Turbomachinery Controls
Improve Reliability, Enhance Performance

TURBOMACHINERY SOLUTIONS

→ Controls
→ Actuation
→ Valves
→ Safety Systems
→ Protection Devices
→ Power Management

As an independent company (NASDAQ: WGOV), Woodward and its partners are able to provide control and protection solutions for new and aftermarket turbomachinery applications as well as full service and support and for our current and legacy product lines.

TURNER ENGINE CONTROL SOLUTIONS

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WOODWARD

Advanced Compressor
Load Sharing | EFFICIENCY, RELIABILITY
EXPERIENCE, PERFORMANCE

TURBINE SYSTEMS
Controlling the Power of Energy

Advanced Compressor Load Sharing Algorithms

Load Sharing | ADVANCED COMPRESSOR ALGORITHMS

Woodward's advanced compressor load sharing algorithms are based on over 25 years load sharing experience. Leveraging its field proven pipeline, petrochemical, and generator load sharing experience, Woodward's advanced algorithms allow operators to easily manage and start and stop parallel or series compressor applications.

WOODWARD'S CONTROL ALGORITHMS

Putting plant operations in-control, Woodward compressor engineers work with plant process engineers and operators to customize each load sharing system to meet the plant's control objectives. Woodward's modular software programming architecture allows field proven compressor control, load sharing, and protection algorithms and logic to be customized to the application.

The complexity of load sharing compressors in petrochemical or pipeline applications can be challenging. However, Woodward's advanced performance control algorithms are designed to share key compressor state, load, and operation information, allowing the overall system to be optimized and to proactively respond to large or small process changes.
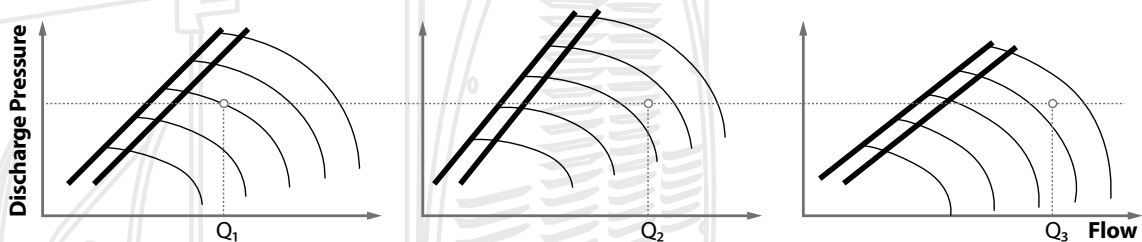

PROCESS CONTROL BENEFITS

Field proven decoupling techniques are used to safely and reliably sequence parallel process compressors on or off line or managing series process compressors during normal plant operation and unexpected transient conditions.

Woodward's multi-unit decoupling software logic essentially adds the output of one controller to the output of the other controllers when in the load-sharing mode. This type of feed-forward biasing allows each controller to take action sooner, providing the following process control benefits:

→ Prevents unwanted "fighting" between controllers
→ Increases process stability and decreases total response time
→ Aids each anti-surge controller in preventing potential surges caused by the performance controller.

Patented rate control and surge prevention logic differentiate Woodward's compressor control and anti-surge protection from that of others. These patented algorithms have long been used and qualified by compressor OEMs like MHI, Siemens and GE.
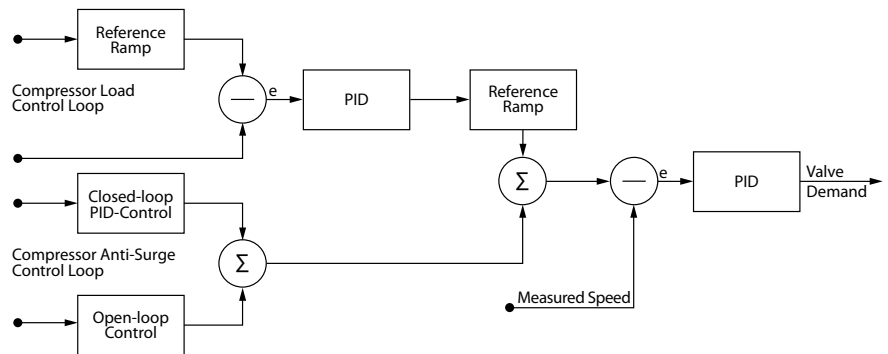
WOODWARD'S PERFORMANCE CONTROLLER:

Woodward's performance control & load sharing software module has the following capabilities:
→ Load sharing up to five units in parallel
→ Load sharing up to three units in series
→ Load sharing "combined" trains (parallel & series)
→ Managing secondary load sharing limiter interaction
→ Emergency fall back routine (in case of system failures)
→ Managing train startup and shutdown interactions
→ Managing anti-surge protection interaction (opening of AS valves)
→ Managing external limiter interaction while sharing
→ Managing forward signals for upstream/downstream units based on load reserve & emergency situations

The communication information shared between each controller for load sharing purpose is selectable, and is performed via a simplex or redundant communications network(s). Depending on the processes requirements of parallel compressor sets, the following parameters can be used to load share:
→ Mass Flow
→ Actual flow
→ Operating point (distance to surge)
→ Motor current/KW
→ External related parameter

Depending on the processes requirements of series compressor sets, the following parameters can be used to load share:
→ (Polytropic) Head
→ Pressure ratio
→ Operating point (distance to surge)
→ External parameter

Woodward's field proven "Performance Controller" keeps the suction/discharge header pressure constant via the throttle valve, IGV or speed demand. When several compressors (trains) are working in parallel and/or series, the load sharing module keeps all units equidistant from the shared parameter via communications between each individual performance controller.