

CHEMICAL PROCESSING

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VALVE MONITORING SPURS MAJOR CHANGES

Plant achieves cost savings and more-proactive maintenance

By Justin Putnal, TPC Group

TPC GROUP had been meeting industry standards, achieving production goals and safely maintaining day-to-day operation for decades. However, we wondered whether we were missing critical issues in our daily operations. The expectation for continuous improvement became increasingly important.

As a leader in providing highly specialized lines of chemical products to major chemical and petroleum-based companies worldwide, TPC Group strives to be a dependable supplier to our business partners. The online reliability of our Houston Operations site — which primarily produces butadiene, butene-1, fuel products, isobutylene derivatives and polyisobutylenes — is critical to serving our customers.

STUCK IN A RUT

The conventional thinking at TPC Group was driven by industry standards and regulatory compliance, not technology. As far as valve maintenance and operation, the company treated unpredictable valve failure as a routine part of running a complex petrochemical process and the cost of doing business. We operated in

a reactive manner — safely addressing valve failures as they occurred.

Anything short of a failure was considered a small problem that might never amount to any downtime, and often went unnoticed due to the lack of severity. The assumption was that we would find small problems during monthly field checks.

There were two key issues with our conventional thinking about small problems in valve maintenance.

First, our assumption that intermittent field tests would discover small problems wasn't always accurate. When a technician manually examines a valve for less than one minute, once a month, the person might miss an intermittent problem. On occasion, the timing of the technician's rounds would correspond with the moment in which a valve wouldn't meet optimum level of performance. Sometimes, however, irregularities would occur long before or long after the inspection.

Second was the assumption that anything short of a complete valve failure didn't require the same degree of attention as a complete valve failure. While it's true that many small problems faced in the field may never result



in downtime, they still can have significant impact. For instance, a control valve that isn't working correctly and tracking set point can create considerable consequences over time on the business — both from a safety and financial perspective.

While a loss of three barrels per hour doesn't sound like much, when it continues for an extended period of time the loss adds up very quickly. When we were relying solely on a monthly five-point check on the control valve, we might never have caught such a problem, resulting in the organization missing out on significant production revenue.

Further complicating our maintenance process was the use of a one-size-fits-all configuration for new valves. This facilitated rapid deployment during valve installations. In many cases, the generic configuration worked fine. Unfortunately, it didn't truly meet the unique needs of certain valves. Too much air pressure on some valves might create excessive load on the device and make lifting off the seat take too long. On the other hand, not enough air pressure could prevent completely lifting off the seat. To maximize plant performance, the company's plan needed all valves to be configured properly.

TPC Group's process control team knew that things had to change and began initiating that change. The company didn't have a formalized valve-monitoring plan in place. Instead, it had established preventive maintenance or mechanical integrity programs for only the most critical control valves — even those programs weren't as thorough as they could have been. The team was well aware of the many benefits of a strong predictive maintenance plan and knew that a best practices plan could transform the organization.

OVERCOMING OUTDATED THINKING

For most organizations, the biggest hurdle for implementing a formal monitoring plan is the cost of procurement and installation. We already had jumped that hurdle. In August of 2014, TPC Group had purchased [AMS Device Manager](#) with the ValveLink Snap-On application. In addition, the company already had installed the monitors necessary to keep close tabs on the hundreds of control valves in the field.

Unfortunately, relatively few people knew about the software and hardware purchased, and the system had not been implemented effectively. After fully understanding the tools we had in place, the team needed little time to become proficient with the new system and initiate utilization in the process areas where

the company had migrated to [DeltaV](#) and upgraded its instrumentation to HART devices.

Using case studies and success metrics around predictive maintenance, the process control team was able to make a case to management for approval of the man-hours needed to get the asset management system configured and effectively implemented. Knowing that this was the first step toward a complete transformation of how we manage assets at the plant, the team did just that.

RAPID RESULTS

After approximately two to four weeks spent configuring and learning the asset management system, the process control team quickly began to see results. We brought the AMS system fully online in February 2015. Almost as soon as we turned the system on, it flagged a problem: one bypass control valve on a boiler feed-water pump was stuck open at 52%.

It was determined that the valve had been operating at this level for six weeks, costing the company tens of thousands of dollars. With our asset management system up and running, identifying and correcting the problem was quick and efficient. Had we not brought the system online, the problem likely would have persisted. This success alone illustrated the need for a key organizational change, resulting in the development of a transformational valve-monitoring plan, fully supported and endorsed by plant management.

This new monitoring system has helped the team flag a number of other critical issues in how the plant conducts maintenance. By setting up a temporary monitoring station with a remote AMS client on our anti-surge valves, the team was able to avoid having to bring the valves into the shop, a project that would have cost in excess of \$100,000 whether problems were discovered or not. The remote client discovered the valves' poor performance stemmed from a misconfiguration on one critical valve, keeping it from dropping below 9% when trying to achieve a full close. Had the valve been monitored from the beginning, TPC Group could have saved hundreds of thousands of dollars in unnecessary surging and leak-by.

The diagnostic data that we receive from AMS are critical. In one instance, the team spent weeks trying to isolate the reason for a significant amount of missing off-gas. Technicians had inspected the butterfly valve we suspected but couldn't identify any issue. As soon as the control valve was examined through AMS, however, it became clear the valve was 10% open. Comparing AMS



data with the valve specification sheet yielded more results: the valve only was getting 39-psi air when it needed 58-psi. After a quick adjustment to the regulator, we realized significant cost savings.

As part of the monitoring program, we establish a baseline for every valve we install. When a new valve is deployed, we take readings to determine exactly how it is working.

Now, we can compare the current data on any of our 193 control valves against initial readings. This has been a game-changer for identifying problems. The team can detect if packing is too loose or too tight, or if air supply is drooping because of a defective diaphragm. Without having an initial baseline, it's nearly impossible to detect some of these small changes and degradations that lead to poor process performance and, eventually, to shutdowns.

Because we quickly and easily can detect small problems before they become severe, we can be proactive in maintenance planning. We can customize our maintenance schedules to fix issues without impacting production, performing work either between production runs or during a planned maintenance outage. As a result, small problems are far less likely to interrupt operations, and TPC Group can maintain its safety and environmental standards.

In addition, before going out into the field to examine a device, a technician now must check the device's history

in our asset management software. This alerts the person to past problems and, so, fosters better preparation to address prospective issues. This means technicians spend less time around functioning equipment, reducing incident rates while working in the field.

THE FUTURE

As a result of the incredible benefits seen by TPC Group from [AMS Device Manager](#) and the Valvelink Snap-on, the company plans to expand its valve-monitoring program. The team will enlarge its wireless network and DeltaV reach as well as integrate smart control valves and other smart instrumentation in the field.

TPC Group's ultimate goal is to provide the tools, infrastructure and knowledge of the system to our technicians so they effectively can discover and diagnose valve issues safely from an indoor workstation. Giving our technicians the tools they need to quickly, easily and thoroughly fix the problems that surface on a day-to-day basis improves every facet of our operations. We can operate a safer and leaner organization while increasing production and reducing unexpected outages. Having insight into the health and integrity of each valve means TPC Group can do better than simply hoping for the best. ●

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