



Zwick Valves in Sulfur Tail Gas (STG) Applications in Sulfur Recovery Units (SRU)

Crude Oil or Natural Gases that have H₂S (Hydrogen Sulfide) entrained in the flow stream means these medias are known as Sour Gas or Sour Crude. And the H₂S must be removed. The most significant gas desulfurizing process is known as the Claus process.

Gases and Crude Oils with over 25% of H₂S content are suitable for the recovery of Sulfur in these Claus process units. The H₂, hydrogen and the Sulphur compounds are separated in this process. The hydrogen is used for various services within the refineries and the sulfur is extracted to ultimately be converted into a solid to be sold on the commercial market.

The vast majority of the 64,000,000 tons of sulfur produced worldwide is a byproduct from refineries and other natural gas processing plants. Sulfur is used for manufacturing sulfuric acid, medicine, cosmetics, fertilizers, pesticides and rubber products.

In the process of Sulfur removal during the Claus process the Sulfur gas is looking for cavities within the internals of the butterfly valves. The largest internal cavity in a butterfly valve is the shaft bore where the metal bearing/bushings resides. Once the Sulfur gas enters this cavity and for some reason/s cools down to below the melting point of Sulfur of 115 C or 240 F it will change phases from a gas to a solid. Once this happens the butterfly valve shaft will be locked in one position until heat if applied to change the solid back into a gas phase. Bearing failures are the highest root cause of failures in Triple Offset Butterfly Valves (TOV). This problem is directly attributed to the need to have bearing/bushings with very tight tolerances when accepting the shaft diameter. Properly designed TOV's are metal to metal torque seated valves. Therefore, very little shaft deflection can be tolerated in order to properly torque the seal ring into the body seat. Adding this tight tolerance need and the STG cooling, valves will lock up.

Most butterfly valves in STG services will have either a bolt-on or a welded on steam jacket to deliver the latent heat from the steam to the body of the valve. Problem is the jackets may not be delivering the proper heat up into or down below to the bearing areas in the upper neck of the valve or in the bottom neck. Thus allowing the STG to cool below 240 F and locking up the valves. Plus, over time plant personal have turned off the steam to the steam jackets for one reason or another and allowing the Sulfur gas to change phases to a solid. Or improper installation of the steam traps on the outlets of the steam jackets allow for collection of condensate in the jacket affecting the ability of the jacket to deliver the proper heat to the valve.

We have the best solution for these problems in STG plants. Zwick Valves has been supplying our Sulfur Tail Gas (STG) valves with our patented Sealed Bearing feature for 21 years here in the US. In addition to the Sealed Bearings we also recommend and supply welded on steam jackets.

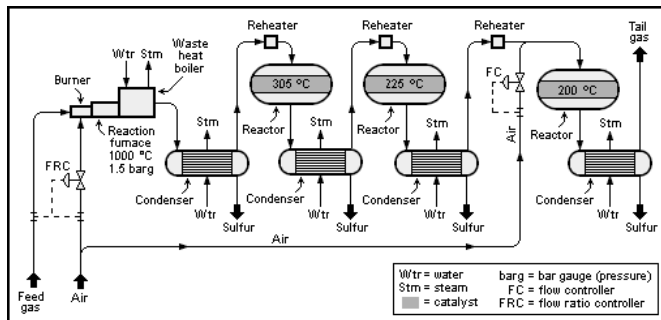
Our patented Sealed Bearing design has 3 lower graphic packing rings on the ID of the bearings and 3 graphic packing rings on the OD of the bearings. Using the load put on the upper packing by the packing studs the graphic rings are put under a load and sealing the bearing cavities on the ID and the OD. Thus preventing the STG from entering the bearing cavities. (The lower Sealed Bearings are loaded by the

outer bearing protruding slightly beyond the bottom of the lower bonnet, so that when the bottom cover plate is bolted on it loads the bearing to capture and load the graphic rings in our bearings.

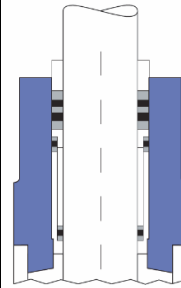
Other manufactures will say they too have a bearing protection ring. And it will consist of only one ring of graphic packing that is not under a load, therefore this one ring will flatten out over a very short period of time and the STG can and will get into the bearing cavities.

To prove what Zwick Valves is saying is the fact that just about every major refiner in the US has changed out our competitors to Zwick Valves with our Sealed Bearing feature and a welded on steam jacket. We have many plants that have had our valves in STG service for over 15 years. We have STG valves in sizes up to 48", one in particular has been in service since 2007 and has never been pulled for service. Following Companies has our valves in STG services:

- Phillips 66
- Conoco Phillips
- Valero
- ExxonMobil
- Shell
- Lyondell
- Marathon
- Torrance Refinery California
- Pasadena Refining
- Citgo



Claus Process Diagram



Drawing of our Seal Bearing