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Special Section: Asset Management

# Utilizing asset data for predictive asset management

## By learning where and when to apply special attention to key assets, petrochemical plant lowers costs, boosts productivity

### Fast Forward

- Braskem S.A. saved nearly \$300,000 per year by identifying one leaking control valve.
- Avoided multi-million dollar revenue losses by preventing an unscheduled shutdown.
- Reduced valve response time through easy loop tuning.
- Improved key asset performance through predictive maintenance.

By Alexandre Augusto da Silva, Geraldo Luiz Bellotti, and Heitor Hiroshi Chaya

More and more companies are experiencing the impact of diagnostic data on the performance of key assets—and ultimately the performance of the entire facility. Asset management systems, like Emerson's AMS Suite predictive maintenance software, provide the means to use information gathered from mechanical equipment, electrical assets, process equipment, instruments, and valves to make informed business decisions. The data empowers plant personnel to detect equipment problems before they occur and take immediate action, if necessary. Better informed staff members can make fact-based decisions on the thousands of assets, producing a positive impact on the bottom line.



Asset management is enabling Braskem, a Brazilian petrochemical company and a leading producer of thermoplastic resins, to move toward predictive maintenance and away from costly preventive and reactive maintenance. The key is learning what assets need special attention as their performance begins to degrade. Readily available information makes it possible to predict what action will be necessary to upgrade a device or when repairs should be made to minimize the impact on production.

Making repairs/replacements at the optimum time limits costs and downtime. There is also less risk of an unexpected failure shutting down part or all of a process before a repair can be completed.

One of the plants has experienced a rapid return on its investment in asset management while maintaining high safety standards for people and equipment. In fact, by identifying just one previously unrecognized control valve leak, Braskem saved nearly \$300,000 per year, as described below.

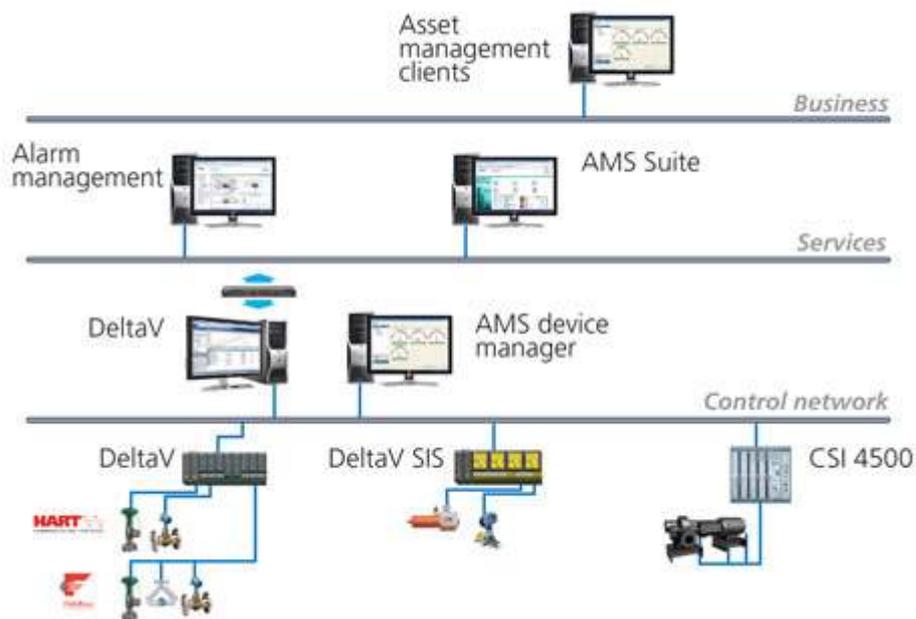
### The architecture

One challenge to implementing a broad asset management program is the integration of assets in a production unit into a common application, where they are accessible and with which plant personnel

are comfortable.

Braskem's asset management system architecture: At the plant floor level, real-time information from HART and FOUNDATION fieldbus devices send diagnostic information into the distributed control system and the maintenance shop. The company also continuously monitors a critical loop reactor, and its safety instrumented system with HART I/O is integrated with AMS Suite, enabling comparison of 4–20mA values of HART signals to verify the safety interlocks are functioning. Diagnostic information is routed to the appropriate plant personnel, and the AMS Suite: Asset Portal system collects a broad base of plant information that engineers use to improve availability and reduce maintenance costs.

### Braskem's asset management system architecture



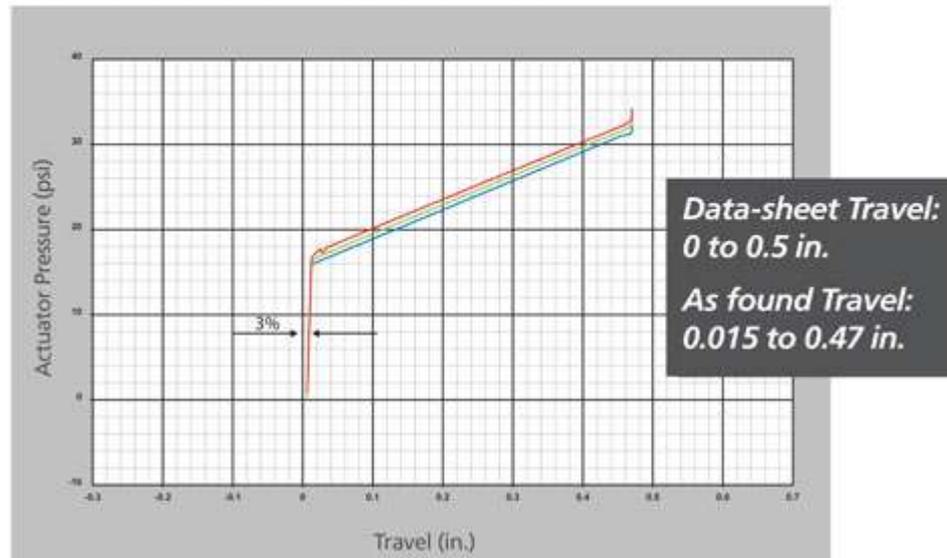
### Smart devices and control valves

All devices connected to the control system, including data from control valve positioners known as digital valve controllers, can be accessed by the online asset management system, making it unnecessary for instrument technicians and other maintenance personnel to go into the field to verify device configuration and status. The parameters for any devices connected can be viewed from the comfort and safety of the instrument shop, control room, or even a remote location. It is even possible, using a personal computer in your home (with the approved security and permissions), to inquire about the health of a specific asset in the plant.

The Enhanced Device Description Language and Field Device Tool/Device Type are used to create a friendly interface. Unique device dashboards present the device information most wanted by maintenance technicians on a single, easily recognized screen. Additional information in various categories is instantly available by following on-screen instructions.

### Searching for the causes

Using AMS Suite with the AMS ValveLink™ SNAP-ON in order to check some valves signatures, we discovered that a pressure control valve wasn't closed completely; it was 3% opened all the time.



### Control valve maintenance

Prior to a recent plant shutdown, an advanced diagnostic test called a *valve signature* was executed on a number of control valves. This signature, represented by a graphic of displacement (valve travel) of the actuator as pressure is applied, can be compared with a similar signature made when the valve was new. In this way, it is possible to detect recent problems that have developed in the valve, actuator, and/or positioner.

The test is conducted by sending a pressure signal to the actuator to open the valve fully, followed by a signal to close the valve. This travel deviation test determines with great accuracy if a valve is achieving complete travel (0 to 100%). The graphic also shows high friction (sticking) points and even if the positioner is well synchronized.

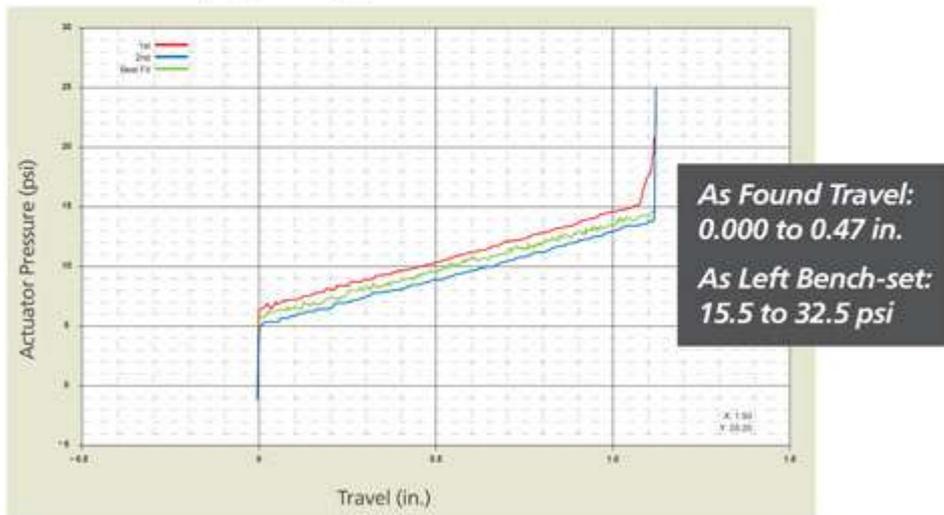
While performing valve signature tests, Braskem discovered a problem with one pressure control valve on a propylene storage tank that had to remain 100% closed under normal conditions. The test showed the valve to be partially open. In fact, it remained about 3% open even though the control panel indicated it was closed.

This small opening was allowing about 20 kilograms of pressurized propylene to escape every hour—a loss valued at \$297,500 per year. It was later determined that the problem was caused by a calibration error at commissioning.

The solution was to perform a valve travel calibration through AMS Suite and its AMS ValveLink SNAP-ON application. The air supply pressure was also increased to from 32 psig to 40 psig. This critical valve now closes fully, and the loss has been eliminated.

### Solution: Using AMS Device Manager

The solution was to perform a valve travel calibration through AMS Device Manager and the AMS ValveLink™ SNAP-ON. The air supply pressure was increased from 32 psig to 40 psig.



### Loop tuning

Some control loops were known to be oscillating, but efforts to tune them using available tuning tools did not stop the oscillations. Using AMS Suite with the AMS ValveLink SNAP-ON to conduct a step response test, technicians were able to tune the control loop properly after setting the valve to the best dynamic response.

### Pump vibration

Braskem technicians, using the diagnostic capabilities of AMS Suite and a CSI online vibration monitor, identified excessive vibration in an axial pump on a loop reactor. In fact, they were even able to identify a specific bearing as the cause and recommended shutting down the process as soon as possible. However, the plant was producing a specific product grade and needed to continue operating for another 15 days to fulfill its commitment to a customer.

The pump's operation was carefully scrutinized over the next 14 days using continuous on-line monitoring along with frequent visual checks at the pump using a CSI 2130 Vibration Analyzer. Although the bearing ceased functioning before the 14-day period was up, the pump kept working.

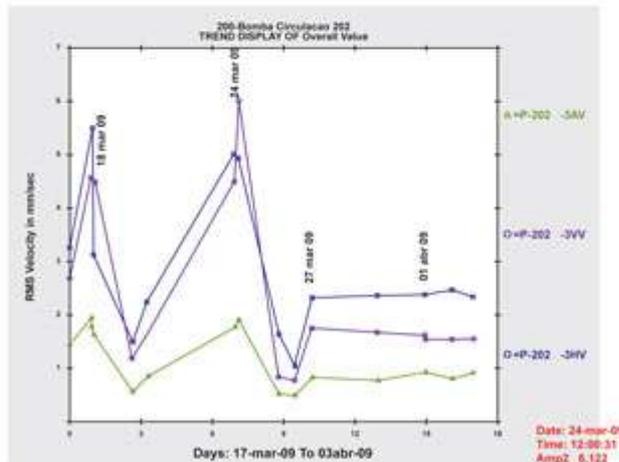
Staying in production over that 14-day period met customer commitment and produced sales revenue of about \$29 million that might have been lost to a competitor if the process had been interrupted.

When the pump was opened up, only the bearing had to be replaced, which was completed in two days. If an emergency shutdown had been necessary due to an unexpected failure, five days would have been needed to identify the problem and make emergency repairs, costing the company more than \$6 million in lost revenue.

Using an asset and predictive maintenance software and vibration analyzers to identify developing problems with key production assets and finding suitable solutions can be worth literally millions of dollars to any company.

## Solution: Intensive monitoring to keep the pump running as far as possible

- Using online monitoring with AMS Suite and the CSI 2130, the vibration trend was continuously analyzed during 14 days.



From mar-18 to mar-24 there was a change in the direction of vibration (V to H). This indicates the end-of-life of the bearing #4

### ABOUT THE AUTHORS

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