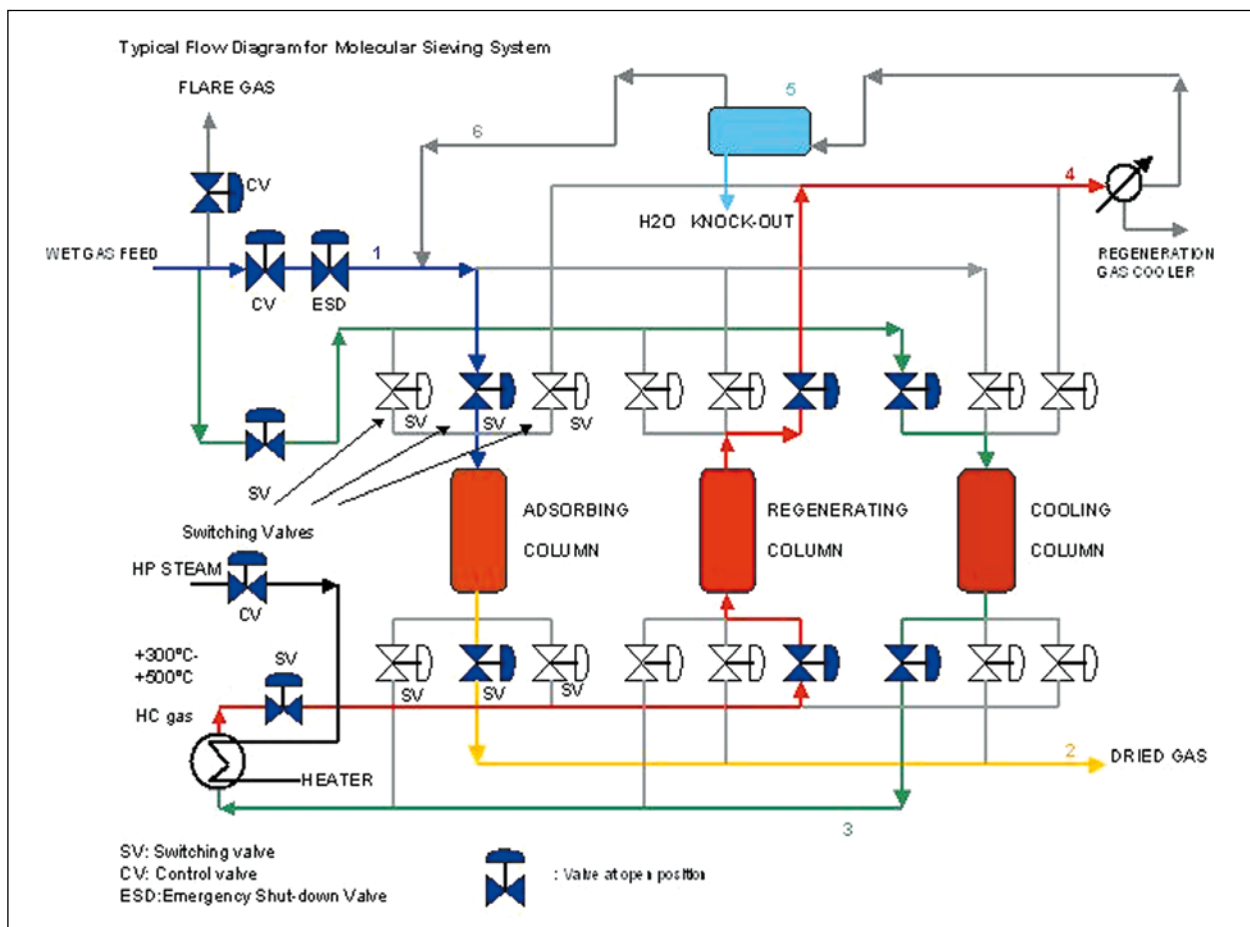


MOLECULAR SIEVING SYSTEM



In gas processing, molecular sieving system is a common practise to remove impurities (eg. H_2O , H_2S , CO_2 etc). A typical system consists of 2 or more columns packed with molecular sieve material (Zeolites). As the wet or sour stream is processed in one column, the other is regenerating.

Prior entering the column for the absorption phase, the gas stream enters an inlet horizontal separator (not shown in diagram) for removal of water and other liquid contaminants. After the separator, the stream flows into the adsorption column (1). Desiccant in the column adsorbed the impurities and this phase occurs in a down-flow direction. 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 will exit the adsorption column and directed to a dust filter to remove any dust from the breakup of the desiccant (2).

Heating a portion of the mainstream in a salt bath or direct-fired heater and passing it through the bed regenerates the saturated desiccant bed (3). The under-saturated regeneration stream removes the water, H_2S , CO_2 or liquid hydrocarbons.

The regeneration stream exits the column and cooled (4). Cooled regeneration gas will flow to the regeneration gas separator to remove condensed water (5). 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 (6).

Switching Valve in Molecular Sieving System

The switching valves on the molecular sieving system plays an important role of directing the inlet/outlet stream of gas into the columns hence switching the columns from an adsorption phase into regeneration phase (and cooling phase) in a preset sequence. Each of the columns would have at least 4 switching valves. These valves are sometimes called dryer sequencing valves. Cycling sequency may vary depending on the molecular sieve system, but typically these valves cycles from three to four times every day. Process has a wide range of temperature and pressure parameters. Temperature range of 25 °C to 400 °C and operating pressure of up to 100 barg are typical in a molecular sieve system. Hence, the valve in service are required to withstand these range of fluctuation in temperature and pressure plus the need of a tight shut-off valve. An additional challenge for switching valves are caused by particulates (molecular dust) coming from molecular sieving columns in regeneration sequence. Operation speed requirement for valves are not demanding, although cycling is done frequently. Valves requires typically fail to close action.

Metso Automation's Solution Valves



Neles trunnion mounted ball valves.

- ❑ Neles Stemball® design ensures reliable operation and excellent response even with high-pressure differentials
- ❑ Trunnion mounted to gives lower friction and operating torque
- ❑ Spring loaded metal seats; durable tightness, two-way tight; excellent in high-cycling applications
- ❑ Suitable for impure and abrasive fluids
- ❑ High capacity per nominal size
- ❑ Stable and accurate control
- ❑ High MTBF (Mean Time Between Failure)
- ❑ Certified up to SIL 3 safety system by Lloyds' with Neles B series actuator
- ❑ Optional bellow seat for improved tightness in high pressure/temperature environment

- ❑ Various options of ball coating, eg; NiBo, Tungsten Carbide (CrC)
- ❑ Meeting the strictest environmental regulations, low emissions
- ❑ ASME Class 150 to 1500
- ❑ Temperature range: -200 °C to +600 °C / -328 °F to +1110 °F



Neldisc® Metal Seated Flanged Butterfly Valve; L6 series

- ❑ ZeroLeak triple offset metal seat design excellent in high cycle, high temperature and abrasive application.
- ❑ 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.
- ❑ Bi-directional tightness even in large thermal cycling
- ❑ Low friction and wear resistant
- ❑ Low operational torque; minimized actuator size
- ❑ Robust and heavy-duty stem and bearings excellent in thermal cycle and medium with impurities
- ❑ High MTBF (Mean Time Between Failure)
- ❑ ASME Class 150 to 600
- ❑ Temperature range: -200 °C to +600 °C / -328 °F to +1110 °F)

Actuator

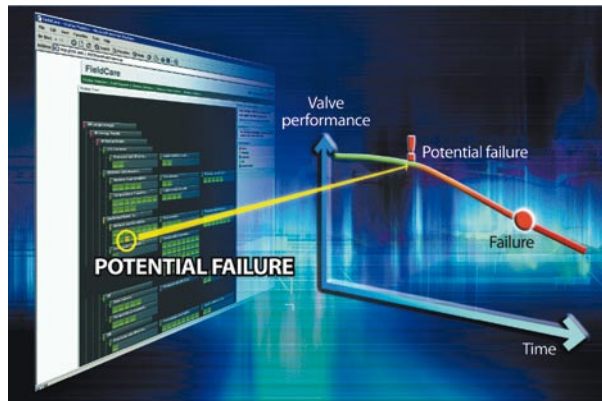
Neles B series Double Acting and Spring Return Actuators

- ❑ Designed for extreme long cycle life
- ❑ Self-contained spring cartridge for increased reliability
- ❑ Wear resistant bearings
- ❑ Corrosion resistant housing for the most demanding operating environment
- ❑ Torque output from 40 Nm to 100,000 Nm/30 ft.lbs to 73,800 ft lbs for maximum air supply of 10 bar/ 145 psi
- ❑ Temperature range: -40 °C to 120 °C / -40 °F to +250 °F (Operating temperature has to be specified prior to order)
- ❑ Options include:
 - High cycle design
 - Oversized Cylinder design
 - Manual overrides
 - Locking devices

Recommended Option*Neles SwitchGuard™, intelligent on/off valve controller*

Neles SwitchGuard is an intelligent controller for pneumatic on/off valves. SwitchGuard is designed to meet and exceed the demanding requirements of process-critical switching operations, particularly in high cycling applications. Excellent reliability and large air capacity are essential characteristics for products operating in such conditions. With SwitchGuard and especially when used with Neles FieldCare, you can get the visibility and improved accessibility to all of your critical On/Off valves and utilize the unique diagnostics features to guarantee high availability for your on/off applications. Metso Automation highly recommends SwitchGuard as a complete valves solution for the Molecular Sieving System.

Neles FieldCare is a field device configuration and condition monitoring tool. FieldCare features remote access to devices, diagnostics and calibration. All devices are available from one location. FieldCare's multi communication protocol support is based on FDT/DTM technology. FieldCare's advanced condition monitoring reduces troubleshooting time, increase response time and enables predictive maintenance of field devices.

**Benefits:**

- ☐ Increased reliability
- ☐ Visibility to your valve
- ☐ On-line diagnostics always available
- ☐ Speed control with wide selection of open / close ramps
- ☐ Open solution
- ☐ Cost saving with the simpler solution to install and maintain



The information provided in this bulletin is advisory in nature, and is intended as a guideline only.
For specific circumstances and more detailed information, please consult with Metso Automation.

**Metso Automation, Flow Control****Europe**, Levytie 6, P.O. Box 310, 00811 Helsinki, Finland.

Tel. +358 20 483 150. Fax +358 20 483 151

North America, 44 Bowditch Drive, P.O. Box 8044, Shrewsbury, MA 01545, USA.

Tel. +1 508 852 0200. Fax +1 508 852 8172

South America, Av. Independência, 2500- Iporanga, 18087-101, Sorocaba-São Paulo

Brazil. Tel. +55 15 2102 9700. Fax +55 15 2102 9748/49

Asia Pacific, 238A Thomson Road, #25-09 Novena Square Tower A, 307684 Singapore.

Tel. +65 6511 1011. Fax +65 6250 0830

China, 19/F, the Exchange Beijing, No. 118, Jianguo Lu Yi, Chaoyang Dist, 100022 Beijing, China.

Tel. +86-10-6566-6600. Fax +86-10-6566-2575

Middle East, Roundabout 8, Unit AB-07, P.O. Box 17175, Jebel Ali Freezone, Dubai,

United Arab Emirates. Tel. +971 4 883 6974. Fax +971 4 883 6836

www.metsoautomation.com