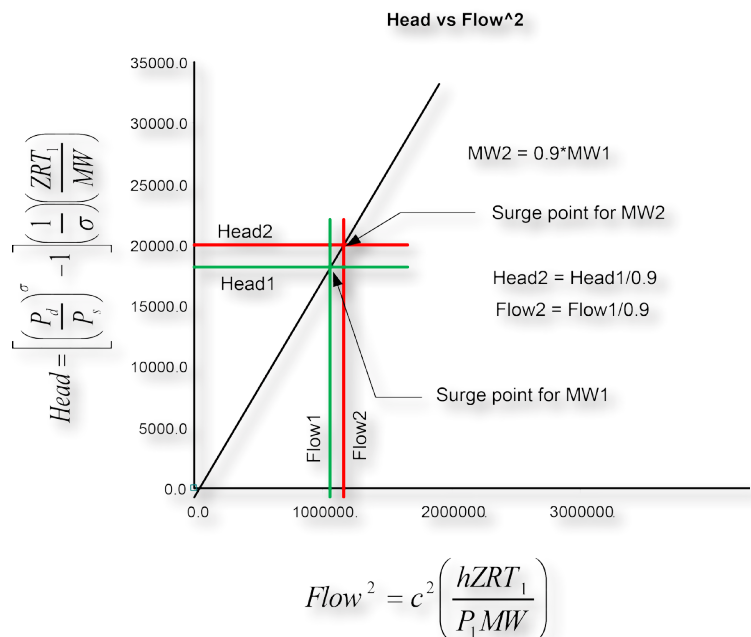


Surge and Performance control Features

Feature	TS160	TSx
Surge line prediction invariant to changes in gas conditions – accurate surge line prediction regardless of changes to suction density	Std	Std
Adaptive control line – increases minimum margin if operating point reaches surge line	Std	Std
Surge Anticipation – starts opening recycle valve if operating point drops quickly, even if well to the right of the minimum control line	Std	Std
Selectable modes – Full manual, Full Auto and Cooperative Auto	Std	Std
Automatic Surge Line Update – surge line is updated with surge points detected during operation.	NA	Std
Parallel Load Sharing – managed performance control for two or more compressor in a parallel arrangement	NA	Std
Adaptive Tuning – Applies more aggressive gain and integral when operating point moves too close to the surge line	Std	Std
Process Demand Scheduler – stabilizes process by preventing interaction of the anti-surge controller and process controller. Provides process control over the entire flow range of the compressor	NA	Std

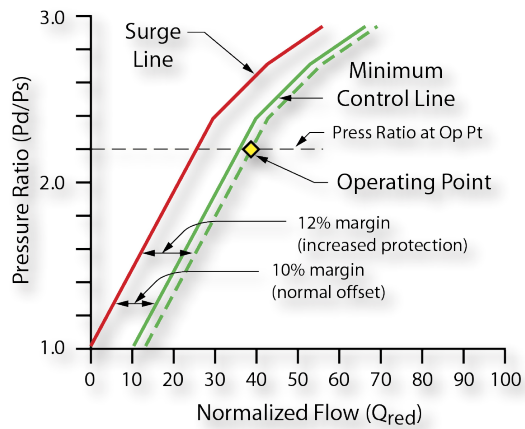
Reliable Surge Line Prediction

Any changes to the molecular weight will affect the head term in the same way that it affects the flow term. So if the molecular weight drops the head will increase and the flow will also increase. The new surge point will fall on the same line.



Adaptive Control Line

- Configurable increase in margin if surge occurs
- Provides added protection in presence of a system failure
- Guarded reset
- Generates operator alarm and provides a surge count

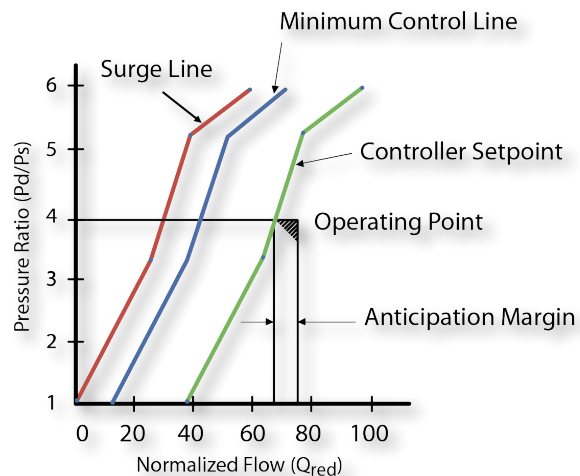


Selectable Modes

- **Automatic** – anti-surge controller is in complete control of the recycle valve operation
- **Manual** – operator is in complete control of the recycle valve (no surge protection)
- **Cooperative Auto** – automatic surge protection but allows operator to increase recycle beyond amount required by anti-surge controller

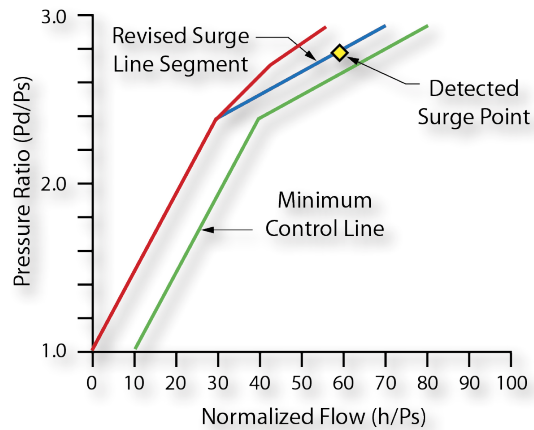
Surge Anticipation

- Allows normal movement of operating point
- Starts opening recycle valve right away if flow drops quickly
- Minimizes recycle after transient is complete
- Minimizes instabilities



Automatic Surge Line Update

- Automatically adds a detected surge point to the surge line and re-draws line
- Memorizes pressure ratio and reduced flow when a surge occurs
- Re-shapes surge line to provide reasonable line slopes
- Accommodates inadequate surge testing

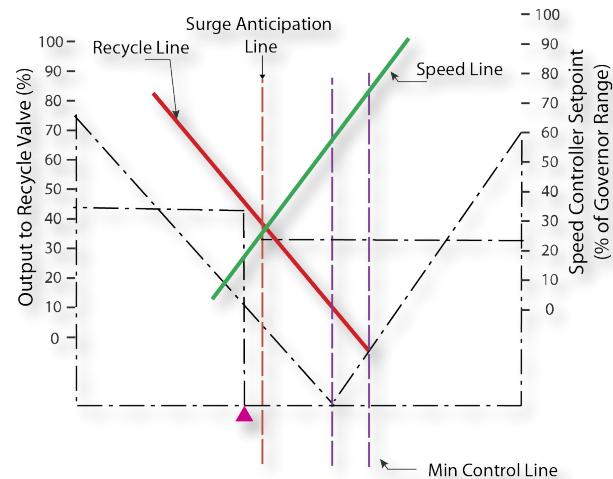


Parallel Load Sharing

- No dedicated controller required
- Data transferred over high-speed peer-to-peer network
- Simple capacity split (weighted if required)
- Balancing managed by Process Demand Scheduler
- Automatically adapts to compressors being added or removed from sharing

Process Demand Scheduler

- Allows process control over entire flow range (0 to 100%)
- Prevents interaction of process controller and anti-surge controller
- Process controller can be located in TSx or DCS with minimal hand-shaking



Adaptive Tuning

- Allows appropriate tuning for normal operation
- Applies more aggressive tuning if operating point drops below minimum control line
- Helps drive valve closed more quickly if margin is high

