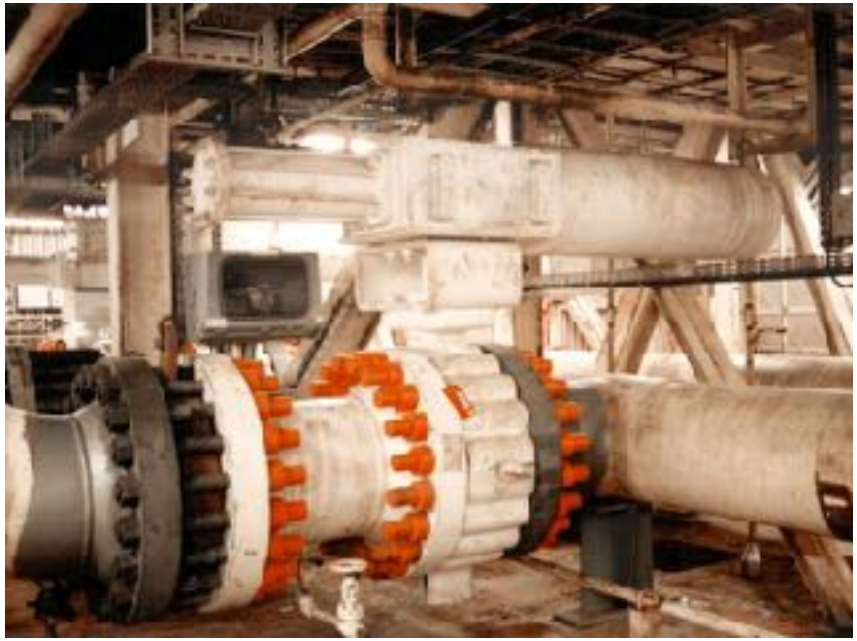


FUTURE DEVELOPMENTS

With two triple offset valves installed in series at a minimum distance, analysis using computational fluid dynamics shows no negative effects on the second valve.

FUTURE DEVELOPMENTS

- Further product development can be aimed at establishing the optimal face-to-face set up between a TOV + spool piece + TOV combination vs. two longer face to face TOVs with no spool piece
- In either these combinations, the user is able to decide (positive) direction of installation while the use of two trims in a single body would not allow to do so



FUTURE DEVELOPMENTS

- Although double positive isolation has become in recent times a key topic in the oil & gas industry, due to the high pressures combined with explosive, environment polluting and health adverse risks, other industries may start considering this approach to isolation also

QUESTIONS

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