

APRIL 2005

WWW.CHEMICALPROCESSING.COM

CHEMICAL PROCESSING

LEADERSHIP | EXPERTISE | INNOVATION

AMS Device Manager benefits plant from start to finish

Smooth startups and predictive maintenance are supported by asset-management software

By Warren Way, E.I. DuPont deNemours Co.

IN THE LATE 1990s, DUPONT, WILMINGTON, DEL., was planning to expand production of chemical intermediates for making industrial and commercial Teflon by commissioning two new plants at its Fayetteville Works site in North Carolina. Engineers at the facility knew the value of networking the information generated by smart field devices, as well as the importance of having a central database of information about the process. After evaluating several options, DuPont engineers selected AMS Suite: Intelligent Device Manager software from Emerson Process Management, St. Louis, as the means of accomplishing both objectives.

AMS Device Manager is a versatile software package that can be used by engineers and technicians to calibrate instrumentation, check out control loops, validate interlocks and assist in startups. An additional benefit is that it can be used as a predictive maintenance tool.

This asset-management software allows DuPont personnel to effectively work with field instruments without leaving the control room and, in doing so, save a significant amount of time during commissioning and startup. As a predictive maintenance tool, it enables technicians to determine the operating condition of field devices so they can make



Figure 1. DuPont's Fayetteville Works site produces Teflon intermediates.

informed decisions about maintaining or replacing those devices. This results in higher reliability of operating equipment and lowers the likelihood that unexpected shutdowns will occur.

The first expansion plant was commissioned in 2001. Results indicate that the asset-management system — including the required hardware — paid for itself during startup and commissioning. The software is now a valuable tool for the maintenance department to calibrate, troubleshoot, perform diagnostics and follow up with various activities.

Smart software for smart instruments

AMS Device Manager, an element of Emerson's PlantWeb digital plant architecture, leverages the large amount of diagnostic information being generated by intelligent, microprocessor-based field instrumentation. The software interfaces with smart instruments via an RS485 communication network, which makes it possible to communicate with these devices and examine their condition in a way never before possible.

We loaded the software onto a PC in the control room. It communicates in real time with any HART



Figure 2. The author and David Bailey, instrument technician, obtain diagnostics on the condition of a field device suspected to be malfunctioning. This console is located in the control room, enabling the operators and maintenance technicians to communicate easily and quickly.

device in the process-control network without interfering with the ABB Freelance control system. Large amounts of field-based data are retrieved, integrated into a single database, organized and processed, and are then accessible to engineers and technicians on the PC.

AMS Device Manager features a number of time-saving functions, including configuration and inventory management of smart instruments, loop testing and tuning, valve calibration and diagnostics, monitoring and issuing of status alerts when the condition of a field device warrants attention, troubleshooting of suspected problems and documentation of all activities. Technicians can perform all of the functions generally associated with a handheld communicator and more, without leaving the comfort and safety of the control room.

We have never, to my knowledge, had to put an instrument on a bench in an instrument shop — we didn't even have an instrument shop on site when the first unit was built. All of the transmitters and valve positioners were installed directly from receiving, and all of the calibration, function and loop checks were done with the AMS Device Manager software. We

saved at least 20 days of a technician's time because these procedures were streamlined so effectively.

Startup shortcuts

Because the software communicates directly with each device, it gives us a way to satisfy DuPont's rigid loop-checkout and interlock-validation requirements without technicians having to go into the plant and physically locate 250 newly installed transmitters, attach test instruments and complete the established procedures.

Loop checkout tests the integrity of the wiring that connects field devices with the control system and confirms their I/O capability following installation. This testing proved to be extremely efficient, since all field transmitters could be polled in sequence from the control room.

With the system in configure mode, device outputs are varied from 0% to 100%, and changes are observed on the DCS console, indicating the responsiveness and proper calibration of each device. The integrity of each loop was confirmed in minutes because technicians didn't have to venture into the field to find and open each device, clip on handheld communicator leads and force outputs while constantly communicating via radio with another technician in the control room.

AMS Device Manager made it possible for one person to do everything. I estimate that loop checkout took 100 hours using this system. Without the software it could have taken 700 man-hours.

Interlock validation ensures that the control-system software is written correctly and that the safety interlocks are functioning as intended. A companion program called QuickCheck, developed by Proconex Inc., an Emerson business partner, makes it possible to test the interlocks by modifying process variables coming from the HART transmitters. Because multiple transmitters can be grouped and monitored while the output is fixed by an operator on one control screen, interlock validation is more efficient using the AMS Device Manager software in conjunction with QuickCheck.

We set up groups of transmitters in loop-test mode with outputs equal to normal process variables. With the process in simulation mode, a technician systematically manipulated the output of each transmitter to exceed process conditions and then waited for the

plant to respond, indicating that the safety interlocks were working properly.

This procedure took place in the control room alongside the control console. The technicians didn't have to search for instrument data; these data were right there for them in an organized manner. This saved a tremendous amount of time while effectively validating the interlocks. Using these technologies probably enabled us to be up and running 10 days sooner on each project than if we had used traditional methods on these two projects.

The benefits we experienced in commissioning and starting up the first plant were repeated when the second unit was brought into operation in late 2002. Faster startups allowed us to deliver the chemical intermediates for Teflon production earlier than expected.

Practice predictive maintenance

AMS Device Manager provides information about the operating condition of the field devices and associated equipment, which is the basis for predictive maintenance now that the plants are operating normally. Although there isn't a great need for predictive maintenance of the instrumentation in a new plant, problems can develop, especially with valves, and online monitoring by the software conveys a valuable heads up if the condition of a device begins to deteriorate. This early warning enables maintenance technicians to determine how long the device is expected to last and when it should be replaced, considering its importance.

Advance knowledge of a de-

The asset-management system — including the required hardware — paid for itself during startup and commissioning.

vice's condition is especially useful at our plant; chemical hazards can make it difficult to get to an instrument or to break into a line while the plant is operating. For such procedures, it's necessary for all personnel to be in protective gear, which can be cumbersome and uncomfortable to work in. We can now try to pinpoint the cause of a problem before maintenance personnel suit up to go into the plant.

In the past, it was standard operating procedure to go out, pull a valve and take it back to the shop for repair if it didn't seem to be performing properly. Frequently, no problem was found and the valve was reinstalled. If the problem persisted, the valve might be pulled a second time. This doesn't happen anymore.

Now, when a valve appears to be malfunctioning, the first thing we do is compare the valve's current performance with its signature (a baseline taken when the valve was new) to determine if and how the basic characteristics have changed and whether that change is affecting the overall operation (Figure 2). Is it slowing down the process? Is it affecting the quality of the product? The answers to these questions can help determine whether any action needs to be taken. If there

is nothing wrong with the valve, the technicians look elsewhere. Most importantly, maintenance decision-making now is based on factual information, not supposition.

It's not necessary to be in the control room to communicate with these devices. Recently, I was in Maryland for Thanksgiving when an instrument in the newer plant failed. It was replaced with a spare transmitter that had a slightly different configuration. Although the plant was not fully operational, it was scheduled to run over the weekend, so they called me. Using my personal laptop computer, I was able to connect with the instrument via our corporate network, scale it according to the stored data on the device it replaced, and put it in service — all from more than 500 miles away and in less than 15 minutes.

Without question, this versatile software has earned a place in the arsenal of weapons we have to eliminate processing problems and ensure smooth, efficient production without unnecessary delays. It has saved us time and maintenance dollars while permitting increased plant uptime. **CP**

.....
Warren Way is a control systems engineer for E.I. DuPont deNemours Co., based in Fayetteville, N.C. He is a mechanical engineer with 35 years of experience at DuPont. E-mail him at warren.u.way-iii@usa.dupont.com.

Reprinted with altered headline with permission from Chemical Processing, April 2005.

©2005 Putman Media Inc. All rights reserved. On the web at www.chemicalprocessing.com.