Expertise in Turbomachinery Controls

WHITEPAPER

Breaking Down Control Barriers

Publish Date: 2/2/2015
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This paper discusses how plant historians enable users to collect all data necessary to properly manage and optimize the process and machine relationship.

Many processes and reliability engineers believe that process control & optimization and asset condition monitoring live in two separate worlds. While data is exchanged across separate systems via communication protocols, such as OPC, DDE, HART, MODBUS, operational barriers remain in place. Teams tend to create knowledge- exchange walls around those systems.

As a result, the worlds of process optimization and asset condition management have evolved on parallel, but separate, paths. Experts in process optimization embed their knowledge and operational instructions in Plant Historians and Distributed Control Systems (DCS).

Reliability and machinery experts rely largely on dedicated online and offline Condition Monitoring Systems (CMS). While this line of demarcation may have become blurred by certain advances in automation technology, it has largely remained in place between process and asset expertise (Figure 1).

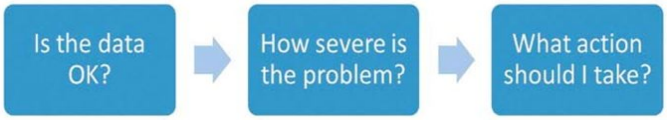

Figure 1: Current decision-making process flow chart

This phenomenon is particularly evident in vibration protection and management. Machinery-protection systems have historically been deployed with the goal of shutting down the unit or enunciating an alarm when thresholds are exceeded.

In the past, best practices have dictated for live diagnostics the connection of powerful data analyzers to the protection system's transducer-buffered output. Now we are seeing wider use of online condition monitoring systems that collect high-resolution dynamic and trend data, and perform correlation with basic process control parameters from external systems, such as historians.

Concurrently, the last two decades have seen the widespread adoption of process historians. These systems were born from the need to have better historical data trends for post-mortem analysis, a feature where control systems used to fall short. With the advent of process historians, a series of new applications have enabled process engineers to develop optimization techniques that have helped to increase plant profitability.

The adoption of these systems is a tangible sign of progress. But at the same time, the worlds of process asset optimization remain somewhat disconnected. The practical consequence of the lack of integration can be illustrated by what typically happens when a vibration alarm is detected.

In today's plants, an operator's likely action and decision-making process is relatively simple, as shown in Figure2.

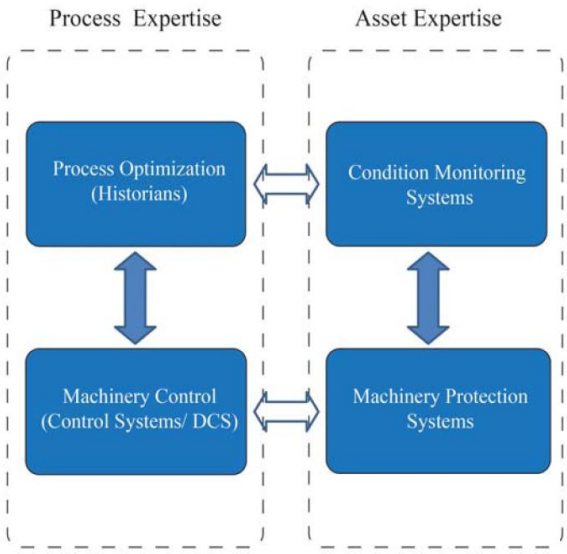

Figure 2: A line of demarcation remains between process control and asset expertise

One complicating factor to this otherwise straightforward approach arises from the origin of the data needed to answer these questions. It is often necessary to consult instrumentation and control technicians, machinery engineers and control room managers who interrogate separate systems that contain the necessary data to resolve matters. This approach is functional, yet sub-optimal.

While control and protection best-practice and industry guidelines, such as API 670, require a

separation between controls and monitoring systems, there is now a strong argument in favor of better integration of all data into a single system for diagnostics purposes.
In the past, plant historians were not capable of collecting the thousands of sample-per-second data required to enable true machinery analysis in the form of bode, polar, orbit, spectrum and other plots. Because of this shortcoming, these data ended up being stored and displayed in purpose-built condition monitoring systems.

While these systems can correlate basic process data integrated via digital protocols, their specialization is the display of plots that enable machinery-diagnostics specialists to do their job. Given the complexity and specialized skills required for the interpretation of massive amounts of machinery data, the world of online condition monitoring meant the establishment of reliability teams using these systems as their primary tools.

The features offered by plant historians enabled process engineers to demonstrate return on investment by optimizing the process. Yet we may be reaching a point of diminishing returns unless we can begin to answer the question: "If I optimize the process further, what is the effect on my critical assets?"
While parts of this question can be answered by separate systems and teams, the ability to share the same platform is going to enable process and reliability engineers to address questions they could not answer before.

Compressor Surge

Let us take the challenges posed by compressor surge. Today, best practice requires dedicated controls systems to collect process variables, such as flow, and pressure, responding to change in milliseconds, to return the system to normal operation.

Compressor control systems perform an asset protection and controls function, yet there is often a significant amount of data that can be overlooked, such as vibration; and that may be used for the detection of impending surge. These data may be measured by vibration sensors monitoring shaft axial motion as well as radial vibration (Figure 3).

The latest plant historians enable users to collect all data necessary to properly manage and optimize the process and machine relationship. By leveraging data mining techniques, users can quickly sift through data to focus on areas of interest.

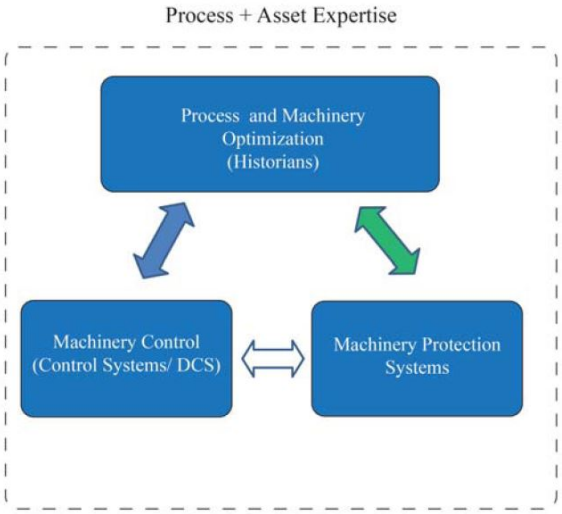

Figure 3: Whereas process experts and asset reliability experts lived in different domains using different systems, the new paradigm simplifies this relationship and breaks down knowledge-exchange barriers

Plant managers today are faced with increasingly complex operations, stretched resources and a shrinking talent pool. At the same time, a proliferation of systems means additional capital and maintenance cost, as well as cyber-security concerns. With historians capable of storing and displaying all process and asset condition information, we are now beginning to see the breaking down of communication barriers between departments.

Clearly, a renewed look at new historian and CMS technologies is warranted. Simplified systems eliminate barriers between those teams that need to find ways to increase cross-functional cooperation. This opens the door to achieving more results with less infrastructure.

About The Author:

Pier Parisi is the vice president of marketing for Compressor Controls Corp. (CCC) Global. He previously served as VP of sales and marketing with FOMAS Group, and as oil and gas marketing leader with GE. Mr. Parisi earned his MBA degree in global management and international business from University of Phoenix.