

# Fisher® Compressor Anti-Surge Solutions



Severe Service



**EMERSON**  
Process Management

## Application Discussion

A compressor can be the most critical and expensive component of a process system. Protecting this valuable asset from damage caused by surge is the function of the anti-surge system, of which a critical part is the anti-surge (or surge relief) valve.

Surge can be defined as a flow instability that takes place when the compressor cannot produce enough pressure head to overcome the downstream resistance. Put simply, the compressor discharge pressure is less than the pressure in the downstream system. This can cause a reversal of flow through the compressor. Surge also can be caused by a lack of suction flow.

Figure 1 shows a typical set of compressor curves (also known as compressor map, characteristic curves, or wheel map.) The X-axis typically is flow rate, and the Y-axis discharge pressure. There are separate curves for various machine speeds, and a line drawn to connect the curves at the zero points defines the surge limit line. Compressors operating to the left of this line are unstable (in surge), while operating to the right is considered stable. Assuming the compressor is operating at point A in the stable region, if the load resistance increases while the compressor speed remains constant, the operating point will move to the left. When the operating point reaches the surge line, the compressor goes into surge.

### Surge Characteristics

- Fast flow reversal (measured in milliseconds)
- Excessive compressor vibration
- Increase in flowing media temperature
- Noise
- May cause compressor to “trip”

### Consequences of Surge

- Shortened compressor life
- Loss of efficiency
- Reduced compressor output
- Mechanical damage to seals, bearings, impellers, etc.

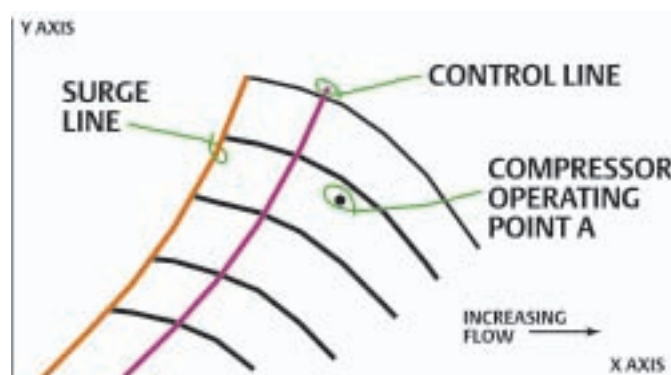


Figure 1. Compressor Surge Control Map

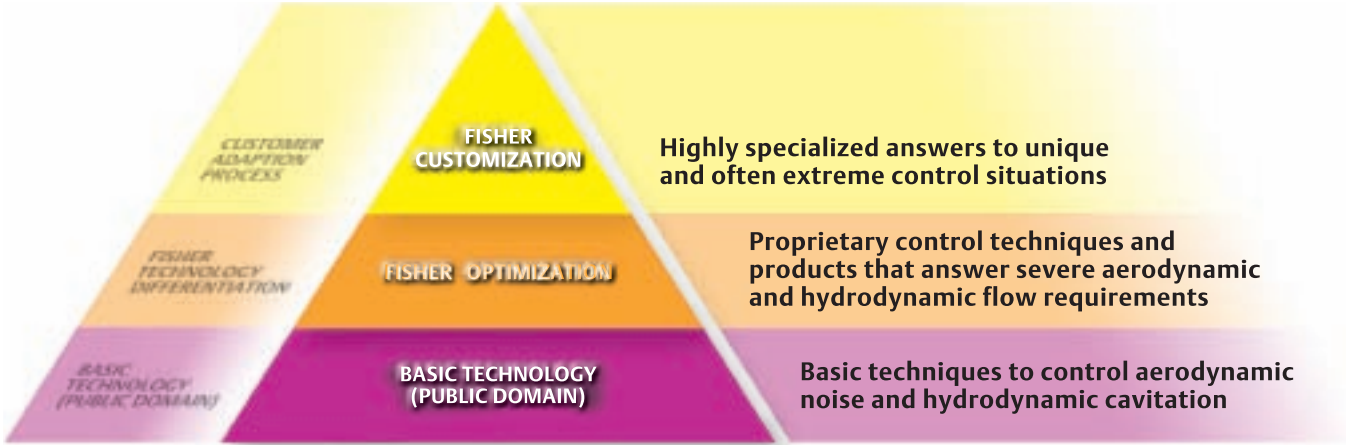
Recirculating some or all of the compressor discharge through the anti-surge valve normally controls surge. Some compressor systems are designed to recycle a portion of the flow continuously. While this can be an effective way of controlling the compressor, it wastes energy.

### Anti-Surge Valve Selection Criteria

- **Capacity** — The anti-surge valve must be able to pass the highest possible output capacity of the compressor. However, it is very common that a multiplying factor is applied to the compressor capacity figure.
- **Noise Control** — During a surge event the pressure drop and flow rate experienced by the valve can be high, causing excessive levels of noise. This must be considered in valve selection, although noise control through the entire range of valve travel may not be required. An extreme surge event that results in the valve moving to its full travel is short in duration (typically less than 10 seconds.) If it continues much longer, the compressor will shut down for other reasons (high temperature or excessive vibration are two common reasons.) Therefore, use of a characterized cage may be possible.
- **Speed** — Anti-surge valves are required to stroke very quickly (typically in the open direction only.) For example, valves with travels up to 20 inches have been required to stroke in as little as 0.75 seconds. This can necessitate oversized actuator connections and the use of volume booster(s) and quick exhaust valve(s).
- **Fail Direction** — Most compressor recycle valves are required to fail open. This is accomplished through use of appropriate spring-and-diaphragm actuators or piston actuators with trip systems.
- **Valve Characteristic** — Linear typically is preferred, but equal percentage is used also.

Emerson offers the Fisher Optimized Antisurge Valve, an engineered control valve package specifically designed for the rigors of compressor antisurge applications. Each component in the system is OPTIMIZED to meet best-available performance as required by a performance specification and to ensure reliability and availability of the compressor system.

# Fisher Severe Service Solutions



## Compressor Anti-Surge — Control Valve Solutions

### FISHER CUSTOMIZATION

An ethylene plant in Saudi Arabia utilized Fisher Optimized antisurge valves to replace an existing system. The Fisher Optimized antisurge valves were designed to meet the face to face of the existing valves and dramatically improved capacity, noise attenuation and controllability compared to the original equipment. See [D351140X012](#) at [www.Fishersevereservice.com](http://www.Fishersevereservice.com) for additional details.

### FISHER OPTIMIZATION

Fisher Optimized Antisurge Valve



- Valve trim is characterized with high turndown (100:1 or greater), if required
- Eliminates valve noise and vibration utilizing multi-stage, noise attenuating Whisper® trim
- High balance area valve plugs and cushioned actuators on long stroke installations reduce potential piping vibration
- Cuts the number of actuation accessories in half compared to traditional systems
- Employs the FIELDVUE-ODV tier that is designed with special antisurge-specific control and tuning algorithms
- Enables setup and tuning to be done remotely and in minutes, rather than hours
- Provides online, non-intrusive diagnostics including performance diagnostics, triggered diagnostics, on-seat diagnostics and partial stroke testing

### BASIC TECHNOLOGY



- Standard control valve
- Startup and operation schemes designed around standard valve flow characteristic
- Actuator and instruments selected for fast-stroke open operation; typically less than two seconds
- Noise addressed with path treatments

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**The Next Step**

Contact your local Emerson Process Management sales office or sales representative location for more information or to make a purchase.

For severe service solutions, see us at [www.FisherSevereService.com](http://www.FisherSevereService.com)



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