

Atmospheric Distillation Tower Vacuum Breaker

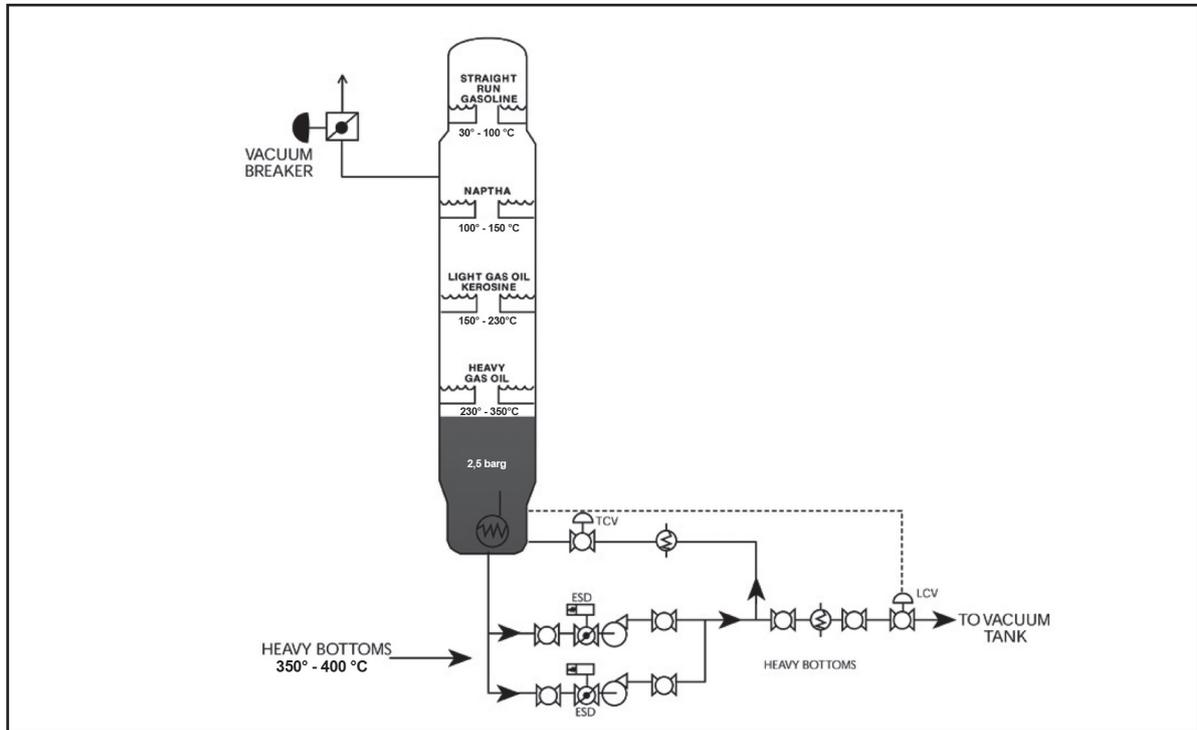


Fig 1. Principal P&ID drawing of an atmospheric distillation tower vacuum breaker.

Introduction

There are many distillation columns in petroleum refineries. In fact just about every refinery process has in one form or another an atmospheric distillation column. Typical operating service conditions in the column would be liquid/vapor phase hydrocarbon at 400 °C and 3,5 - 5 barg. The vacuum breaker is present to protect the column in the event of a process upset. If there is a sudden temperature decrease due to a heater failure, there is a risk that rapidly condensing vapor phase hydrocarbons could cause the column to change from

a pressurized to a vacuum condition. Not designed to operate under these conditions a vacuum in the column could cause it to collapse. Refiners depend on the vacuum breaker to open, in response to a pressure sensor detecting a rapid pressure loss, to prevent a vacuum from forming in the column.

The vacuum breaker, although not officially classified as an ESD valve, is used only in an upset condition. The valve is required to remain in the closed position until an upset is detected. The ideal product choice for this application is the Metso Automation Neldisc/B1JA/Neles Valv-Guard valve assembly.

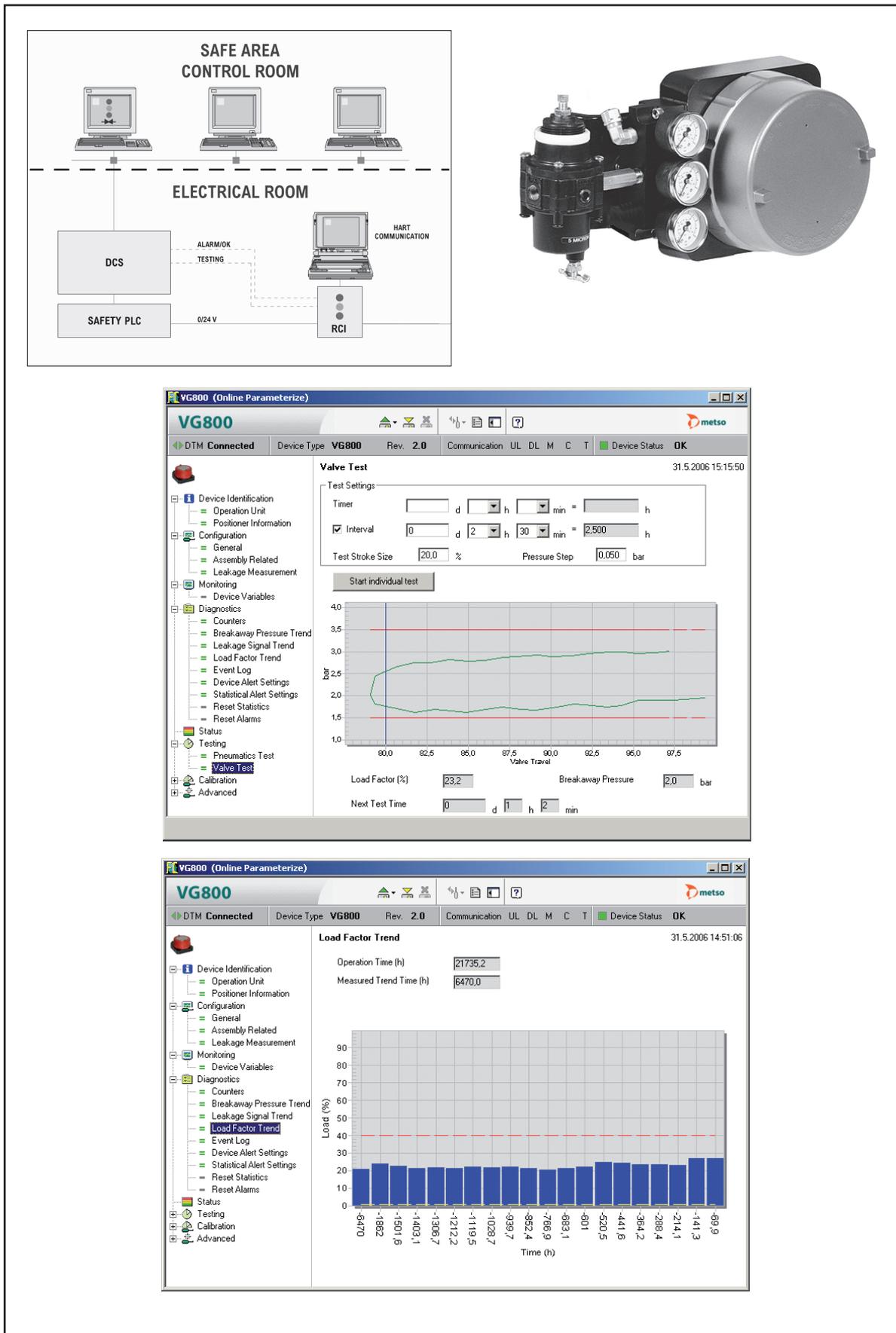


Fig 2. Neles ValvGuard tests the valve operation with partial stroke testing and these tests can be run automatically according to predefined time interval. Each test is analysed and test results are stored into the device memory. With the trending feature user is able to compare latest test results and see how valve dynamics has developed during the lifecycle of device.

Metso Automation Neles ValvGuard

Due to the fact that the valve can be required to remain in the closed position for long periods of time, up to a four-year period, the predictive maintenance benefits afforded by Neles ValvGuard are extremely important. The valve actuator assembly is arranged in the normally closed, fail open, orientation. The Neles ValvGuard should be set to test the assembly at the required time interval with the minimum acceptable percentage of valve rotation.

Neles ValvGuard can run partial stroke tests to check the condition of the valve assembly and inform operator if it starts to deteriorate. With freely selectable alarm limits the diagnosing of the valve condition is automatic and unplanned shutdowns can be avoided.

Valve Selection

The Metso Automation ZeroLeak Neldisc is the perfect choice for this application. Although the feed is introduced close to 400 °C, the vacuum breaker is typically installed near the top of the column where the temperature is closer to close to 100 - 150 °C. This is well within the ZeroLeak Neldisc temperature limit of 300 °C.

Typical required valve size range in this application will be 4" to 12", determined by the total capacity of the crude unit or distillation column. Pressure rating will typically be ANSI Class 300 (ISO PN50).

Fire test requirements will apply to this application. High temperature valve construction (order code option H) will be used and carry with it API 607, 4th edition and BS 6755 Part 2 fire certifications. The high temperature option also includes the solid cobalt based alloy bearing and shaft coating and graphite packing that are required for this application.

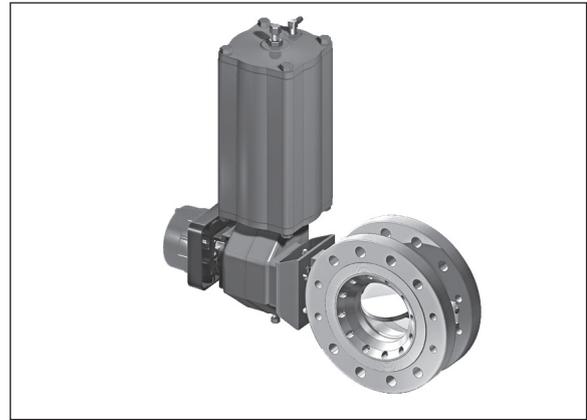


Fig 3. L6 series double flanged Neldisc butterfly valve + B1J series sprint operated pneumatic actuator + Neles ValvGuard ESD safety device.

In most installations, high temperature, carbon steel (A216 WCB) construction is specified. Standard 316 stainless steel disc material is acceptable in most cases. Occasionally, if the feed to the column is sour (high sulfur content) and an alternate material selection of, NACE compliant, stainless steel may be required.

Actuator Selection

The ideal actuation choice for this application is the Metso Automation B series pneumatic actuator equipped with a spring to ensure the safety action when supply pressure is lost. This actuator is capable of reliably actuating the valve even after months or years in a static condition. During the actuator sizing process consideration should be given to the graphite packing installed in the valve and the possibility that some very minor coking may have taken place inside the valve.

Conclusion

The Metso Automation ZeroLeak Neldisc in combination with the B1JA spring-to-open actuator and Neles ValvGuard is the ideal valve assembly for distillation column vacuum breaker service. If customer preference dictates Metso Automation offers several ball and butterfly valve designs that will satisfy the requirements of this application. These options can be explored with the Metso Automation technical sales force.

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.

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