17.5.6. Steam systems

Steam systems are used as a central energy supply required in various process units to operate reboilers in distillation columns, to heat pipes and to drive turbine-driven compressors.

17.5.7. Condensate treatment unit

The condensate treatment unit is used to treat condensate collected in the individual process units to allow it to be used again in the process as boiler feedwater.

The following steam condensates are collected:

- Steam condensate from heat exchangers
- Steam condensate from heat tracing
- Process condensates from processing stages
- Steam condensate from drives for large machinery working as condensing turbines.

17.5.8. Under firing of furnaces

The furnace is an integral part in the processing plant. Its heat output is used to heat a product flow in the process depending on the plant load.?

If processing products are to be heated up in a processing stage, this is mainly performed by burning fuel gases or fuel oils in industrial furnaces. The combustion process is started using ignition equipment to briefly exceed the ignition temperature. Naturally aspirated atmospheric burners or positive pressure burners are used. Compressed air is added to the fuel gas in positive pressure burners. The furnace is fitted with an underfiring system that contains a burner management system which regulates the burner functions, start procedures and safety measures. The burner facilities are designed to comply with technical rules DVGW 610 and TRD 411/412 for safe operation.

17.5.9. Turbo compressors

Compressors are used to increase the pressure of process gases in the processes. In refineries, multi-stage turbo compressors are predominately used for large volume flows at high pressure in the process units. This type of compressor is equipped with various machinery, safety and control equipment to ensure a high level of operation safety, availability and efficiency. The required drive output is provided by a steam turbine.

Gases that are compressed include hydrogen, air, all synthetic gases and heavy hydrocarbons, such as sulfur dioxide, carbon dioxide and hydrogen sulfide.

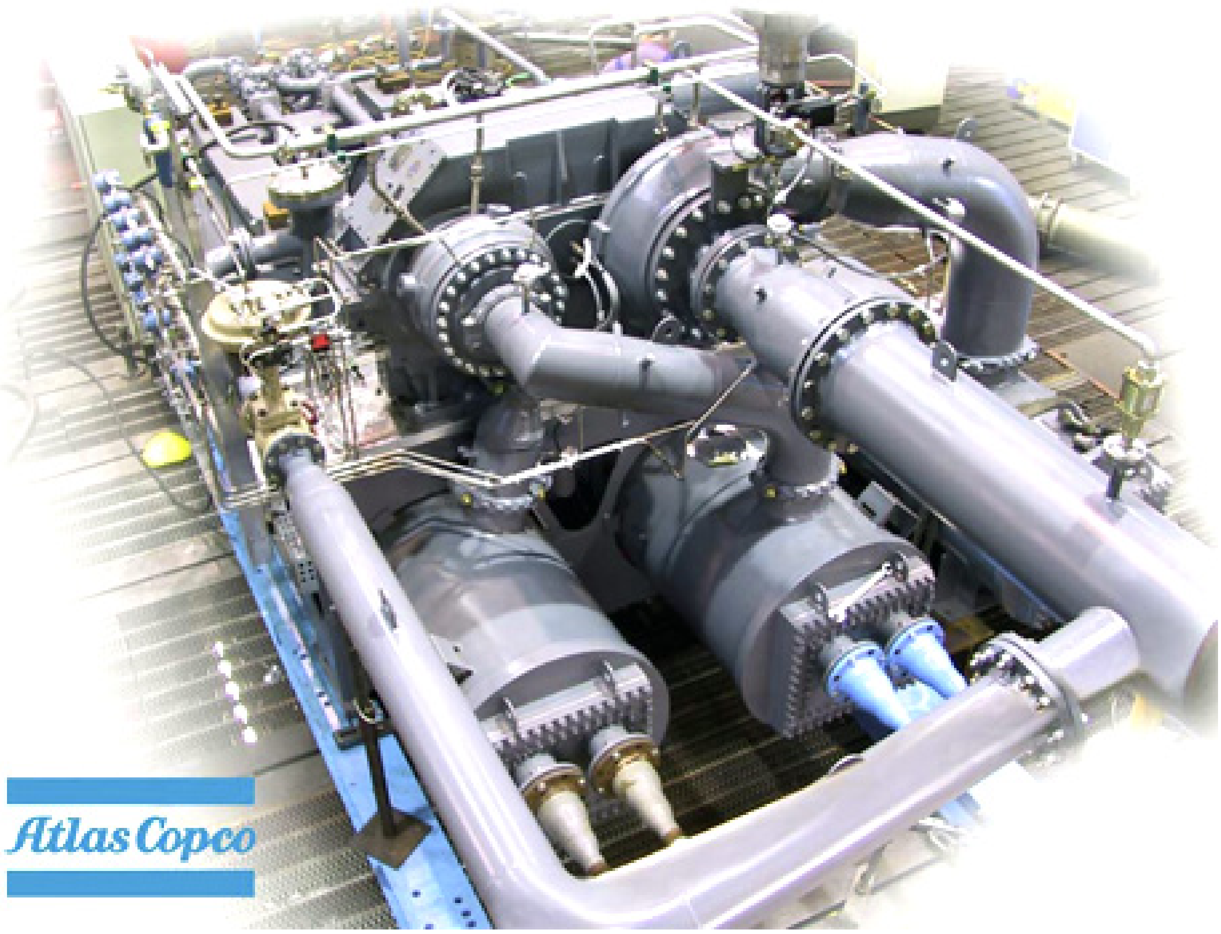


Figure 17.5.9.-1: This is an integral multi-wheel compressor with the 3rd stage compressor wheel attached to the main compressor bull-gear, but assisted by the turbo-expander.

17.5.10. Anti-surge control valve application

Whether in petrochemical facilities, gas transmission pipelines or LNG facilities, the compressor systems are some of the most critical pieces of the equipment in the entire plant.

Compressor bypass control in the energy sector, place formidable demands on control valves. Valves, some of which fitted with large pneumatic actuators, need to make long strokes very quickly, while they must also be able to handle small stroking movements without overshooting. A new kind of pneumatic valve hook-up with volume boosters and a highly accurate, dynamic digital positioner has been engineered to meet the requirements for these types of processes, providing the valve with excellent control characteristics.

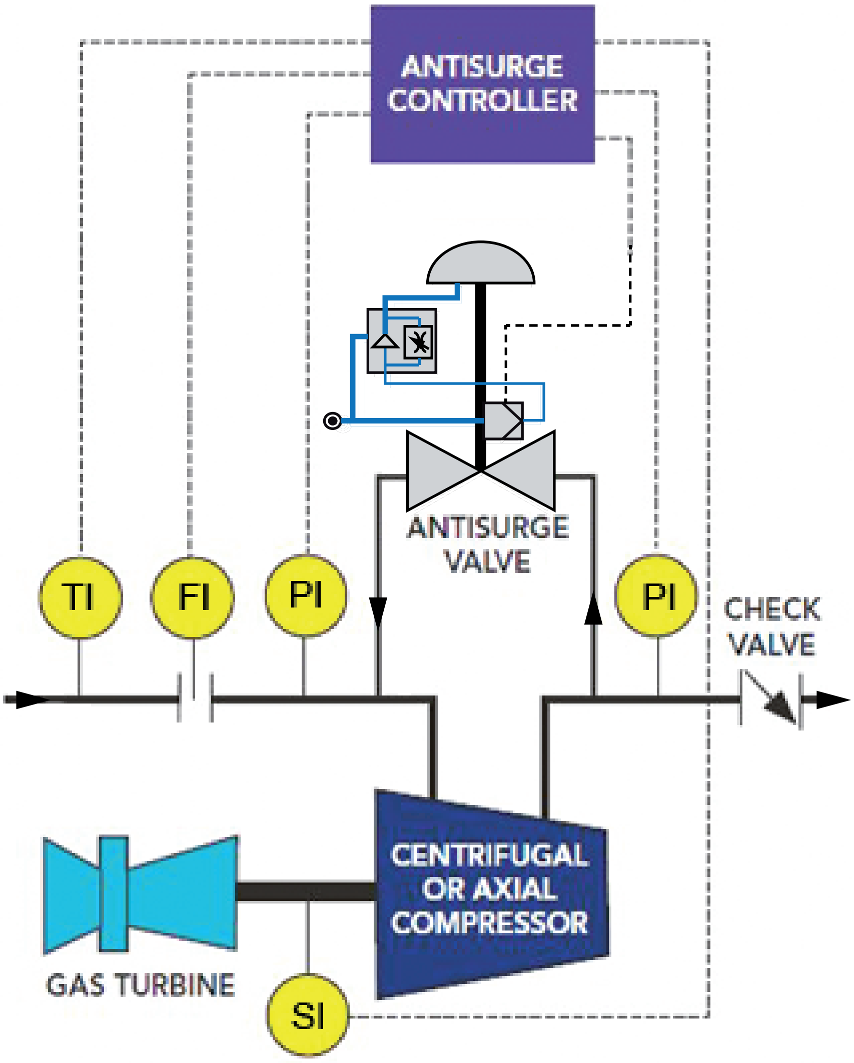
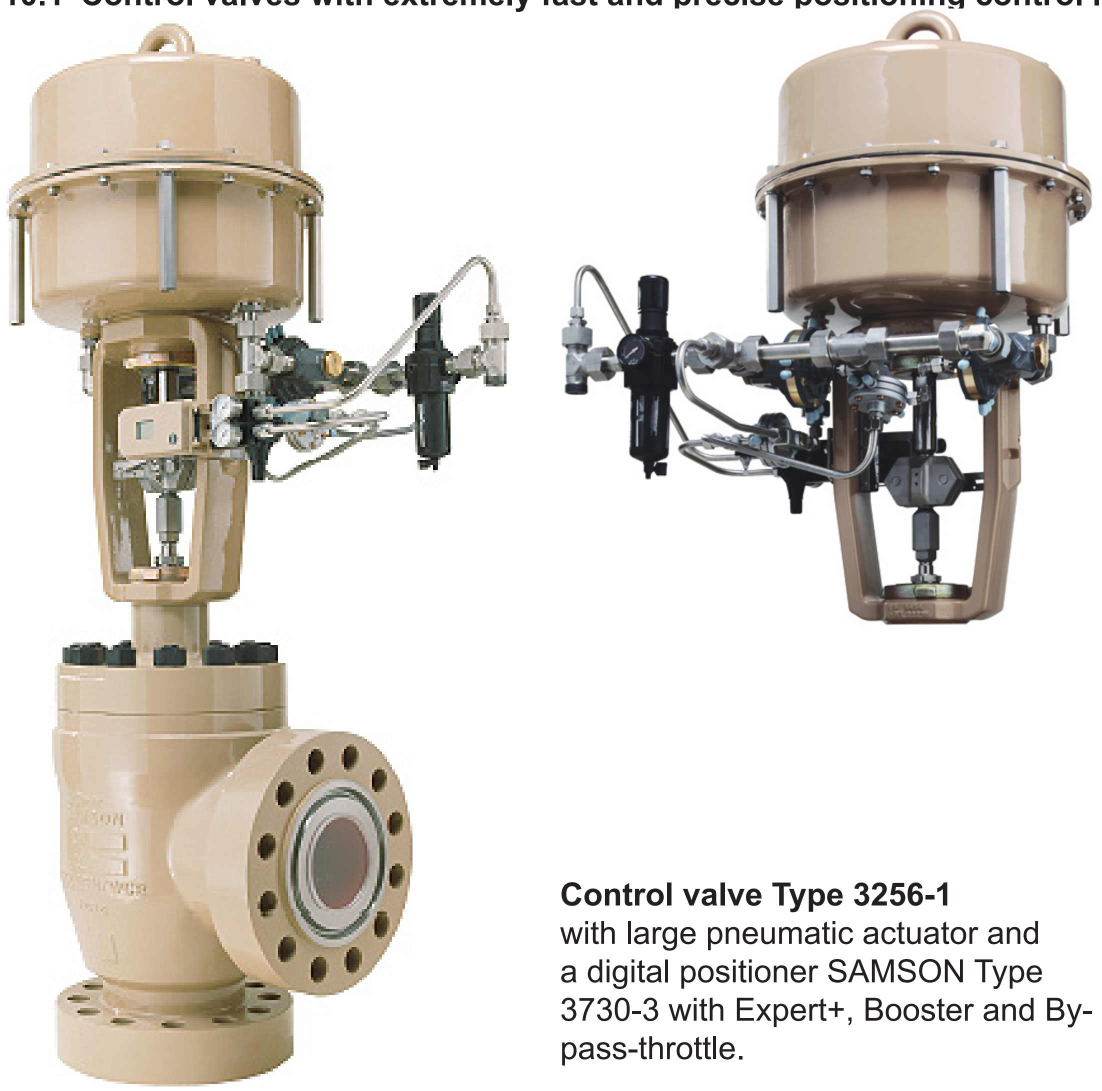


Figure 17.5.10.-1: Typical anti-surge control schematic

In the event of a potential surge condition, the anti-surge controller will send a signal to the anti-surge valve to open to required set point to pass a given amount of flow back to the inlet of the compressor. Depending upon the process upset, this may require a small amount of valve opening or full valve opening. In the event that the valve must go wide open, it must do so in less than two seconds. If the valve does not open quickly, it can expose the compressor to additional surges.

Not only must the anti-surge valve open quickly, it must possess enough capacity to pass the required amount of flow to protect against a surge event. Because the high differential pressure between the inlet and outlet of the compressor (1000 psi or greater), there is the potential for noise generation as flow is bypassed around the compressor. To eliminate the potential for noise and subsequent vibration, the valve must possess noise-attenuating trim. These factors are critical to the valve operation, but one factor that is often overlooked is the dynamic performance of the valve when not experiencing the need for full stroke capability. As a result, the valve actuator accessories are adjusted to meet the stroking time requirements, but at the expense of controllability and overall robustness.

17.5.10.1 Control valves with extremely fast and precise positioning control loop



Control valve Type 3256-1
with large pneumatic actuator and a digital positioner SAMSON Type 3730-3 with Expert+, Booster and By-pass-throttle.

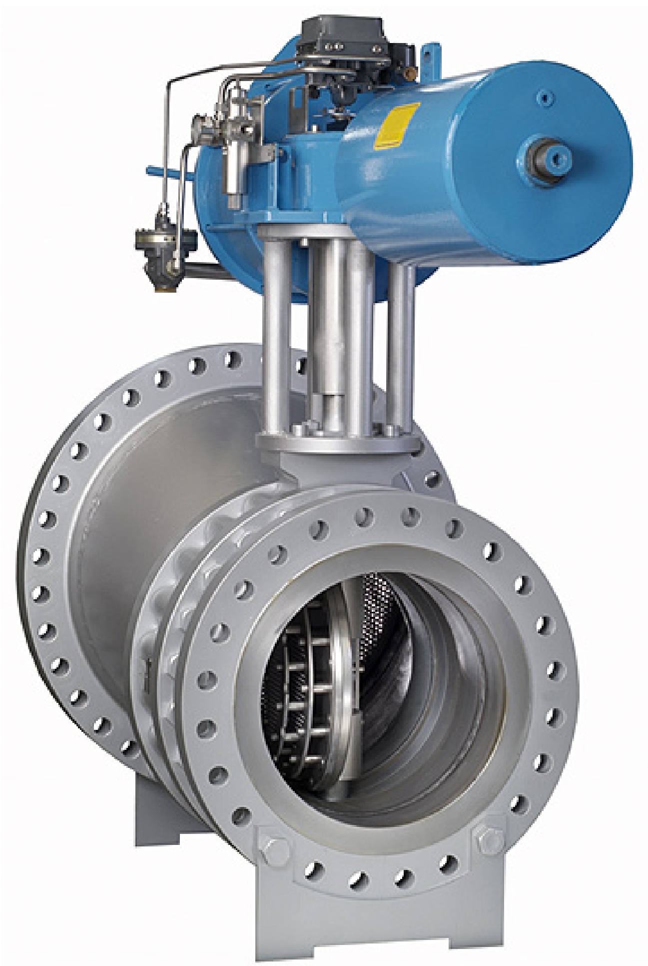
Figure 17.5.10.1.-1: Anti-surge Valve

The control valve positioner holds the greatest potential to improve actuator control and response time. In the past, spool type positioners with fast response were typically used in these applications because of their ability to respond quickly to step changes. However, these devices require constant tweaking and do not allow the user any way to monitor the performance of the valve.

As the performance of highly accurate, dynamic digital positioners has improved, so has their ability to be used to facilitate tuning of the valve and the ability to predict potential problems before they occur. This has been brought about by improvements in the positioner gain settings and in performance monitoring equipment.

17.5.10.2 Example: Anti-Surge application

Triple eccentric Butterfly Valve Type LTR 43
with low noise disk and downstream silencer



Medium	Cracked gas
Molecular mass	27.81 g/mol
Mass flow	327,150 kg/h
Pressure valve inlet	7.00 bara
Pressure valve outlet	1.53 bara
Temperature valve inlet	75.22 °C
SPL	lower than 105 dB(A)
Leckage Class	V
Opening time	less than 2 s
Closing time	less than 4.5 s