

Finding the balance between profitability and surge.

Finding the right balance between process performance and surge protection can be challenging. In the past, control strategies stressed “playing it safe” by keeping a compressor operating well above its surge flow. Today’s competitive realities demand more – maximizing the overall process efficiency by safely operating compressors closer to the surge limit, without the risk of crossing over the line. Is it really possible to have both utmost protection *and* maximum efficiency?

With the patented compressor control algorithms utilized by GE Energy, the answer is a resounding “yes.”

What is surge?

When the low flow operation limit of a compressor has been exceeded, the result is flow reversal, or surge. This is an unstable, pulsating condition that is usually evident by an audible boom, piping vibration, rapid increase in discharge temperature, and oscillation of flow and discharge pressure.

Why is surge so damaging?

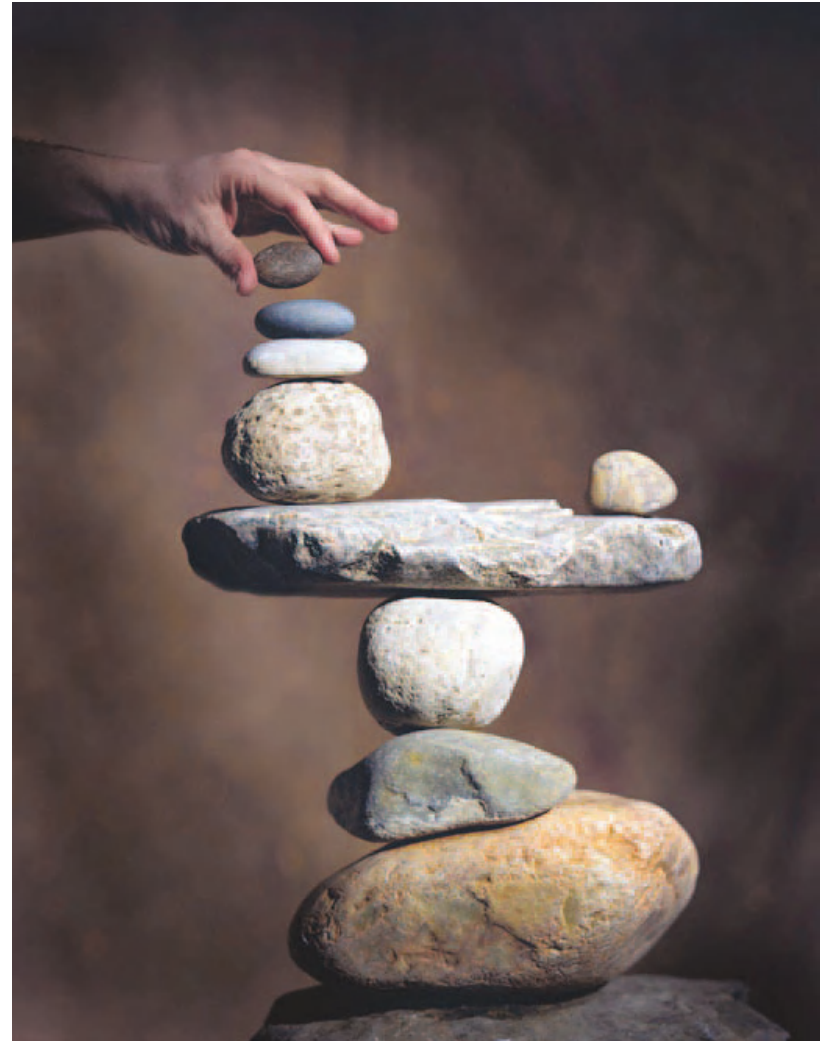
While effects can vary, process and machine effects can be catastrophic. The temperature of the recompressed gas increases exponentially after several surge cycles, causing high temperature alarm and shutdown levels to be reached, shutting down the entire process. And, the often-violent flow reversals of surge show up as damaging vibrations, which can destroy bearings, seals, and other internal components.

How is surge controlled?

By providing a secondary flow path, the gas can flow back *around* the compressor through recycle piping, preventing surge. When the compressor flow is reduced to the control limit, the recycle valve will open, allowing the gas to flow from the discharge back to the compressor inlet. It is the job of the anti-surge controller to operate this valve properly.

Does the choice of controls matter?

Absolutely. While the basic mechanism of surge prevention is easy to understand, the controller’s embedded algorithms must be sophisticated enough to allow maximum compressor operating range without compromising protection. This requires algorithms to respond rapidly to changes in process conditions, complementing the normal control routines to create a steady state of operation. It also requires algorithms that can learn and adapt. GE Energy uses patented technology that delivers both.



As a compressor approaches its surge limit, small changes in pressure result in large changes in flow, requiring quicker, more acute corrective actions to mitigate risk. The technology used by GE Energy calculates the compressor flow’s rate-of-change, or flow derivative, and provides a corresponding corrective signal to the recycle valve, recycling enough flow to stop the surge event on the first occurrence. GE Energy’s use of a flow rate-of-change strategy provides protection over the full range of operation, maximizing process efficiency.

The compressor is further protected by use of a patented Surge Minimum Position algorithm that actually *learns* how each system should respond to a surge cycle to prevent additional surge cycles from occurring. When a surge event is sensed, the system uses its learned information to respond accordingly, minimizing the effects of surge.

Learn more by visiting us online at gepower.com/controlsystems or by contacting us at 800-835-5182 or 970-461-5201.

