ARC BRIEF

MARCH 28, 2009

SABIC Improves Plant Stability and Cuts Costs

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Keywords

Automation Maintenance, Control Loop Monitoring, Control Loop Tuning, Plant Stability

Summary

In today's economic environment, every plant must run as efficiently as possible. This means cutting costs and improving margins while satisfying customer demand. To be more effective, plants need to reduce process variability and improve stability, ensuring agile and profitable operations. Plants require a sound automation strategy that extracts maximum value from manufacturing assets and sustains that performance over time. This includes cutting raw material costs, reducing energy usage, and eliminating other inefficiencies in manufacturing operations.

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Leading process manufacturing companies have adopted automation asset management solutions that improve the overall effectiveness of plant assets. The structured methodology for control loop monitoring and maintenance is a contributing factor that improves performance and plant stability while reducing costs and unnecessary downtime and repairs. Control engineers have responsibility for a large of number of loops so they need the tools to identify where to focus their efforts to ensure that their work has the largest economic impact on plant performance.

SABIC-IP is using PlantTriage to improve the stability and reduce costs in several of its plants. The company has already achieved notable results using control loop monitoring tools. This includes:

- Eliminating process swings from upstream operations
- Reducing process upsets from control valve hardware issues

- Reducing energy consumption in distillation, with modified control strategies.
- Overall improvements to plant stability
- Over $1 million per year energy savings due to tighter control and optimization of the hydrogen process

SABIC's facility in Burkville, Alabama has captured many of these benefits, and serves as an example of an effective user of control loop monitoring technologies.

Control Loop Monitoring Drives Stable Operations

Automation and control systems are critical components, ensuring that a plant operates safely, efficiently, and profitably while producing consistent product quality. The automation system monitors and controls the process and alerts operators to deviations from normal operation. An effective alarm management strategy is important because of the growing void of experienced operators who understand the process and has the know how to correct problems. Even experienced operators are finding it difficult to track process conditions because of levels of abstraction introduced by increased levels of automation complexity and sophistication.

If automation systems are not performing effectively, then productivity, agility, reliability, product quality, profits, and competitiveness all suffer.

The control strategy and proper control loop performance is just as important for safe, reliable, and profitable. However, most manufacturing companies don't have an effective strategy to obtain and sustain the maximum value from their automation assets. Ultimately, this affects the performance of their manufacturing operations. Suboptimal control due to poorly tuned loops, equipment problems, or improper control strategies result in poor process stability and high variability. These problems contribute directly to subpar business performance. If automation systems are not performing effectively, then productivity, agility, reliability, product quality, profits, and competitiveness all suffer.

Within a typical plant there are literally hundreds if not thousands of control loops that reduce energy consumption, raw material usage, and manpower requirements. In addition, these loops form the basis for safe, reliable and stable operations. It is well documented, however, that in a

typical plant more than half of all loops are actually increasing variability, thus negatively affecting quality, throughput, and reliability. Even if a process were running at an economic optimum, over time the performance deteriorates due to changing business requirements, modifications in operating condition, and wearing of equipment.

Manufacturers must be vigilant to keep control loops operating at peak performance since they are critical for safe and efficient operations. Unfortunately, resource constraints keep companies from achieving this goal. To create a strong foundation for all operations, leading manufacturers are adopting a comprehensive control loop monitoring and continuous improvement program targeted at optimizing control loop and automation performance. Sustaining automation and asset performance is imperative to securing stable and robust conditions necessary for optimizing operations and profitability.

Automation and control loop performance monitoring is a balancing act: do too much and it's a waste of time and money, while doing too little causes poor performance, unscheduled downtime or catastrophic failure. The vast majority of plants today are spending little or no time on control loop performance, so the opportunity for improvement is quite large. Since control personnel are responsible for numerous systems and hundreds of control loops, it is impossible or even inadvisable to attempt to have all your systems and loops running optimally since the time, effort, and expense are exorbitant. The key is to locate the few areas that are problematic and have large payback. Locating these crucial areas is difficult without the aid of analysis tools. Sustaining asset performance is not a one-shot deal. It requires continuous monitoring and tuning to maintain automation systems and control loops functioning at top performance because of the degradation and operational changes that occur over time. Control loop monitoring software provides the tools to monitor, improve, and sustain control system performance.

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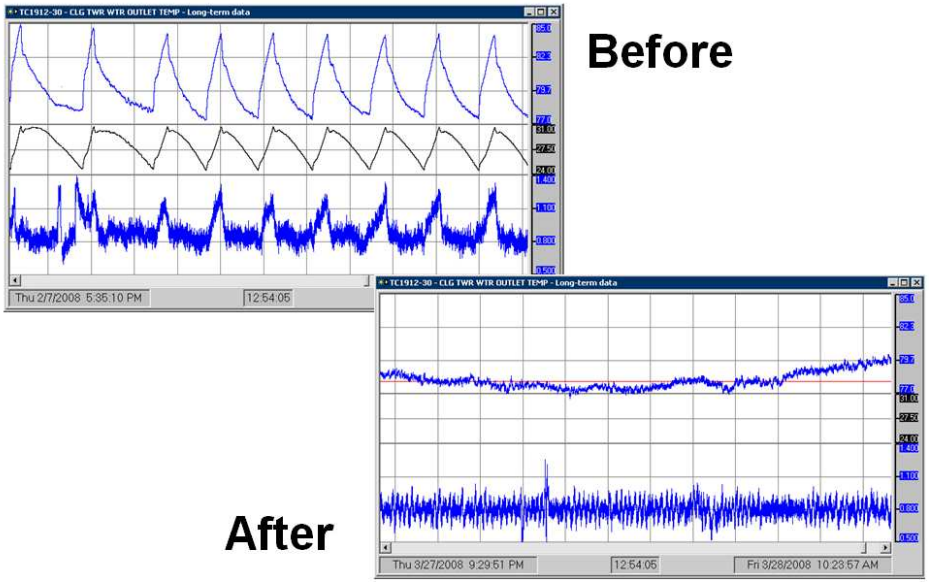
SABIC /GE Plastics Improves Plant Stability with PlantTriage

SABIC, Saudi Basic Industries Corporation, is one of the world's largest manufacturers of chemicals, fertilizers, plastics, and metals with annual sales or about $75 billion. The company has more than 30.000 employees and serves customers in more than 100 countries.

The SABIC Innovative Plastics (SABIC-IP) facility in Burkville, Alabama produces a variety of plastics for OEM's in the automotive and computer electronic markets. The Burkville plant operates 5 distinct business areas including:

- Resin (both batch and continuous)
- BPA (Bis-Phenol-Acrylate) monomer
- Chlor-Alkali Plant makes C12 for Resin
- Finishing Plant (Extruder and Pelletizer)
- Boiler and Cogen



Resolving control problems help to drive plant stability

Manufacturers throughout the world use SABIC-IP's engineering and commodity plastic products to produce a variety of items such as water bottles and automotive headlights. Like many other process manufacturing companies, SABIC-IP has to deal with high variability in raw material and energy costs. For instance between 2006 and 2008 its main ingredient, phenol, has increased 50 percent. Energy costs have displayed large variations over the past several years too. To deal with these variations more effectively, the plant has been focused on reducing energy and maintenance costs along with improving plant stability. The company has a small staff of process control engineering with broad responsibility that includes ensuring optimal performance of their automation and control system.

Stable Operations Approach

The corporate "StableOps" group was searching for ways to improve process stability, increase efficiency, and reduce operating and maintenance costs. The plant, which recently installed an IP.21 process historian, was collecting copious amounts of data but was not leveraging the information to improve plant stability.

The StableOps group looked for tools that could take advantage of the information it was collecting about its manufacturing process. The company evaluated control loop performance, alarm management, and loop tuning applications. After considering its options and performing due diligence by checking references, SABIC-IP selected PlantTriage integrated with TiPS LogMate Alarm Management as its enabling tool.

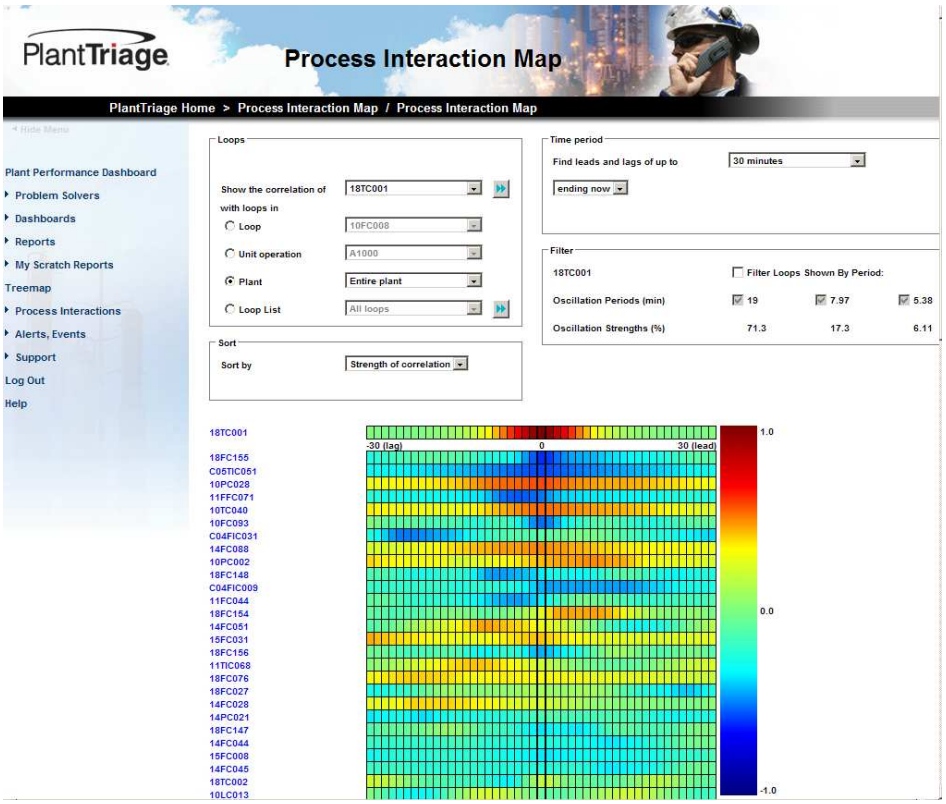
The pilot site was the Burkville plant because the lead control engineer had some previous loop optimization experience. PlantTriage was installed in the resin plant. The data was gathered with IP.21 to minimize the communication load with the DCS. Burkville focused on several key assessments including:

- Oscillation Significance
- Avg Abs Error
- Time in Auto
- OP at Limit
- PV at Limit

Keith Phillips of SABIC Innovative Plastics, Burkville, Ala., says, "We use to have to use qualitative arguments to explain where we could reduce operating costs, but now we have the data to back it up. We can now show how tightening control with smaller tolerances can save money.

With positive results from the pilot, SABIC decided to rollout PlantTriage company-wide. A PlantTriage system capable of monitoring 2000 control loops was specified for its Selkirk plant. The system covered control systems across the entire plant.

At the Selkirk plant, each control loop was assigned a relative economic weight, to ensure that results would reflect not just technical issues, but also the business affect. From the onset of the project, the site resolved major issues with equipment, process, and controls.



Process Interaction Map identifies the source of interactions

Results and Benefits

Using PlantTriage, SABIC-IP experienced numerous benefits throughout their organization. For instance, using the Process Interaction Map (PIM) capability the Burkville plant eliminated hydrogen swings. The PIM correctly identified the cooling tower temperature controller as the source of the problem. By changing the temperate control strategy, the hydrogen was stabilized and there was a noticeable reduction in nuisance process alarms throughout the plant.

> From an operator at the Selkirk plant commenting on the effectiveness of PlantTriage, "Incredible change. It used to be that if you sneezed, the process was upset. Now, it's like a dead person's heart monitor. That column is rock-steady."

The plant experienced considerable economic benefit as well. "One critical loop was for our hydrogen compression process, which is partially used to offset natural gas as an energy source," explained Control Engineer Keith Phillips. "Once we used our new software to analyze loop interactions, we realized that a simple on/off control for an upstream fan was causing a temperature spike carrying through to our hydrogen compressor. By re-tuning our fan control loop, we were able to tighten our control limits and reduce the im-

pact downstream. We recognized that because we had such large control limits before in the hydrogen compressor, we were not maximizing our hydrogen recovery. By tightening this upstream control and optimizing the hydrogen process we are able to save over $1 million per year in energy consumption."

PlantTriage was also able to improve the stability of a chlorine header. The header was a constant source of irritation to operators since it required constant attention. Using PlantTriage tools, the company was able to identify a 5.5 percent hysteresis in one valve and 3 percent in another. After replacing the valves, the system was able to run in AUTO with no environmental incidents since the repair. One of the key issues was the ability to distinguish between hardware problems, tuning problems, and control strategy problems. With the focus in the right place, problems are resolved quickly.

With PlantTriage, SABIC-IP was able to significantly improve the stability of its Burkville plant. For example, a typical plant has about 40 percent of its loops oscillating and 12 percent of its loops unable to hold setpoint. The Burkville plant now has only 16 percent of its loops oscillating while only 2 percent cannot hold setpoint.

Metric	Typical Plant	Burkville Plant
% Loops Oscillating	40%	16%
% Loops Unable to Hold SetPoint	12%	2%

Burkville Plant Compared to Typical Plants

Conclusions

Asset effectiveness and business performance is built on a strong automation and control foundation. A best practice and continuous improvement strategy using performance supervision and automation asset management is one cost-effective ways to improve asset performance. Leading manufacturing companies like SABIC-IP are using advanced tools to improve the stability of their processes while reducing energy and maintenance costs. ExperTune reports that savings on the order of millions of dollars per year have been achieved through application of the control loop monitoring tools.

This paper was written by ARC Advisory Group on behalf of ExperTune. The opinions and observations stated in the paper are ARC's. For further information or to provide feedback on this paper, please contact the author.