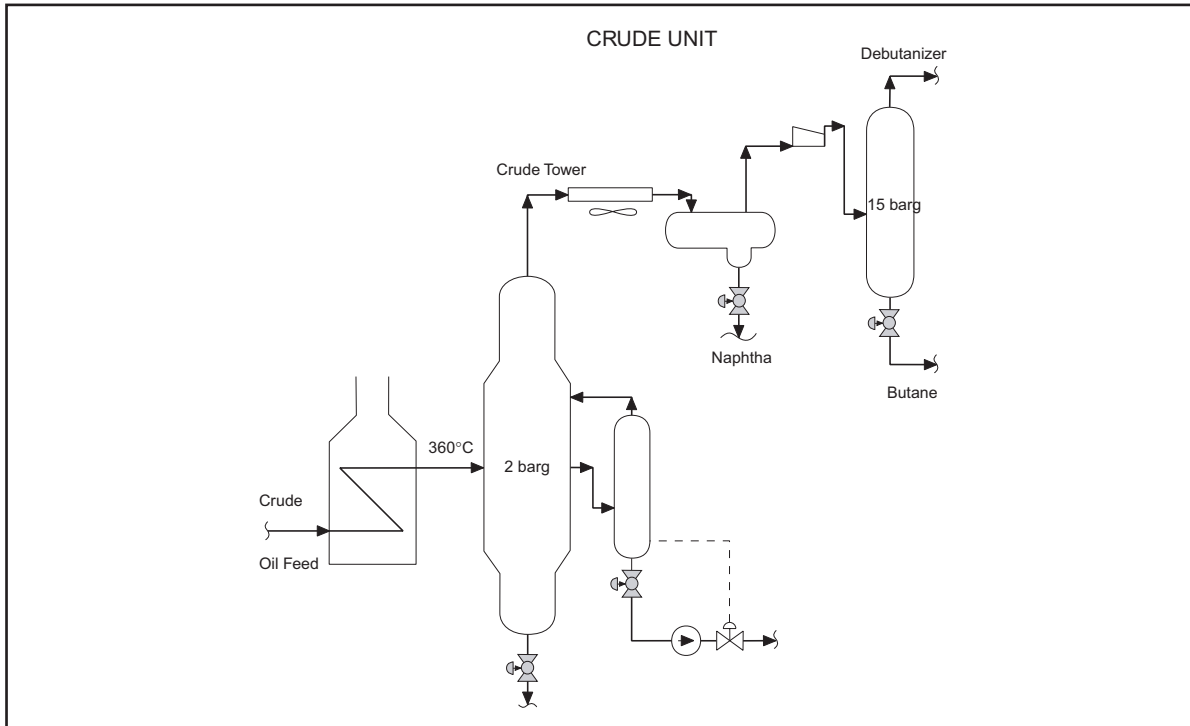


Oil refinery and other units processing hydrocarbons - ESD valves with high integrity level



Introduction

There are fire and explosion risks in the units processing flammable hydrocarbons in case the fluid comes in contact with the atmosphere. If there are high- and low-pressure sections in the plants like e.g. in refinery HDS (hydro desulphurisation) units, the low-pressure side has to be protected against high pressure in case of control failure.

Traditionally the number of emergency shut-off valves (ESD) in the process lines in a refinery is not very high.

With Neles ValvGuard's partial stroke testing functionality the ESD valves are automatically diagnosed for their operability while the plant is in operation. With this technology general plant safety can be improved in a cost effective way.

Neles ValvGuard can be installed in all type of pneumatic actuated emergency shut-off or blow-off (ESV) valves.

The following areas need special attention because of increased risks:

Distillation tower bottom areas

The fluid is in liquid phase in the lower part of the towers and under the pressure by the large gas volume in the unit. In case of e.g. a shaft seal leakage at the bottom-flow pump, large volumes of liquid may run out.

A fire safe ESV valve in the bottom line reduces effectively the probable maximum loss in these locations.

Towers of special interest to the safety engineer

- Towers with LPG
- When a droplet of LPG leaks out it vaporizes and a 200 times larger hydrocarbon gas volume is formed
- Crude oil and heavy oil distillation.

X Series Ball Valve with Spring-to-close Actuator and Neles ValvGuard



Due to the high oil temperature a smallest leakage may cause a fire. Coke formation takes place in temperatures above 300 °C. This and the corrosiveness of the oil are causing need for more cleaning and maintenance at the pumps and their suction filters than with clean fluids. These operations are to be executed when hot oil under pressure flows in the neighboring piping.

High pressure separator outlet lines

The treated oil in the reactor section is collected in the hp-separator from where it is let down to the low-pressure section for fractionation.

The extreme case: Hydrocracking unit. The pressure in the reactor loop is about 200bar but on the distillation side it is about 10bar. The ESD valve must work if the control valve fails.

Note 1: Separate reports are available to discuss the ESD valve solutions in heater areas, valve selection for heavy cokey oil and for turbo compressor isolation.

X series valve offering

The X series XA, XT is a seat-supported ball valve with full bore, type body, and reduced bore, type XB, XC, body versions.

For emergency shut-off the reduced bore version is in most cases acceptable for better economy. It is also technically recommended for smaller actuator size and therefore shorter closing time and lesser space demand and less total weight.

For large nominal sizes and high pressures Neles have in program trunnion-mounted ball valves.

Seat options, soft or metal-seat

The program includes normal soft seats and all-metal seats.

For applications with fire risk the all metal-seated valve is recommended. Compared to the soft-seated ball valves the first ones are not delivered drop-tight but the leak rates of metal-seated valves are negligible from the point of view of sustenance of the fire. They are much less than the leak rates of a soft-seated ball valve when the seats are partially destroyed by the fire or when the seats are completely destroyed and the sealing takes place by the secondary metal contact like demonstrated in the fire-safety tests.

Metal-seated valves needs higher operating torque than soft-seated valves.

The X series offering is designed primarily for metal seats, which is revealed in the use of driver-design and high-strength steels in the torque transmission from stem to the ball.

Series XA, XT / XC, XB with metal seats.

Maximum leak rates, metal seats

Standard factory testing:

ISO 5208 Rate C (equals to 30% of IEC/ISA class 5 leakage at 20bar test pressure)

Valve size	Leak rate ml/min	
	Rate C	Rate B
2"	0.09	0.03
3"	0.14	0.05
4"	0.18	0.06
6"	0.27	0.09
8"	0.36	0.12

ISO Rate B (10% of class 5) is a standard option.

The body has the pressure release property over the seat which has the back-up spring.

Series XA, XT / XC, XB with PTFE seats

The design has the body cavity pressure release property.

The soft seated X series is fire tested.

Actuator and control options

In usual pressures and valve sizes in refineries Neles series BJ spring-to-close actuator is the most suitable selection.

For normal applications the stroking times achieved with the Neles ValvGuard alone may not be short enough.

For the quick closing action a separate quick exhaust valve (QEV) or volume booster (VB) mounted in series to Neles ValvGuard can also be used.

Typical full stroke closing times with ValvGuard only and with extra instrumentation:

Valve size	Typical Closing Times	
	With VG only	VG with VB or QEV
2"	< 4 s *)	< 1s
8"	< 45 s *)	< 3s *)

*) Depending on the actuator size used

In case of the air supply failure the ValvGuard drives the valve to closed position automatically.

Other actuator options:

Double acting actuator with air volume tank:

- Used for reducing the cylinder size and shortening the closing time in large valve sizes.
- With the power from the tank it is possible to operate the valve few times in case of the air failure.

Electric actuator with a gear:

- Used e.g. in tank farm and loading areas, if air supply is not available. Operation times are longer than with pneumatic actuators.
- Because of the fire risk the actuator and the power cables should be specified for a certain burning time.
- Because of the cabling costs, the total costs of electric actuation are essentially higher than the costs of pneumatic system, which relies on the existing instrument air network.

Neles ValvGuard can be installed to pneumatic actuators only.

Neles ValvGuard

Most ESD valves can be closed at least some degrees without causing harm to the process. Also, ESV valves which have suitable dead angle (e.g. most ball valves) can be opened few degrees without opening the flow.

Neles ValvGuard can partially close or open the valve to check it's operation. The valve movement during partial stroke testing can vary between 3-100%. Normally this value is 20% for normally open valves, if process allows. For normally closed valves the partial stroke test size needs to be less than the valve dead angle, which is normally between 5-15%.

During the partial stroke test the cylinder pressure is measured. That information is used for the diagnostics information, i.e. valve breakaway pressure and load factor calculations.

Refer to bulletins 9VG20 and 9VG20B for more information about Neles ValvGuard and it's functionality.

Fire protection

Burning tests have been made with Neles actuators and with Neles ValvGuard for demonstrating their capability to close the valve in case it is subject to high temperature.

Refer to bulletin 6B20 about standard actuators and fire safe boxes for Neles pneumatic actuators for keeping the actuator remotely operable in case of probable fire durations.

Other valve options in Neles offering

Consult with Metso Automation sales office about other options:

- Top-entry ball valve
- Possible to use welded valve connections and service the valve through the top-entry cover
- Used in very high pressures and in locations with extreme risks when pipe flanges can not be accepted
- Neldisc butterfly valve
- Very economical in large diameter – low pressure applications
- Available seat, bearing and body version combinations.

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 your local automation expert at Metso.

Metso Automation Inc.

Europe, Vanha Porvoontie 229, P.O. Box 304, FI-01301 VANTAA, 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, 20 Kallang Avenue, Lobby B, #06-00, PICO Creative Centre, Singapore 339411, 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.metso.com/valves

