

# Equipment to Improve the Safety and Reliability in FCC Units

Engineering  
GREAT Solutions



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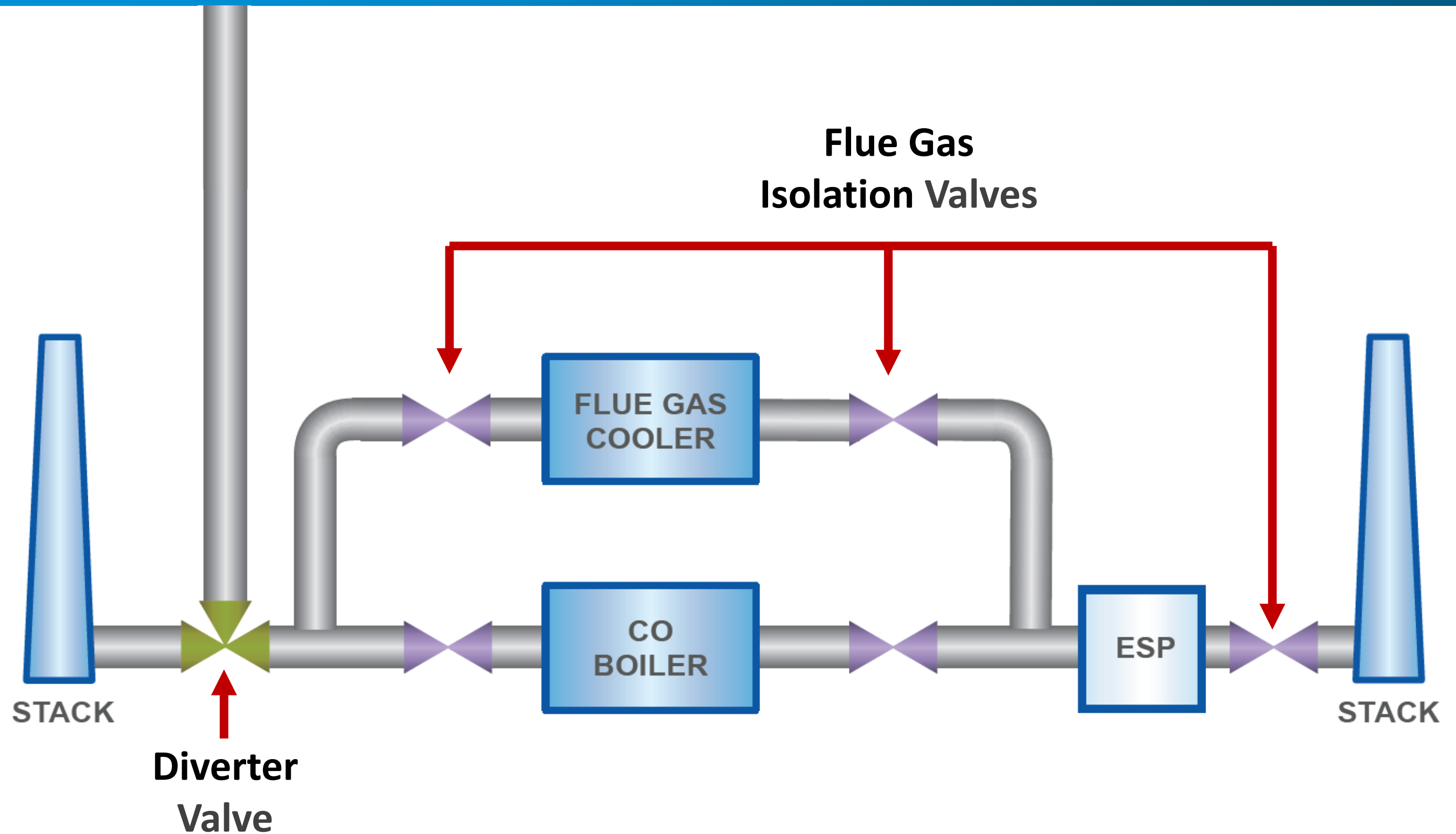
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# Flue Gas Line Typical Layout

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# Diverter Valve vs Seal Pots

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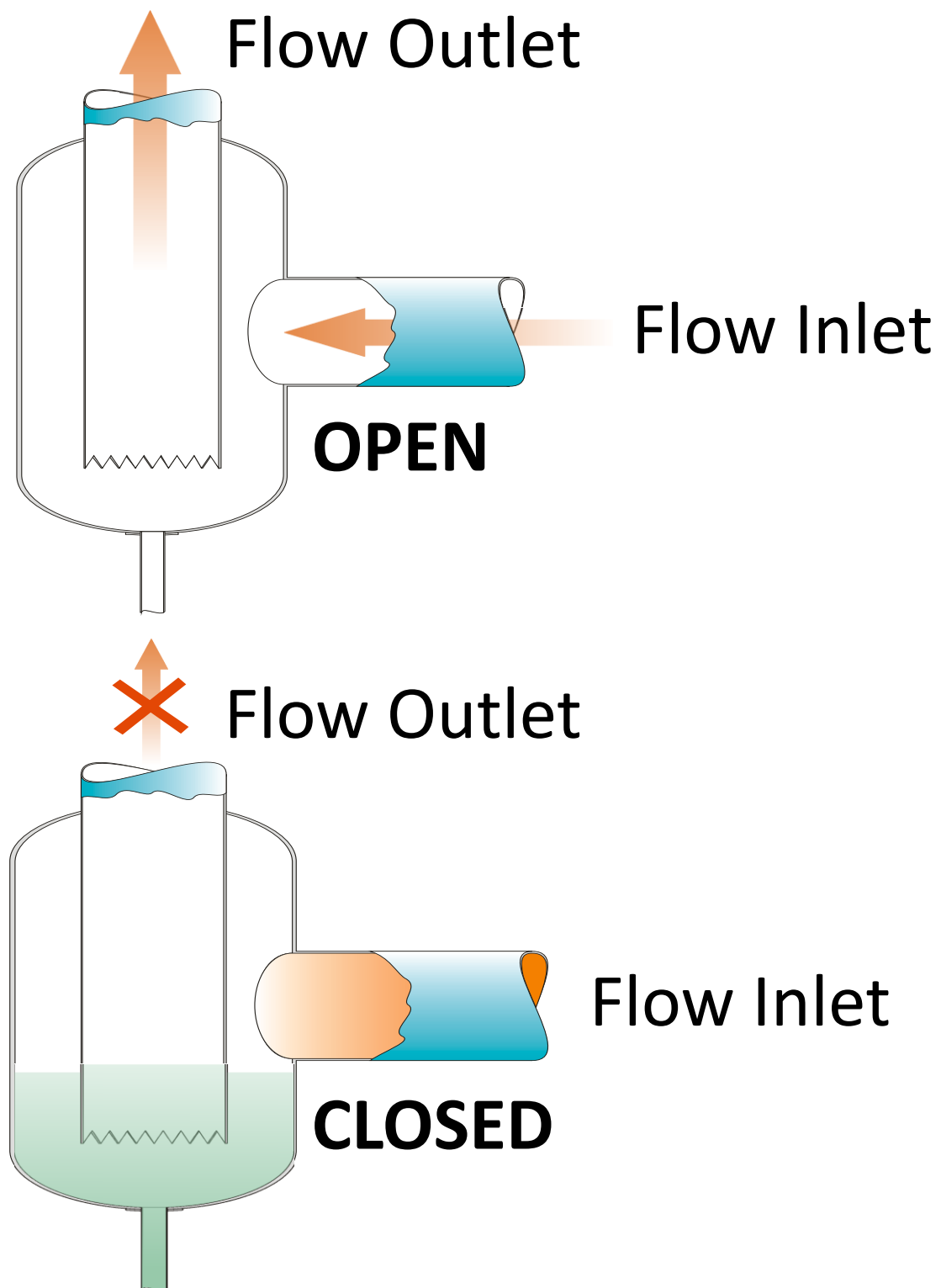
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- Seal Pots may seem a good alternative to more complex three way valve such as a Diverter:
  - *No moving parts*
  - *No complex hydraulic or controls*
  - *No purging, spares, maintenance*
  - *No Valves vendors bothering you at Refcomm*
- Seal Pots, however, pose subtle but severe reliability issues.
- A user case from a South American Plant is resumed in following section.

# Seal Pot Functional Description

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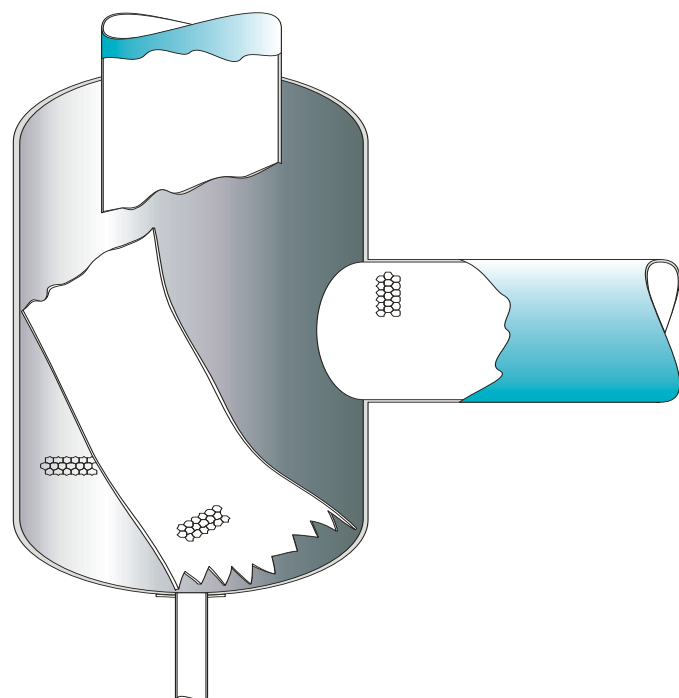
- High Gas Temperature requires Refractory lining and abrasion Resistant lining, but refractory absorbs water. Water trapped inside the refractory pores increases rapidly its volume, causing the explosion of the refractory.
- Water also needs to be neutralized, Flue Gas from the Regenerator condensates increasing the acidity of water. The acidic water corrodes the refractory anchors.
- Water Level control system/ transmitter may be plugged by catalyst and fails. Loss of level control can overflow water to the other pot. In this conditions, the central duct is subject to thermal shocks, leading to internal collapses.



# Typical Seal Pots Failures Modes

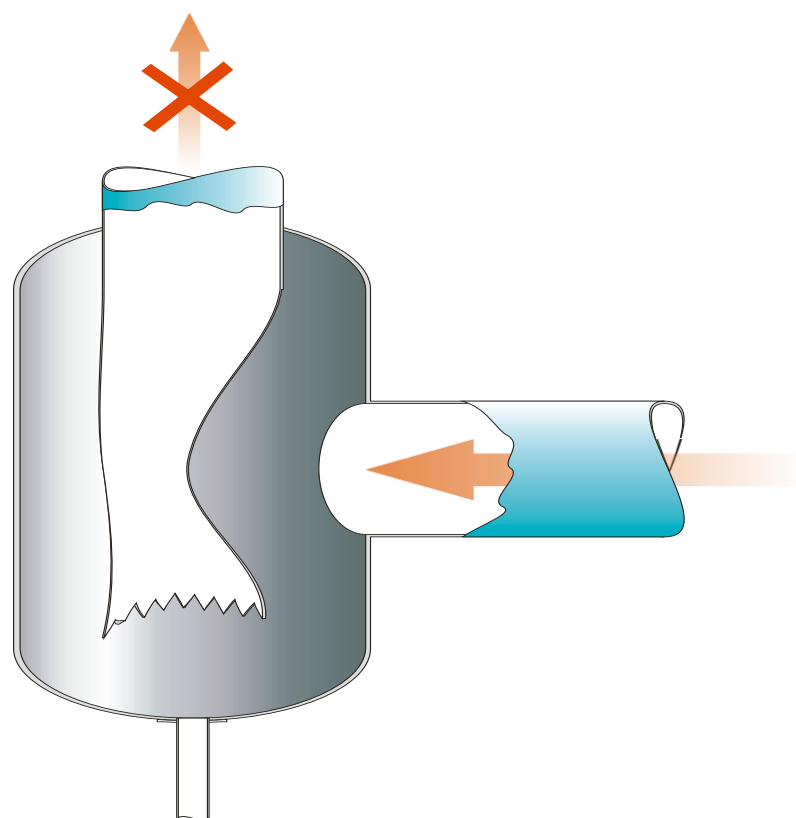
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**Internal Duct Rupture  
(Thermal Shock)**

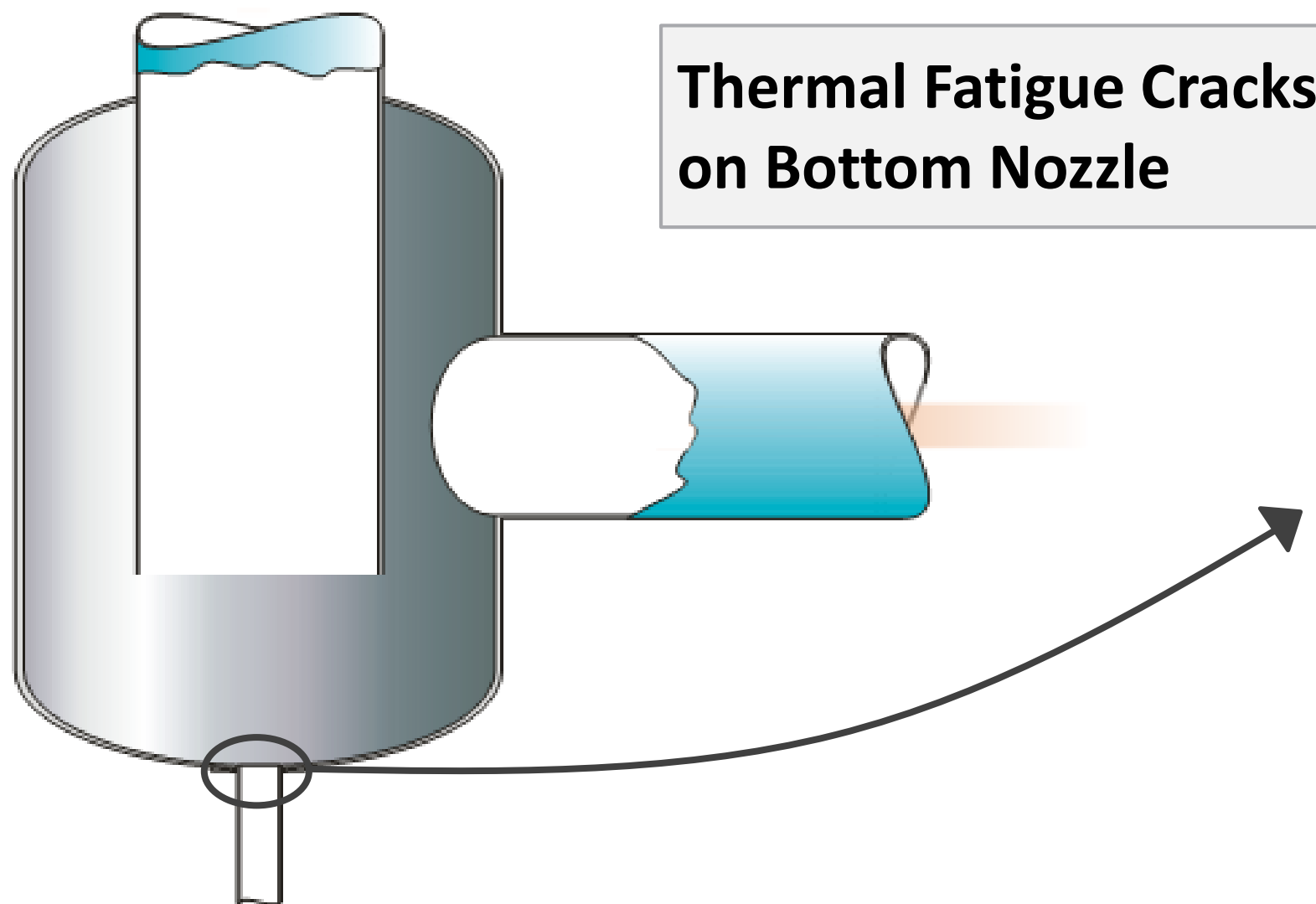
Thermal Fatigue  
Cracks on Bottom  
Nozzle



**Internal Duct Buckling  
obstructing Gas Flow**



# Typical Seal Pots Failures Modes



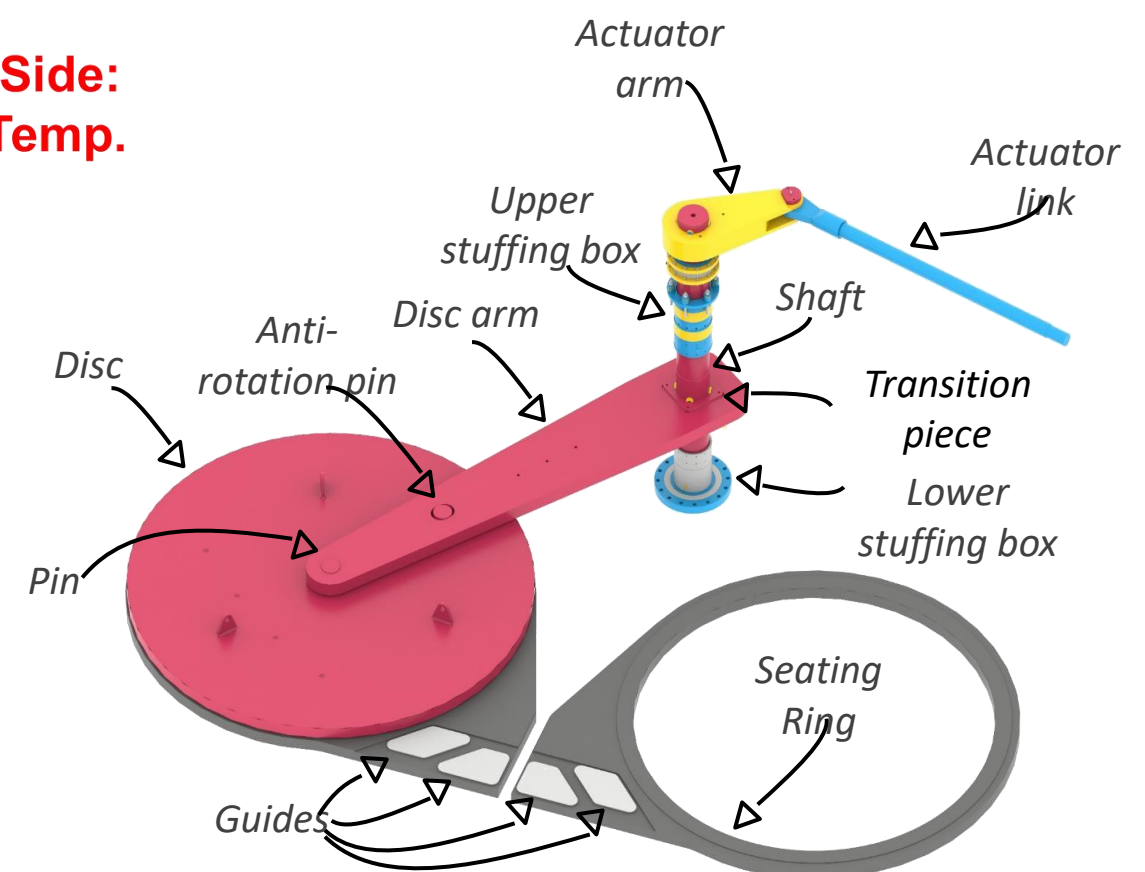
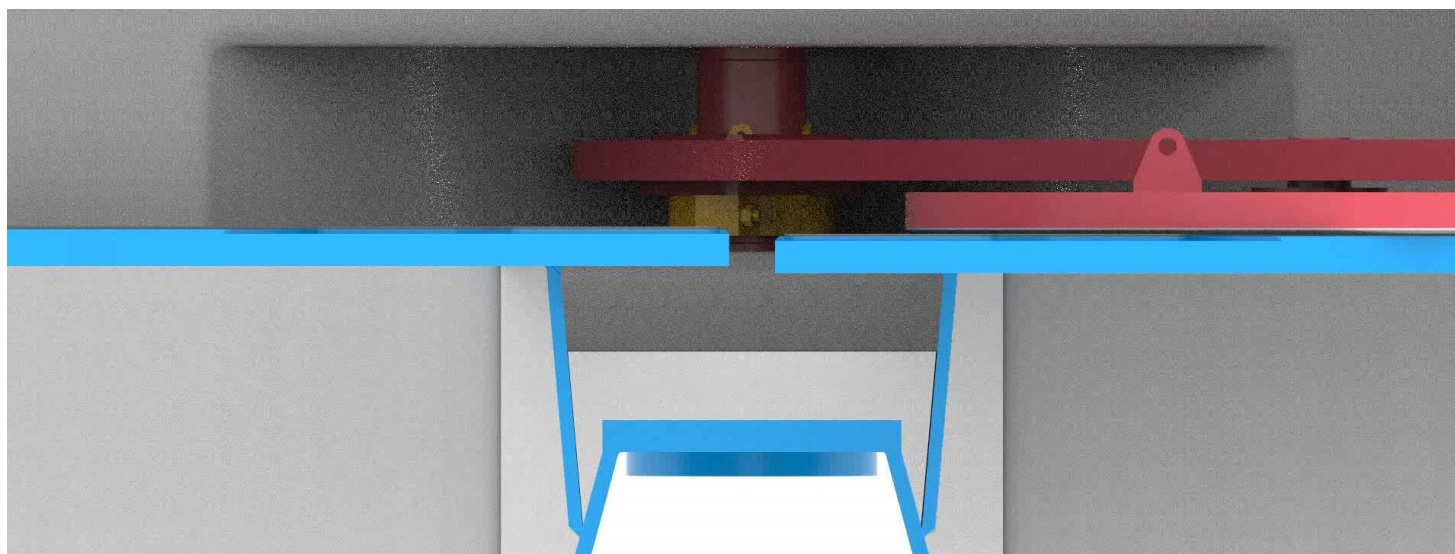
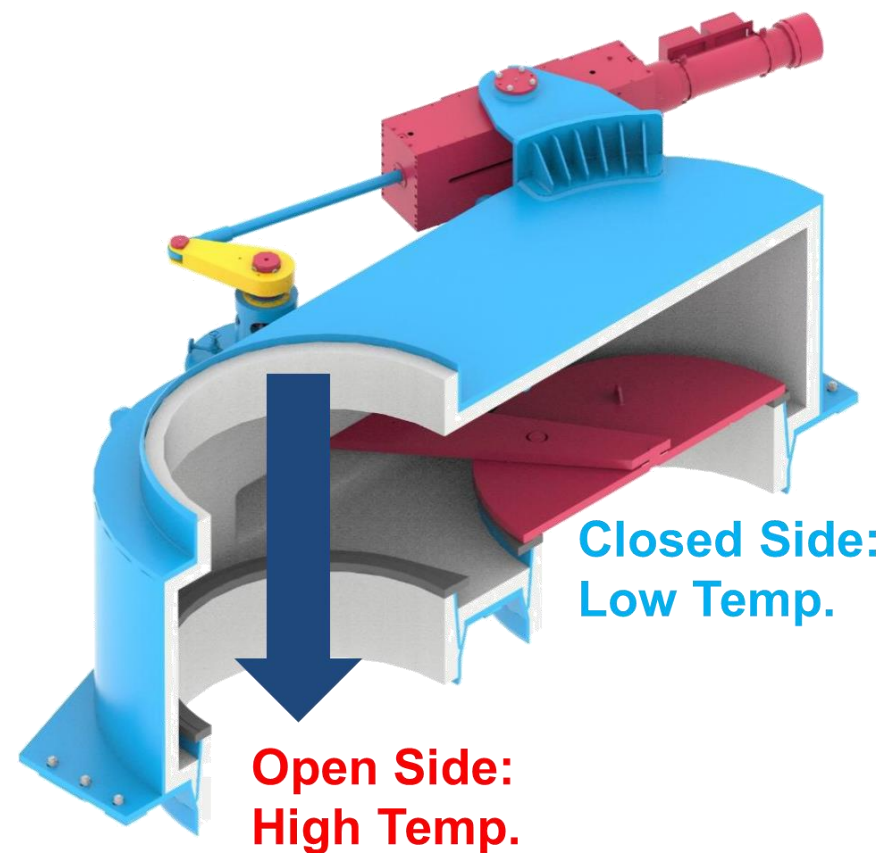


# Pendulum Style – Special Features

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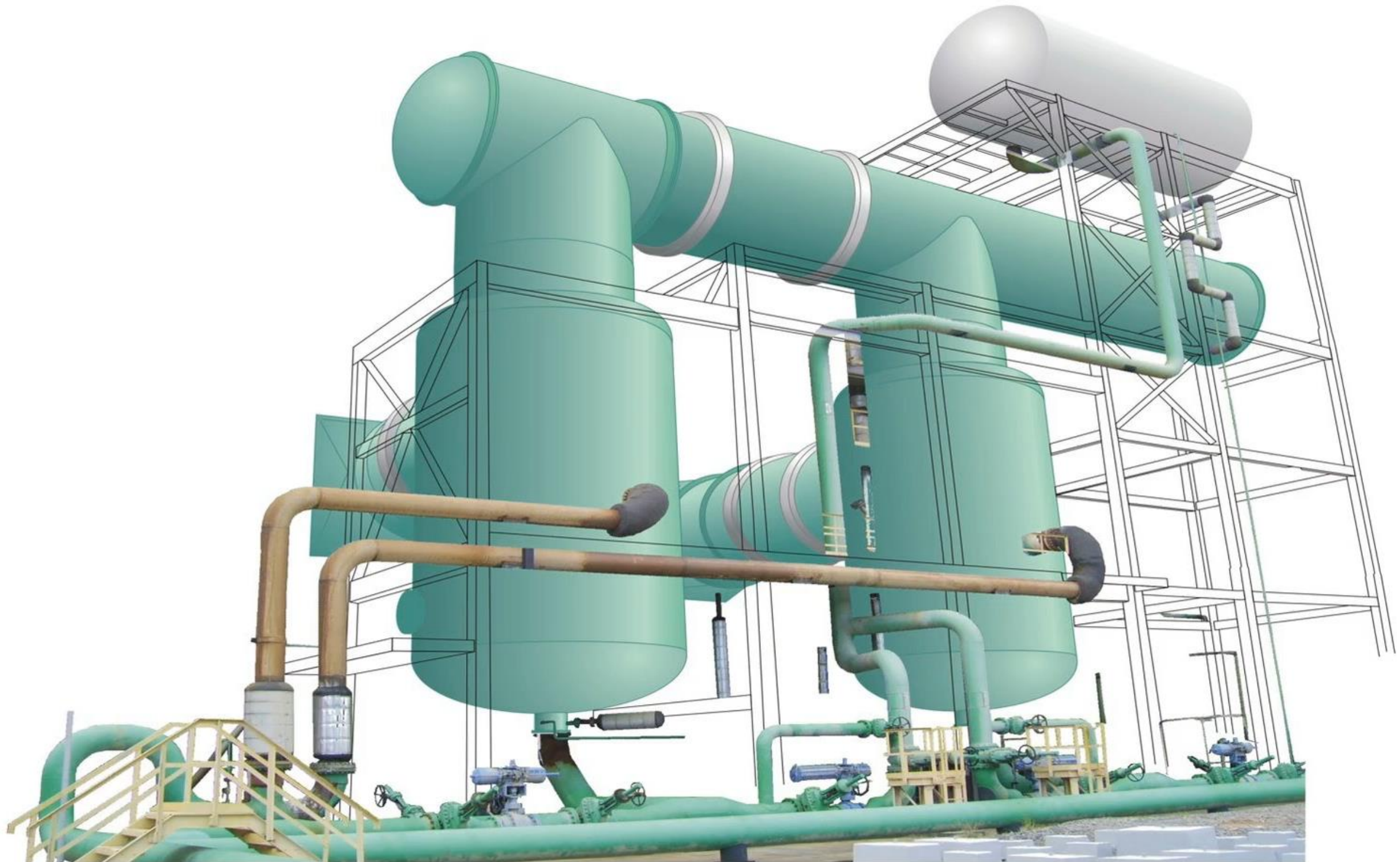
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- Shaft is made of ALLOY X750, a nickel based high performance steel, with outstanding stress/corrosion strength at high temperature.
- Disc Arm connection to Disc consists of two pins, which allow both the motion transfer between Disc Arm and Disc, and constrain the disc against its rotation.
- A special sloped profile of disc and guides allows a smooth sliding during stroke even with under not uniform temperature distribution.





# Installation Sequence





# Flue Gas Isolation and Bypass

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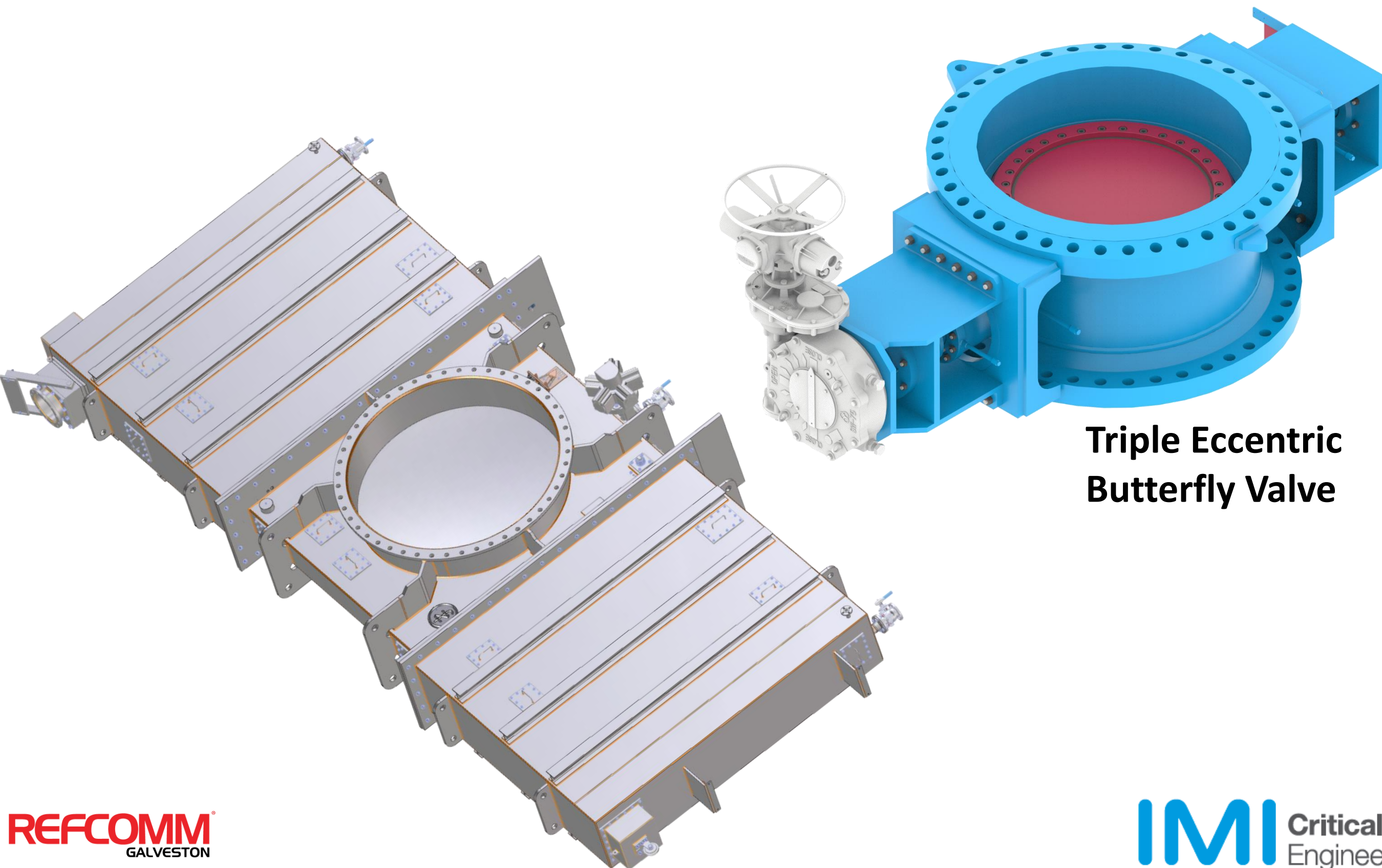
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- Isolating Low Pressure Side of Flue Gas Line
  - *Co Boiler*
  - *Electrostatic Precipitator*
  - *Flue Gas Scrubber*
- Different Technical Solutions are available. Selection of the best one will depend on many side parameters and will require a dedicated Technical Analysis for each application.
- Main features, pros/cons are resumed in the following slides.

# Flue Gas Isolation Valves

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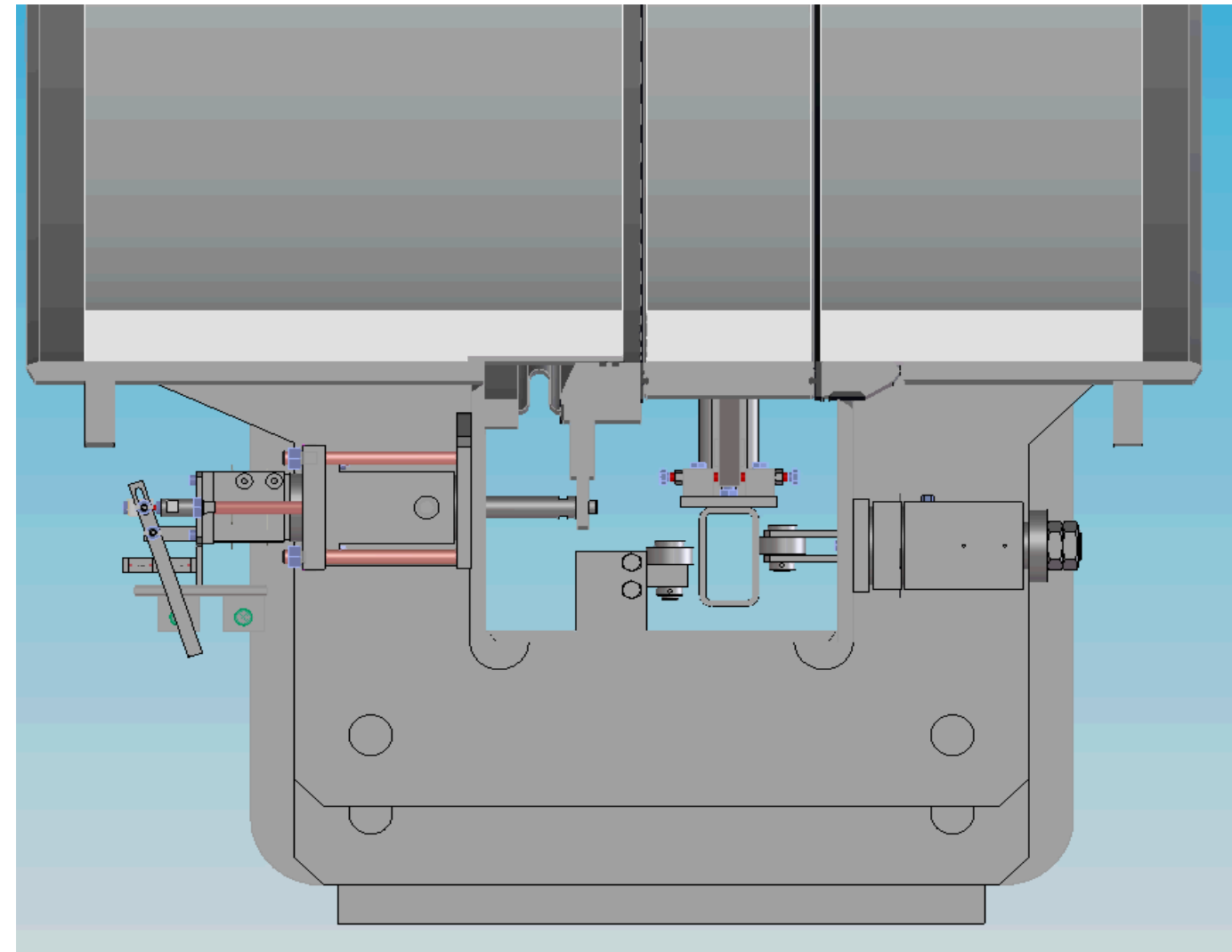
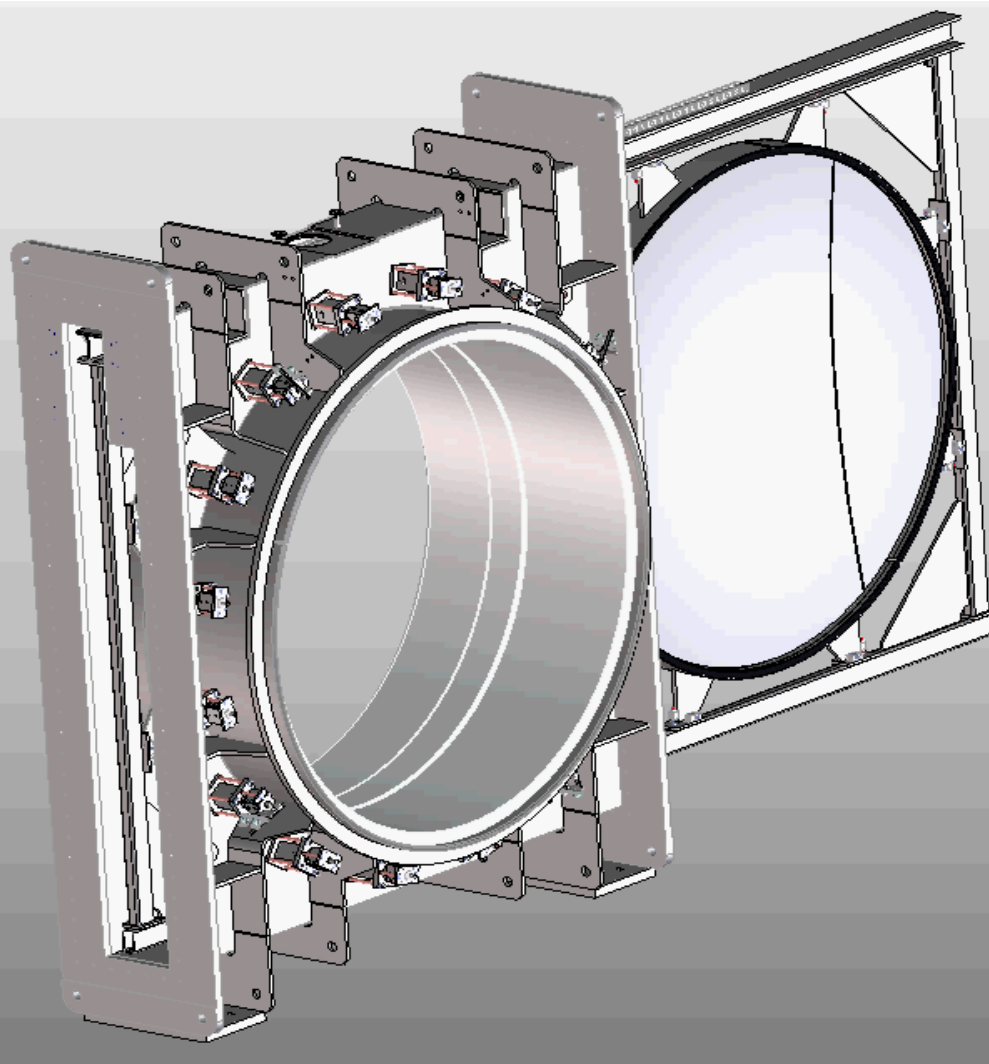


**Triple Eccentric  
Butterfly Valve**

# Goggle Valve – Stroking Sequence

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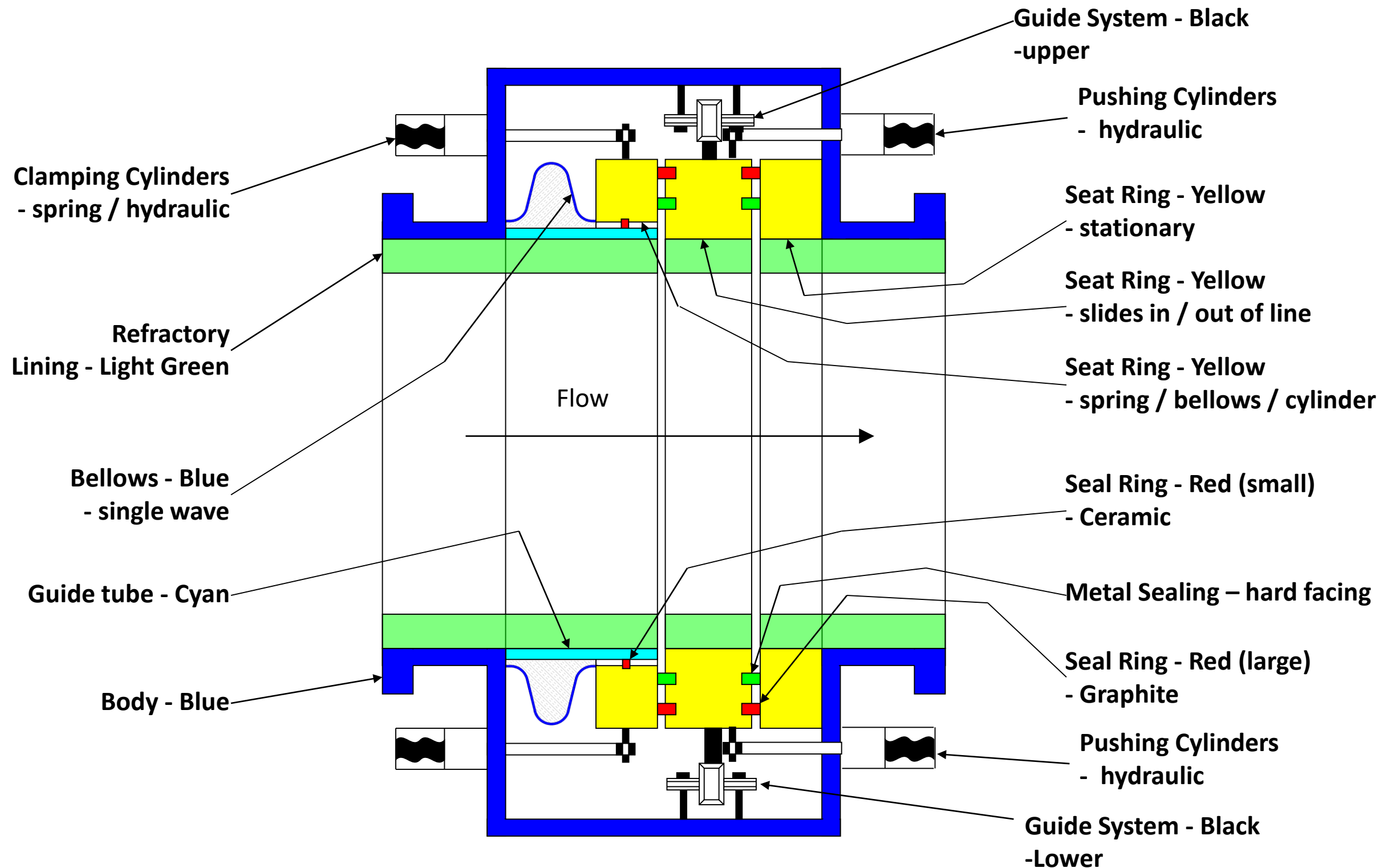




# Goggle Valve – Internal Components

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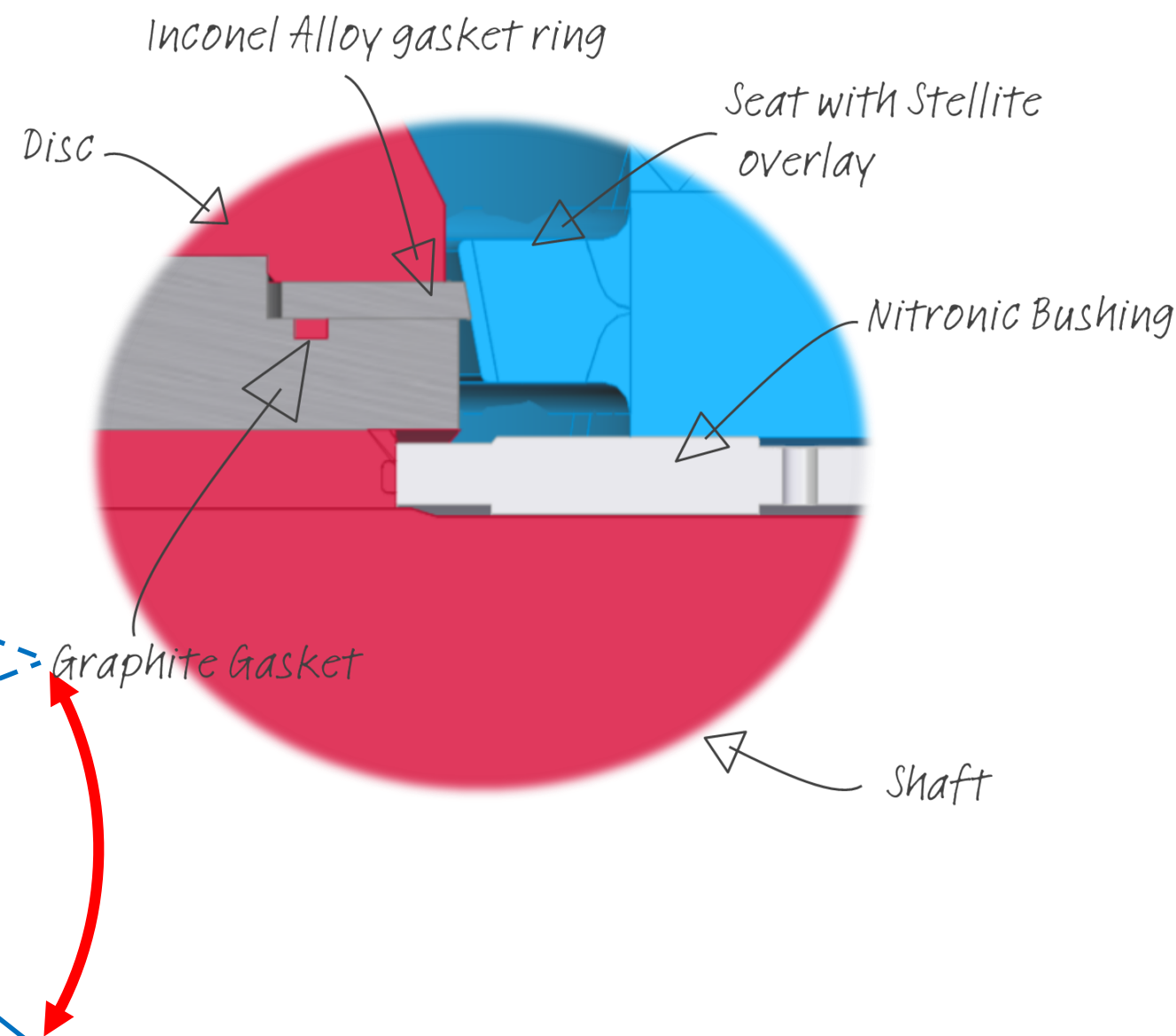
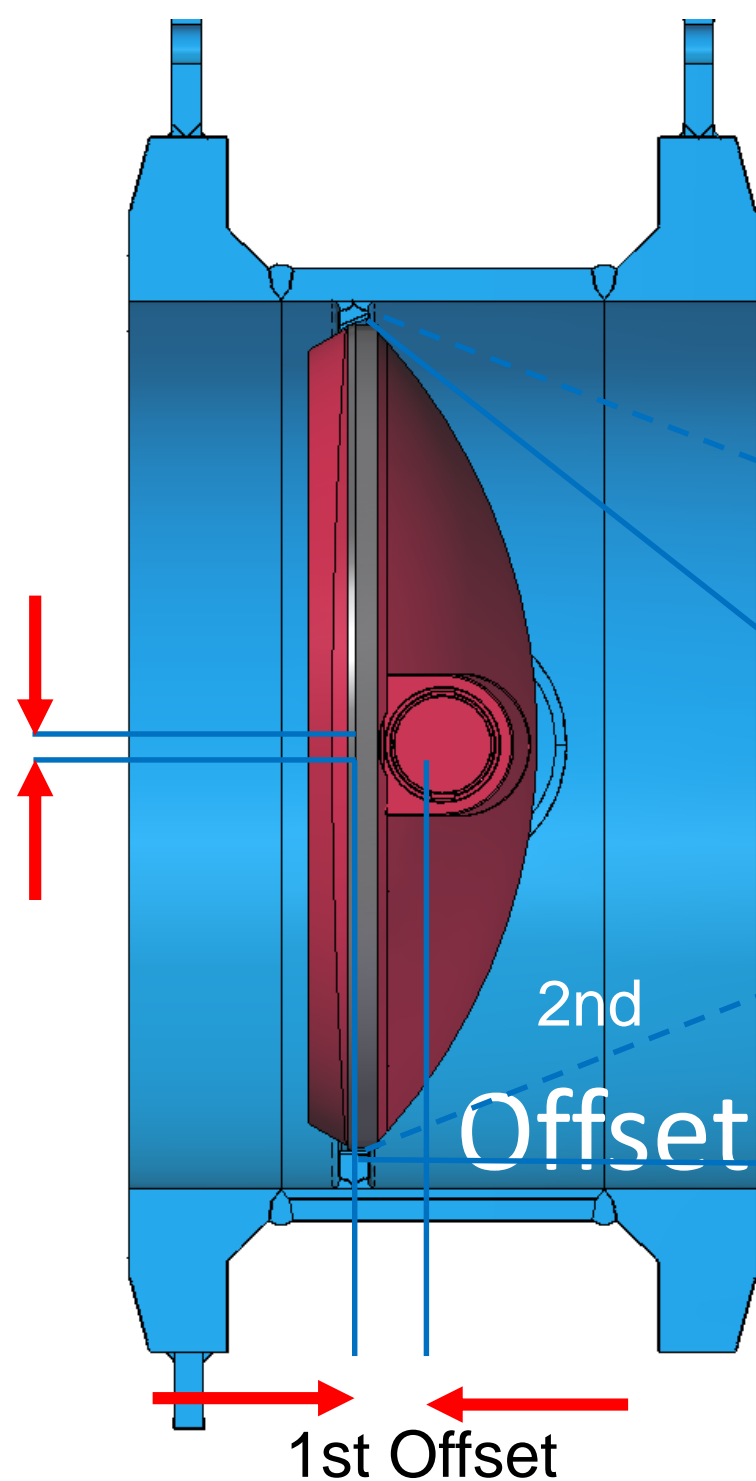
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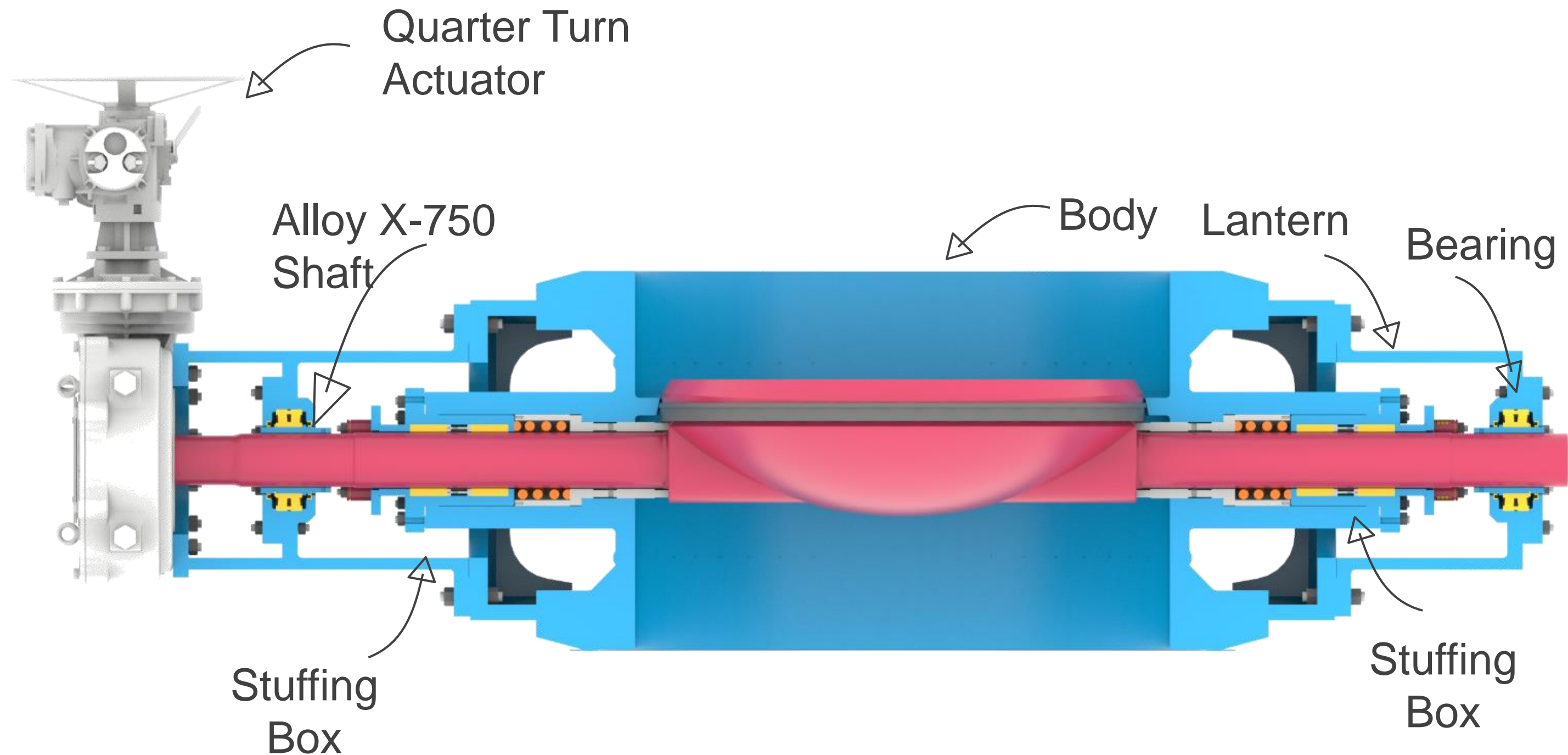
# Triple Eccentric Valve

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- Up to ANSI FCI 70-2 Class V
- Hot / Cold Wall design
- Disc 0 to 90°
- Electro - hydraulic or electrical actuation
- Up to 780°C





# Goggle vd Triple Eccentric

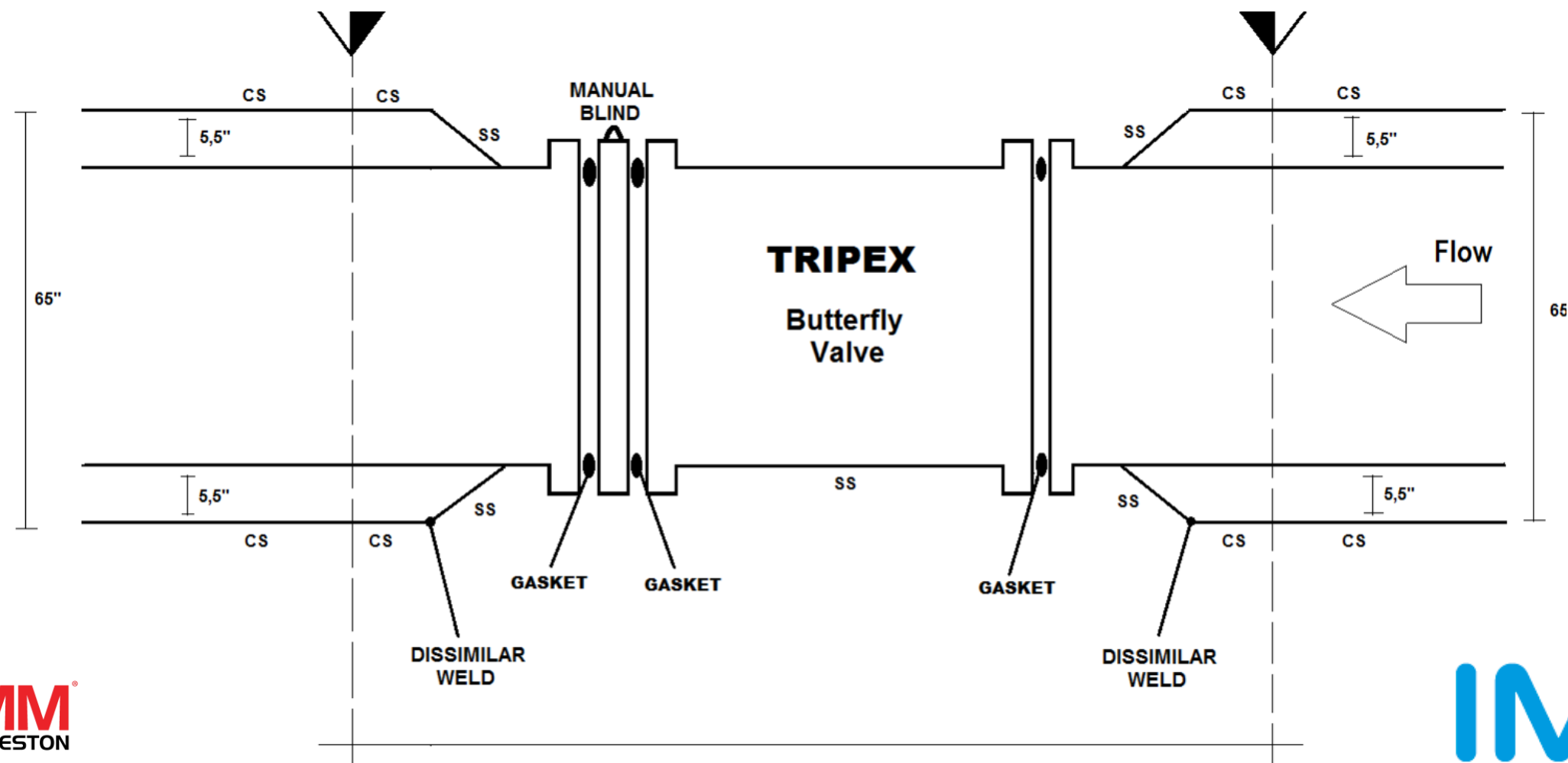
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Feature List	Goggle Valve	Triple Eccentric Butterfly Valve
On/Off	Yes	Yes
Control	No	Yes
Design Pressure	Low – Medium	Low – High
Pressure Drop	Zero	Low
Double Block and Vent	Yes	No
Horizontal/Vertical Line	Yes	Yes
Retrofittable on existing line w/o Structural works	No	Yes
Can do ESD or Fast Action	No	Yes

## □ North America Customer

- *The existing CO- Boiler isolation valve where Class II (step seated butterfly) and the leakage in closed position was posing safety issues.*
- *A Triple Offset Valve was the correct solution.*
- *IMI Remosa designed also the custom CW/HW transitions.*





# User Experience – CO Boiler Isolation Valve





# User Experience – Google Valve

- ***Project Requirements***
- ***North American Plant***
  - *Construction of new Flue Gas Scrubber system*
  - *Treat emissions from both the FCK & FCC by reducing the following:*
    - *SO<sub>2</sub> , SO<sub>3</sub> , and NO<sub>x</sub>*
    - *Greenhouse Gases*
    - *Reduce Overall Flaring*
  - *Safe and Reliable Isolation and Control of the following equipment:*
    - *Existing Flue Gas Stack*
    - *2x Vacuum Furnaces*
    - *2x SCR's*
    - *Waste Heat Boiler*
    - *Bypass Lines*
    - *New Scrubber Stack*

# Project Highlights

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- **Scope of Supply**

- **(11) Goggle Valves:**

- (1) 60", (1) 70",  
(3) 96", (4) 126",  
(1) 144" (1) 166"

- **(5) Butterfly Valves:**

- (1) 60", (1) 68",  
(1) 82", (1) 91",  
(1) 122"

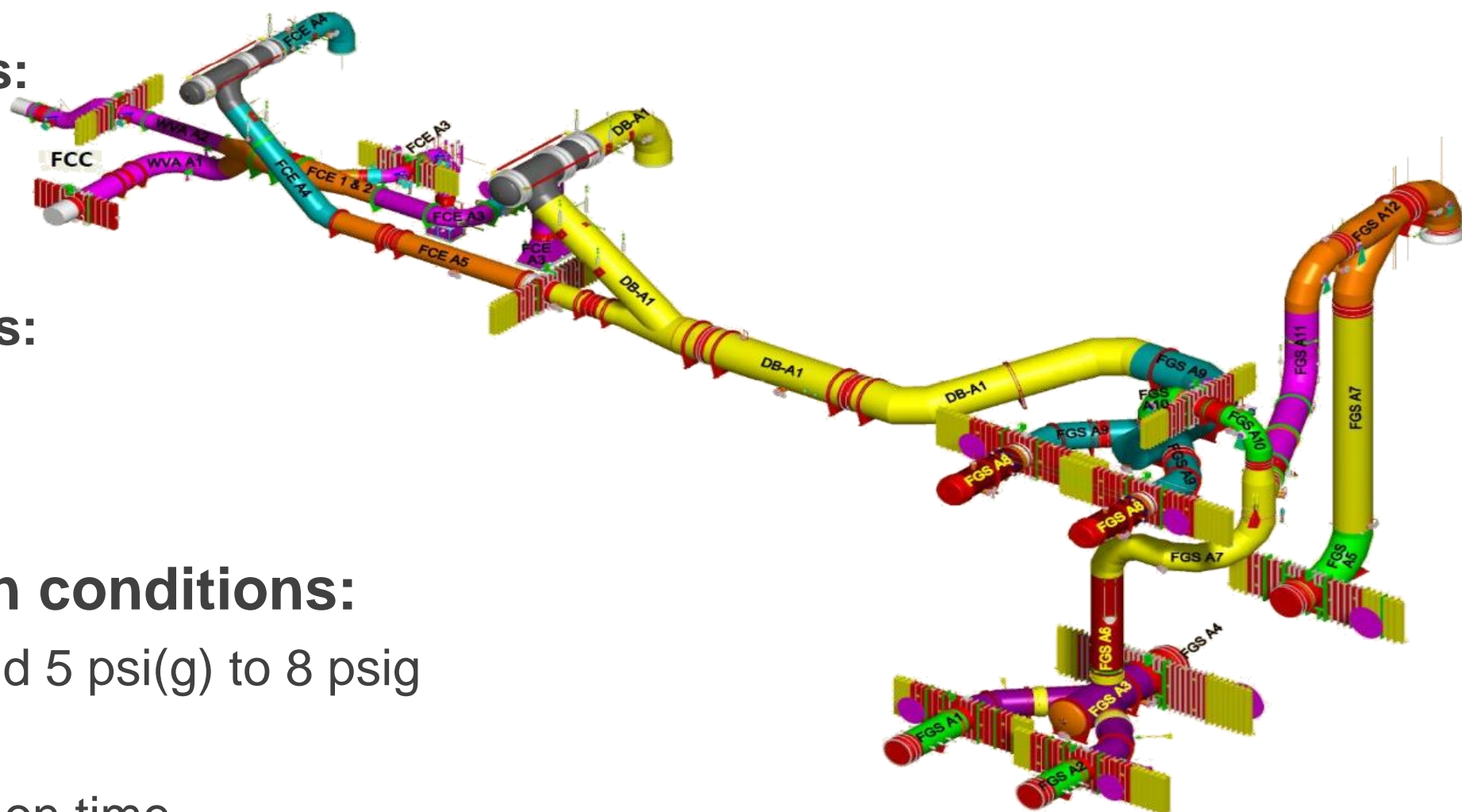
- **Goggle Valve design conditions:**

- 800°F to 1450°F and 5 psi(g) to 8 psig
    - Seismic Loads

- Entire project completed on time

- Delivery sequenced according to the site's construction and installation schedule. Each valve was rigged, removed from trailer and lifted into position upon arrival to minimize handling and crane movement.

- First T/A was recently completed without the need for any major maintenance or repairs. Visual inspection, basic PM activities, internal seal rings were replaced, and each valve was function tested.





# Flue Gas Scrubber Project





# Flue Gas Scrubber Project



Thank You!

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