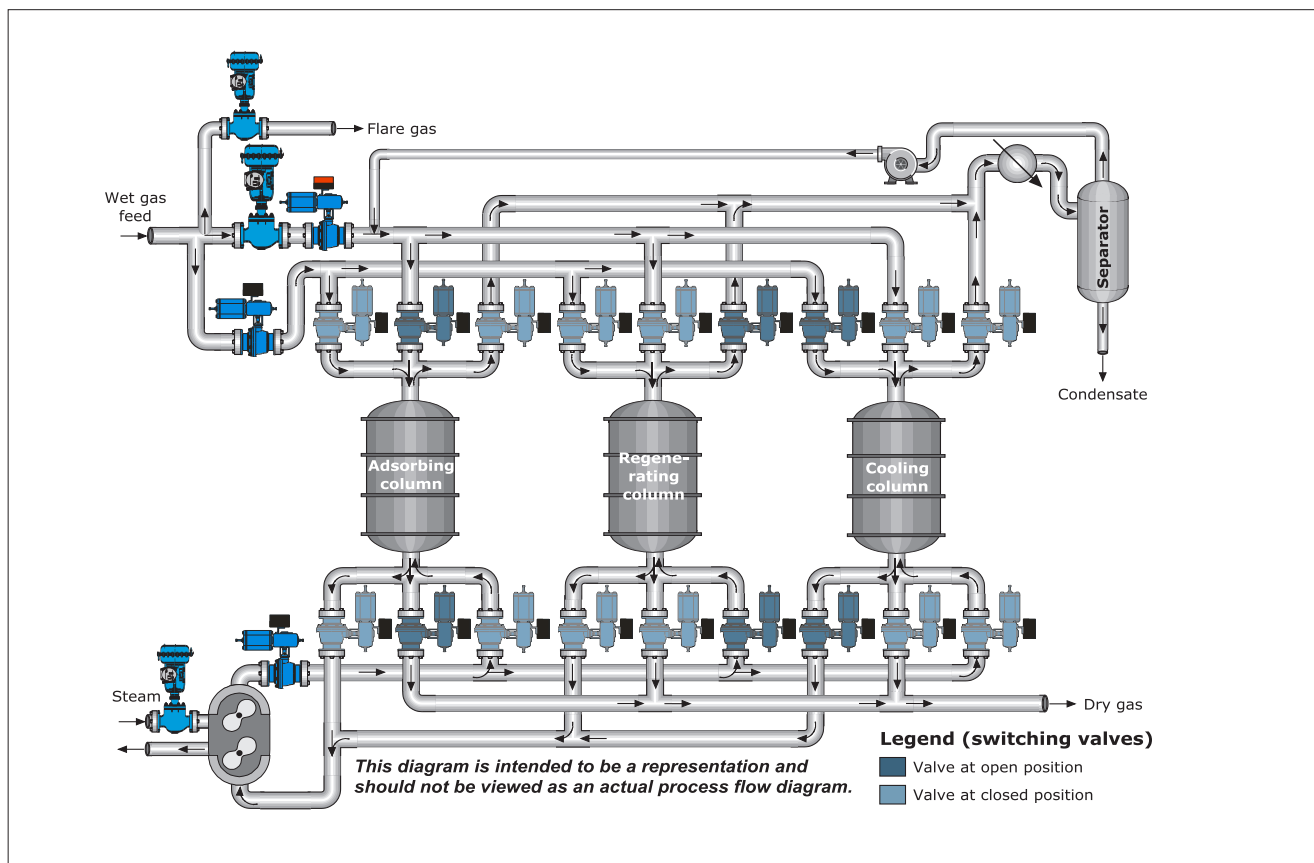


Molecular sieve valves



Process overview

In gas processing, molecular sieving is a common practise to remove impurities (e.g. H₂O, H₂S and CO₂). A typical system consists of two or more columns packed with molecular sieve material. As the wet or sour stream is processed in one column, the other column is being regenerated.

Prior to entering the column for the adsorption phase, the gas stream enters an inlet horizontal separator (not pictured) for removal of water and other liquid contaminants. After the separator, the stream flows down into the adsorption column. Desiccant in the column then adsorbs the impurities. When the desiccant bed approaches maximum saturation, the inlet stream is automatically switched to the regeneration column. The switch from adsorption to regeneration is made possible by programming the control system to a sequential automated cycle.

Dry gas exits the adsorption column and is directed to a dust filter to remove any dust that may have appeared from the breakup of the desiccant.

Heating a portion of the mainstream in a direct-fired heater and passing it through the bed regenerates the saturated desiccant bed. The under-saturated regeneration stream removes water, H₂S, CO₂ and liquid hydrocarbons.

The regeneration stream exits the column and is cooled. Cooled regeneration gas will flow to the regeneration gas separator where condensed water is removed. Gas exiting the regeneration gas separator will be sent to the regeneration gas compressor. The compressor elevates the pressure of the regeneration gas to allow it to be recycled to the inlet of the gas adsorption column.

Process applications

The process has multiple valves for controlling inlet streams and process safety. However, by far the most important valves in the process are the switching valves. Proper gas drying and therefore reliable functioning of the switching valves is important to the plant uptime, process efficiency and the quality of the processed gas.

Switching valves

The switching valves, sometimes referred to as dryer sequencing valves, play an important role in a molecular sieving system by directing the stream of gas in/out of the columns. They are closed and opened in a preset sequence to switch the columns from adsorption to regeneration and vice versa. Each column has a minimum of four switching valves.

Cycling frequency varies depending on the molecular sieving system, but typically these valves cycle three to four times per day. Relatively low temperatures are used during the adsorption phase, but during regeneration the temperature can rise up to 250-400 °C (480-750 °F). Typically the pressure ranges around 40-100 barG (580-1450 psig). Depending on the type of process and dryers, the valves have to be capable of withstanding moderate or huge temperature and pressure fluctuations. It is also common for dust to escape from the molecular sieve beds, which presents an additional challenge for the valves. The sizes typically range from 2" to 18", but bigger sizes are possible in large gas dryers. Valves are typically required to have fail to close failure action.



Neles ball valve

Neles™ solution for switching valves

With over 30 years of experience in molecular sieving applications, **Neles trunnion mounted ball valves** are the optimal solution for ensuring efficient and safe molecular sieving.

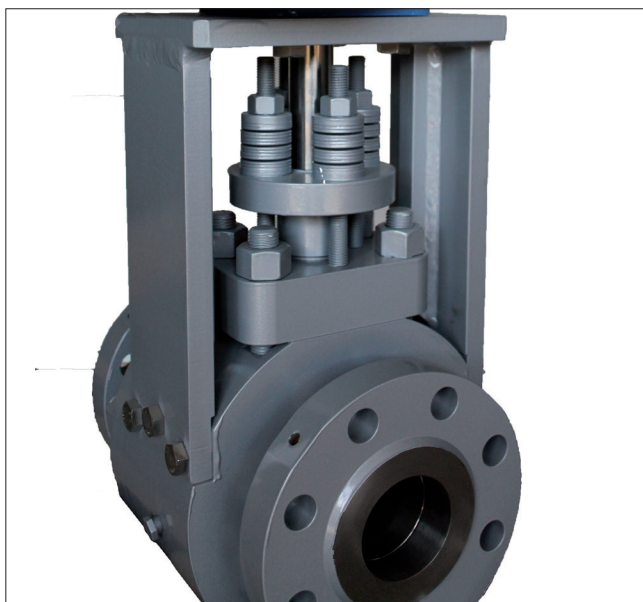
- **Reliable operation and excellent response** even with high-pressure differentials
- **Low emissions** ensured by rotating stem design and self-lubricating live-loaded packing
- **Dust and particle build-up resistant** as the ball and seat are in continuous contact effectively wiping the seat with each cycle
- **Compact size and light-weight** making installation easier and allowing savings in piping costs
- **Trunnion mounted design** providing low friction and operating torque
- **Certified up to SIL 3** by third parties
- **Hard coatings available** including NiBo and Tungsten Carbide
- **Temperature swing resistant** from low adsorption temperatures to high regeneration temperatures
- **Pressure classes from ASME 150 to 1500**

For larger pipe sizes and less demanding applications, **Neldisc™ triple eccentric butterfly valves** are a field-proven and economical solution.

- **Reliable and low maintenance** due to simple construction
- **Small outline and low weight** allowing savings in both valve and piping costs
- **Low operational torque** reducing wear and actuator size
- **Triple eccentric design** ensures reduced friction and long operational life
- **Unique full metal seat design** assures tightness over long operational periods
- **Mechanically induced disc and seat contact;** does not rely on differential pressure for tightness.
- **Robust and heavy-duty stem and bearings** excellent in thermal cycling and media with impurities
- **Temperature swing resistant** from low adsorption temperatures to high regeneration temperatures
- **Pressure classes from ASME 150 to 600**

Neles piston type pneumatic cylinder actuators ensure reliable and safe valve actuation.

- **Wear resistant bearings**, providing support for the lever arm to reduce friction and expand operational life
- **High performance and accuracy** making efficient process control possible
- **Robust design** – standard anodised/chromed cylinder pipe, hard chromed piston rod, corrosion resistant construction and high quality springs
- **Modular construction** allowing fast assembly and efficient spares handling
- **Mounting position is up to the user** making piping design easier and cheaper
- **Simple actuator design** making it easy to mount accessories
- **Certified up to SIL 3** by third parties
- **Wide temperature range**, from -55 °C to +120 °C (-67 °F to +250 °F)



Rotating stem with live-loaded emission-proof packing



Metallic bellows seat capable of ensuring long-lasting, two-way tightness in large temperature fluctuation during adsorption and regeneration cycles

Benefits

- Reliable and field proven valve operation
- Save piping and valve costs with compact and lightweight valve solutions
- Eliminate problems caused by escaping desiccant dust
- Meet strict reliability, safety and environmental requirements
- Meet process uptime targets and scheduled shutdown plans of 4-5 years

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