Work Processes Guide

A Guide to Maximizing the Return from
AMS™ Suite: Intelligent Device Manager
by Changing Work Practices

June 2008

EMERSON
Process Management

Disclaimer

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Copyright and Trademark Information

Document History

Date	Description
Mar 2003	Original release, software version 6.1
Oct 2004	Updated AMS Device Manager Suite branding, customer burdened rate, and software pricing.
Feb 2005	Changed the Documentation section to Data Organization and added Test Schemes and Drawing & Notes to the calculation.
Feb 2005	Corrected calculation in Replacing Instruments and Valves (off by 1 minute).
October 2007	Updated system tag size, customer burdened rate, software pricing, and added latest testimonials.
June 2008	Updated software pricing based on Rev AJ price list

Contents

1 Introduction

While experience has proven the importance of technology, it has also shown that technology alone will not get the job done. That’s why, at Emerson Process Management, we look beyond technology to the expertise and work processes that surround technology, in order to strike the most effective balance between all three. From this unique viewpoint, Emerson Process Management shows you how Asset Optimization can fulfill the true potential of your plant.

AMS™ Suite: Intelligent Device Manager software is an essential technology within the Asset Optimization program and PlantWeb® architecture. AMS Device Manager supports instrument and valve maintenance activities at all four levels—reactive, preventive, predictive, and proactive. AMS Device Manager accomplishes this through diagnostics, troubleshooting, monitoring, configuring, streamlining calibration, and documentation.

In addition, AMS Device Manager supports operational excellence by:

- Increasing quality
- Increasing throughput
- Increasing availability
- Reducing operations and maintenance costs
- Reducing costs associated with safety, health, and environment
- Reducing utilities costs
- Reducing waste and rework costs

This analysis is typical for a range of facilities across the process community and will not necessarily be representative for your facility. Individual facilities must consider their work practices and evaluate savings for their particular scenario.

1.1 Work Process Comparisons

This guide compares the following instrument and valve maintenance work processes, first using a traditional approach and then using AMS Device Manager:

- Wiring checkout and loop check
- Device configuration
- Interlock check
- Calibration management
- Instrument documentation
- Troubleshooting
- Replacing instruments and valves
- Turnarounds

By comparing the traditional work processes commonly observed in plants with practices that can be used to realize the full benefits of AMS Device Manager, you—or an Emerson technician—can evaluate your current work processes and determine where improvements to each work process can best be made.

1.2 Savings

Following each work process comparison, there is a table showing the savings that can be realized by changing practices from a traditional approach to a new approach using AMS Device Manager.

Note that the assumptions made in the traditional approach reflect the best practices when using a portable communicator. The assumptions made in the new approach reflect the best practices when using an online AMS Device Manager system with either FOUNDATION™ fieldbus or HART® instruments and valves.

In addition, the savings shown assume an average burdened customer rate of $80 per hour (times are shown in minutes). You can adjust the burdened rate up or down to more accurately reflect the burdened rate in your facility.

1.3 Testimonials

Following the Savings table, each section includes testimonials from actual customers who saved even more time and money.

For example, according to AMS Device Manager customers at:

- **Alabama Power** "…with improved valve operation, better troubleshooting, and faster configuration of field devices, the plant will save as much as $40,000 annually."
- **Solutia** "We estimate the time saved in configuration, calibration, commissioning, and documentation ranges from 1.92 to 5.95 hours during the installation of one new smart device. This covers various kinds of transmitters as well as valves, although the time saved with valves is on the higher end of the range. Using the $50 per hour labor rate, the savings can range from $96 to $297 per installed smart device. The onetime cost saving does not take into account the benefit of having that device available for use from two to six hours sooner. This can make a tremendous difference in the time required for commissioning instrumentation and starting up a new unit."

Note: Additional savings could be the result of many factors, including current work process or hourly labor rate.

2 Wiring Checkout and Loop Check

The first step in commissioning a new instrument is the physical installation. The physical installation steps are the same for both the traditional and new approach:

1. Review P&ID drawings for location and piping instructions.
2. Review device instructions for proper location, mounting, and piping.
3. Verify field device is physically located in the correct location per the P&ID. Verify that a permanent tag label is securely attached to the device that clearly indicates the assigned loop tag number.
4. Verify field device is correctly connected by performing the following inspections:
    a. Physical inspection- properly mounted and oriented as designed, ensure close-coupled connections are securely fastened; pipe stands are structurally sound
    b. Mechanical- Sensing lines, and other process connections are properly installed, connected and verified per instrument design specification
    c. Electrical- Conduit runs are properly connected; seal drains are installed correctly, etc.
5. Verify the input or output signal is within the device's normal operating range.
6. Verify that any special/custom device characteristics required are present (example: custom gas curves, special construction materials, etc.)
7. Measure and adjust associated air and electrical power supplies.
8. Measure loop impedance by disconnecting the signal wiring at both the transmitter and rack room ends, shorting the signal wiring at the transmitter and measuring the loop resistance with an ohmmeter at the termination panel end. This process typically takes two technicians with two-way radios for communication.
9. With an ohmmeter, verify there are no shorts to ground in the signal wiring by checking the wiring to ground while the wiring is still disconnected. This process typically takes two technicians with two-way radios for communication.
10. Verify proper wiring polarity.
11. Connect the wiring to the transmitter in the field and in the rack room.
12. Verify that all field wiring is properly labeled per the instrument loop diagram. This includes all terminations per the instrument loop diagram.
13. Verification that all instrumentation wiring is mechanically sound by performing a physical "Tug Test" of the wires.
14. Verify that the field device enclosure is closed, all temporary shipping stops removed, and the device is mechanically fit for service as defined above and in the device instruction manual.
15. Apply power to device.

The following steps complete the wiring checkout and loop check work process.

2.1 Traditional Approach

To perform a wiring checkout:

1. Connect a portable communicator to the device's termination in the rack room and verify the proper device tag is recognized. For conventional (non-smart) transmitters, connect a signal generator to the device's termination at the field location and have a second technician in the rack room (with a VOM) verify the signal changes as the signal generator's output changes.

2. Manually document each step of the work process on a pre-established form.

In conjunction with the installation and wiring checkout, the following loop check steps complete the commissioning work process:

3. Verify configuration with the specification sheet. For HART and FOUNDATION fieldbus devices, use a portable communicator at either the instrument or the rack room. For conventional devices, compare the device nameplate data with the specification sheet.

4. For conventional devices, disconnect the device and connect a signal generator or calibrator. For HART or FOUNDATION fieldbus devices, connect a portable communicator and generate signals equivalent to 0, 25, 50, 75, and 100 percent of the process variable range or travel.

5. Communicate with a second technician in the control room via two-way radios to verify the appropriate indication is correct on the DCS at each test point.

6. Manually document each step of the work process on a pre-established form.

2.2 New Approach

For conventional devices, the entire traditional approach applies. However, conventional device templates can be used to document manually any changes.

1. Ensure all devices to be checked out are properly installed and powered.
2. Perform a device Scan operation by right-clicking on the interface icon in AMS Device Manager. The device icon will appear, showing you the device is communicating properly.
3. FOUNDATION fieldbus devices will appear automatically without a scan operation, thereby informing you the device is communicating properly.
4. Run the AMS Device Manager Tag Naming Utility to transfer the HART device tag to the AMS device tag.
5. For FOUNDATION fieldbus devices you should name the devices as they appear.
6. AMS Device Manager Audit Trail will automatically document these events, and will display the connection location of the each HART device (i.e. controller, file card, channel) when devices are connected with an Emerson Process Management DCS such as DeltaV™ or Ovation®.

   The following steps complete the loop check work process with AMS Device Manager:

7. Verify device configuration with the device specification sheet. For HART and FOUNDATION fieldbus devices, use an AMS Device Manager workstation networked in the control room. For conventional devices, compare the device nameplate data with the device specification sheet.
8. Use AMS Device Manager to generate signals equivalent to 0, 25, 50, 75, and 100 percent of the process variable range or travel.

   Warning: if the device under test is a control valve, this step will cause valve movement to full stroke position. To avoid personal injury and property damage caused by the release of pressure or process fluid, provide some temporary means of control for the process before generating output signals.

9. Verify the appropriate indication is correct on the DCS at each test point. A single person can set and check each function from an AMS Device Manager workstation.
10. The Audit Trail automatically documents the loop check steps.
11. Enter a manual event into the Audit Trail of the device to signify completion of the loop checkout.

    Note: The above procedures are based upon best practices applicable to most industrial facilities. Total time required to check out a loop may vary depending upon specific plant installation safety and quality requirements.

2.3 Savings

Task	Traditional	New
Connect a portable communicator.	2	0
Perform the task.	3	1
Verify configuration with the specification sheet.	2	2
Generate signals equivalent to 0, 25, 50, 75, and 100 percent of the process variable range or travel.	2	2
Verify the appropriate indication is correct on the DCS at each test point.	4 (requires two people)	2
Document changes and events.	10	Automatic
Time spent walking, locating, and returning items.	15	0
Total	**38**	**7**
Cost: $80 burdened hourly rate	**$51**	**$9**
Savings per instrument or valve		**$42**
Average 400 intelligent instruments and valves		**$16,800**

2.4 Testimonials

- **Abitibi** “We commissioned the instruments in August 2000, and started up the TMP mill in January 2001. I was later able to show the project manager that AMS Device Manager had paid for itself at that time. It was so easy to use; we did not have to hire a contractor to commission approximately 400 smart HART compatible instruments in the new TMP mill. This cost-avoidance easily saved more than the cost of the software.”

- **Noltex** “While the company took several other steps to quickly get the plant up and running, reduced instrument commissioning time alone enabled Noltex to start the second unit 12 days sooner.”

- **Solutia** An average saving of $200 per field device was reported for the installation and commissioning of about 70 instruments. In addition, trial results indicated a small to medium-size production unit could save at least $8,000 annually in day-to-day instrument maintenance and troubleshooting.

- **Syntroleum Corporation** “We believe that an end-user will see the benefits of reduced wiring and commissioning costs. With our experience using PlantWeb, we can develop and export all of the config files necessary, saving engineering and programming time for our customers. Startups will be fast and certain. And later, AMS Device Manager can be used for predictive maintenance and asset optimization during ongoing operations.”

3 Device Configuration

The following steps complete the configuration work process.

3.1 Traditional Approach

1. Connect a portable communicator to the device's termination in the rack room and verify the proper device tag is recognized.
2. Configure the device parameters, one at a time for all 40 to 242 parameters.
3. Document the As Found/As Left parameters.

3.2 New Approach

1. Select the device in AMS Device Manager.
2. Using the Configuration Properties, configure the device. The device parameters are grouped and displayed logically on a few screens. As configuration changes are made, the Audit Trail automatically documents the As Found/As Left parameters.

Note: To further speed up the configuration of similar instruments and valves, create and use User Configurations.

3.3 Savings

Task	**Traditional**	**New**
Connect a portable communicator.	2	0
Configure the device parameters.	20	5
Document changes and events.	20	Automatic
Time spent walking, locating, and returning items.	15	0
Total	**57**	**5**
Cost: $80 burdened hourly rate	**$76**	**$7**
Savings per instrument or valve		**$69**
400 intelligent instruments and valves		**$27,600**

3.4 Testimonials

- **Pharmaceutical Company** "We save three hours per device during installation because we can upload the device configurations to a PC where they are stored and can be printed. This represents a $99 saving per device installed."

- **Cianbro** “The AMS Device Manager drag and drop configuration tools allow us to configure devices in half the normal time. We are able to use AMS Device Manager to quickly create our 'as received' instrument database. Any changes that need to be made afterwards are captured in the 'as built' database. Being able to compare easily 'as received' and 'as built' configurations really comes in handy for troubleshooting.”
- **Gainesville Regional Utility** “Since the plant went into operation, the Emerson solution is saving technicians about 600 hours per year in device configuration, calibration, testing, device replacement, and valve diagnostics.”

4 Interlock Check

The interlock commissioning work process involves testing process logic to ensure proper operation and increase safety. During commissioning, the validated logic ensures the process will operate to specification when a predetermined state or combination of multiple device output conditions is detected.

These steps are the same for both the traditional and new approach:

1. Review process logic diagrams, safety interlock logic diagrams, process description, and standard operating procedures
2. Determine each specific test conditions or outputs that allow each process interlock condition to be verified for both a trip and reset conditions.
3. Develop a test scheme indicating the output of all associated transmitters to verify each set of interlock conditions.

The following steps complete the interlock checkout work process.

4.1 Traditional Approach

1. Locate each associated device (typically 2 to 5 devices).
2. Connect a portable communicator to each device, enter the loop test mode, and fix the output to the required test value. For conventional devices, simulate the output with a mA source.
3. Once each associated output is fixed, verify the expected process interlock condition.
4. Adjust each output, one at a time, to verify that each one affects the process as defined in the test scheme.
5. Return each device to its normal mode of operation.
6. Manually document each step of the work process on a pre-established form.

Note: When older instruments and valves are involved, the user may need to disable manually the write protect feature by adding or removing a jumper. This section does not take into account the time or cost associated with that task.

4.2 New Approach

The QuickCheck SNAP-ON™ application simplifies, accelerates, and documents interlock checkout and validation.

1. Group devices for each process interlock test.
2. Fix the output of each device from an AMS Device Manager workstation.
3. Once each associated output is fixed, verify the expected process interlock condition.
4. Adjust each output, one at a time, to verify that each one affects the process as defined in the test scheme.

5. Return each device to its normal mode of operation, verified visually on AMS Device Manager or by running a report.
6. The Audit Trail automatically documents these steps. Enter a manual event into the Audit Trail of the device to signify completion of the interlock checkout. If a pre-established form is required, scan and reference it in the AMS Device Manager Drawings and Notes via hypertext link.

4.3 Savings

Task	Traditional	New
Locate each associated device (typically 2 to 5 devices). Assumption is based on 5 devices.	10	2
Fix the output to the required test value.	5	2
Verify the expected process interlock condition.	1	1
Adjust each output, one at a time to verify that each one affects the process as defined in the test scheme.	2	2
Return each device to its normal mode of operation.	5	2
Document changes and events.	20	Automatic
Time spent walking, locating, and returning items.	15	0
Total	**58**	**9**
Cost: $80 burdened hourly rate	**$77**	**$12**
Savings per interlock check		**$65**

4.4 Testimonials

- **Air Products** “QuickCheck reduced the time required for interlock commissioning from 10 man-hours per interlock to a half hour procedure.”

Note: Obviously, the biggest savings are realized by starting the process sooner than expected. This saving could be as much as $1 million a day.

5 Calibration Management

Typically, eight field devices can be calibrated in an 8-hour day. If something goes wrong or an instrument replacement is required, the process can take much longer. In addition, calibrators and other test equipment require proof of their accuracy. Most instrument maintenance departments follow the same traditional calibration procedures they have followed for years.

These steps are the same for both the traditional and new approach:

1. Establish a calibration route (list of equipment to be calibrated during a specific test period) for each group of instruments. Generally, routes are established based on a plant area, by instrument type or by the calibration date.

2. Define a calibration test scheme for each instrument or types of instruments. This includes the required test equipment, specific test points, how the instrument should respond, and the accuracy of the instrument.

   Note: Routes and test schemes can be created, stored, changed, and tracked in AMS Device Manager. This allows you to make an update to a single route or test scheme and apply it to an entire group of instruments.

The following steps complete the calibration work process.

5.1 Traditional Approach

1. Generate a report from your Enterprise Asset Management or Computerized Maintenance Management System (EAM/CMMS) of instruments and valves that need to be calibrated.

2. Pull the test requirements from the file cabinet for each instrument to test in the route.

3. Go into the process area and locate the first instrument.

4. Attach the calibrator and apply the known pressure, temperature, or other process.

5. Record the readings of the instrument and compare with calibration test scheme data to determine if the device meets its specified accuracy.

6. If an instrument fails the calibration test, make the necessary adjustments and retest the instrument. Be sure the “as left” calibration is within the acceptable accuracy limits established in the calibration test scheme. If the device cannot be pulled back within specification, the instrument must be replaced.

7. When all testing is completed satisfactorily, return to the maintenance shop and write a report on each instrument tested.

5.2 New Approach

With AMS Device Manager, the calibration procedure is greatly streamlined. The Calibration Assistant SNAP-ON application communicates with HART devices and stores data about conventional devices. Thus, the calibration test points and accuracy requirements for every pressure and temperature instrument in a plant can be transferred automatically to a self-documenting calibrator. *This application only applies to conventional and HART instruments*.

1. The AMS Enterprise Server queries AMS Device Manager for devices in need of calibration based on a schedule. The results of the query are written to the CMMS as a preventive maintenance work order.
2. Check out (download) the calibration route to a self-documenting calibrator. The calibration routes and test schemes are maintained in the AMS Device Manager database, and therefore are easily associated to a specific device.
3. Go into the process area and locate the first instrument.
4. Attach the calibrator and apply the known pressure, temperature or other process. The readings of the instrument are stored automatically and compared with calibration test scheme data to determine if the device meets its specified accuracy.
5. If an instrument fails the calibration test, make the necessary adjustments and retest the instrument. Be sure the “as left” calibration is within the acceptable accuracy limits established in the calibration test scheme. If the device cannot be pulled back within specification, the instrument must be replaced.
6. When all testing is satisfactorily completed, return to the maintenance shop and check in (upload) the calibration test results from the self-documenting calibrator. The data is archived for each instrument, thereby automatically creating the documentation essential for regulatory compliance and future maintenance scheduling.

You can use AMS Device Manager calibration management historical data to analyze the frequency of calibrations and extend them over time, if appropriate.

5.3 Savings

Task	**Traditional**	**New**
Pull the test requirements from the file cabinet for each instrument to test in the route.	2	0
Attach the calibrator and apply the known pressure, temperature or other process.	10	10
Record the readings of the instrument and compare with calibration test scheme data to determine if the device meets its specified accuracy.	5	Automatic
Document changes and events.	15	Automatic
Time spent walking, locating, and returning items.	15	15
Total	**47**	**25**
Cost: $80 burdened hourly rate	**$63**	**$33**
Savings per instrument or valve		**$30**
Average 400 intelligent instruments and valves		**$12,000**

5.4 Testimonials

- **Cianbro** "With AMS Device Manager software, we are able to reduce our calibration time by 50 percent. AMS Device Manager calibration screens streamline the process while capturing all the documentation. We have been able to cut our typical configuration, calibration, and documentation time from 3 hours to 1.5 hours per device."

- **Eastman Chemical** "AMS Device Manager saves at least 20 minutes per device calibration because our technicians no longer waste time hunting for the information they need. Accurate, up-to-date specifications on the 750 HART-compliant devices in the AMS Device Manager database make it possible to save more than 250 man-hours annually on device calibrations."

- **Noltex** "The software technology also saves instrument technicians substantial time in preparing for and recording routine calibrations. After the initial setup of the system's "Pass/No Pass" calibration test for each transmitter, technicians no longer manually key information for specific instruments into a calibrator. Now, for every instrument, they simply and quickly download information from the database of the software. This saves 30 minutes per instrument because technicians do not have to pull out a calibration record sheet and file it. This means more than $6,000 per year in savings because Noltex does not have to calibrate 135 smart digital valve controllers and 350 smart transmitters annually at a labor cost of $25 per hour."

- **Pharmaceutical Company** "By being able to automate our calibration procedures, we are now able to reduce our calibration time by 1 hour per device. We typically calibrate about 8,000 devices per year, which represents an annual saving of $264,000."

- **Boston Generating Company** "Last year we started a preventive maintenance plan using a combination of AMS Device Manager and a documenting calibrator to calibrate our smart transmitters. The results have been great. The time we take for calibration is decreased greatly, sometimes by half, because of the preset calibrations and the absence of paperwork. The calibrations are loaded in the documenting calibrator electronically, and the results are uploaded the same way into the AMS Device Manager database. The Audit Trail option helps us also to keep a closer look on our instruments. It also keeps our data organized, up to date, and easy to access."

6 Data Organization

6.1 Instrument Database/File Cabinet

Creating and maintaining an accurate instrument database is critical to enable efficient instrument maintenance. Utilize this database for scheduling routine maintenance, calibration, managing spares inventory, generating and tracking maintenance work orders, and as a tool for keeping track of plant assets.

These steps are the same for both the traditional and new approach:

1. Review specification sheets, loop sheets, and P&ID's.
2. Create a filing folder structure, either in hardcopy or in a database.

The following step completes the instrument database documentation work process.

6.1.1 Traditional Approach

1. Type the relevant data into a database. This can be anywhere from 40 to 242 device parameters for a given device type.
2. Document information about whom you purchased the instrument or valve, as well as the manufacture's web site, technical support number, etc. This may be done on a roll-a-dex or in a database.
3. Organize the product manuals on a shelf for easy reference.
4. Document Test Schemes detailing how each instrument is to be calibrated. Include the calibration schedule interval, the number of test points, notification and pass/fail accuracy values, device power, input, and measurement options, setup/safety instructions, and cleanup instructions.

6.1.2 New Approach

AMS Device Manager simplifies and automates creation of the instrumentation database for instruments and valves. Many times, you will already have an existing database from which you can export data such as the device manufacturer, type, and revision. You only need to enter the location in which to locate the asset within AMS Device Manager.

1. After all 40 to 242 device parameters have been automatically read into the system, drag and drop a device icon into a Control Module folder within the AMS Device Manager Plant Database.
2. Use the Drawings/Notes feature to create hyperlinks to the manufacture's web site, representative's web site, product manual, and support center. This way you will always have the latest information just a click away. ***Tip****: When you have multiple instruments or valves from the same manufacturer, simply copy and paste information from one Drawing/Note file to another.*
3. Create Test Schemes detailing how each instrument is to be calibrated. Include the calibration schedule interval, the number of test points, notification and pass/fail accuracy values, device power, input, and measurement options, setup/safety

instructions, and cleanup instructions. ***Tip****: When you have multiple instruments that will be calibrated the same way, only create one test scheme. So you may end up with a Pressure Test Scheme, Flow Test Scheme, Temperature Test Scheme, Level Test Scheme, or maybe a couple for each category of instruments.*

4. Drag-and-drop the instruments onto the Test Scheme to apply it to the specific device parameters.

6.1.3 Savings

Task	Traditional	New
Instrument Database/File Cabinet Setup	120	60
Organize information about manufacturer, support, representative	4,500	2,250
Document Test Schemes for calibration	9,000	500
Total	**13,620**	**2,810**
Cost: $80 burdened hourly rate	**$18,160**	**$3,747**
Savings per system setup		**$14,413**

6.2 Configuration and Calibration

Documenting configuration and calibration activities is critical; both for managing change record keeping and for assuring the process instrumentation is working at proper performance levels. Documentation accounts for nearly half of the 30 minutes it takes to initialize and configure a HART instrument. Documentation also accounts for half of the 95 minutes it takes to calibrate an instrument.

6.2.1 Traditional Approach

1. Amend or add documents as each configuration or calibration is performed.
2. Update the CMMS or ERP database as each configuration or calibration is performed.

6.2.2 New Approach

Automating the documentation process accomplishes the mundane and improves its accuracy.

1. Configuration and calibration activities are documented automatically in the AMS Device Manager Audit Trail at the same time the activity is performed or uploaded.
2. The AMS Enterprise Server updates your CMMS.

6.2.3 Savings

Task	Traditional	New
Configuration	20	Automatic
Calibration	15	Automatic
Total	**35**	**0**
Cost: $80 burdened hourly rate	**$47**	**$0**
Savings per instrument		**$47**
Average 400 intelligent instruments		**$18,800**

Note: The savings associated with documenting the configuration and calibration activities have been accounted for already in their respective sections, and therefore are not shown twice in the Summary table.

6.2.4 Testimonials

- **ACS Dobfar** "Automated documentation of instrument tests saves us an average of $132 per device per year. That is a reduction of 40%, compared with the costs before we implemented our asset management solution. For our intelligent HART devices, the cost savings are as high as 65%."
- **Noltex** "With archiving, historical records are available to show regulatory agencies the maintenance on each instrument. If there is an audit of calibration records, the information is immediately available without operators or engineers having to sort through paper files. That availability saves an additional $400 per year."
- **Philip Morris** "The flavor usage was off by 2% in two of our process areas. Using the AMS Device Manager Audit Trail, I was able to show that seven of the eight meters in question had been changed."

7 Troubleshooting

7.1 Traditional Approach

Requests to check out suspected instrument problems usually come from operators, shift supervisors, or process engineers. Nearly half the troubleshooting checks made by technicians find nothing wrong. Instruments and valves are usually the equipment to be checked first, since they can be usually checked without shutting down the process. In the case of conventional devices, the technician must go to the field and connect a calibrator to verify the device is functioning properly and calibrated per its specification.

The following steps complete the troubleshooting work process:

1. Locate the necessary instrument documentation.
2. Locate the instrument in the field or the terminations in the rack room.
3. Connect a portable communicator to view the status and configuration of the device.

7.2 New Approach

AMS Device Manager status and diagnostic capabilities help identify the source of control loop performance problems such as defective instruments, wiring and communication problems. AMS Device Manager also eliminates the need for technicians to enter hazardous process areas to perform tests on the instruments.

1. Locate the instrument or valve in the AMS Device Manager Explorer. All of the information is associated with the icon of the online device.
2. Review status, documentation and configuration information from the safety and comfort of the shop. In this way, troubleshooting a control problem can be accomplished in minutes vs. hours for a typical process problem.

7.3 Savings

Task	Traditional	New
Locate the necessary instrument documentation.	2	0
Locate the instrument in the field or the terminations in the rack room.	2	0
Review the status and configuration of the instrument.	5	2
Time spent walking, locating, and returning items.	15	0
Total	**24**	**2**
Cost: $80 burdened hourly rate	**$32**	**$3**
Savings per instrument or valve		**$29**
Average 100 intelligent instruments and valves (25%)		**$2,900**

7.4 Testimonials

- **Abitibi** "We use AMS Device Manager at least once a week to verify an instrument's operation in response to an operator's concern. If an actual problem occurs, steps can be taken to correct the condition before it becomes serious enough to shut down production or impact quality."
- **Degussa Goldschmidt Chemical** "The valve was not leaking and did not need to be replaced. In 10 minutes, the problem was corrected by re-calibrating the positioner. This was done from the control engineer's office. Without AMS Device Manager, maintenance would have shut down the process for four or five hours to replace a valve that was in good working condition. The cost would have been more than that of the replacement valve and the crew's time; it would have included several thousand dollars per hour of lost production time."
- **Noltex** "But when technicians checked the digital valve positioner using the AMS Device Manager software, they determined immediately that the globe valve controlling the discharge of nitrogen to a flare was actually open slightly. That maintenance action prevented further nitrogen loss and allowed continued and uninterrupted production of a quality product. Noltex avoided an unplanned shutdown and saved an estimated $20,000 in energy and production losses as well as repair costs."
- **Weyerhaeuser** "Fast troubleshooting by technicians using AMS Device Manager actually prevented an unscheduled finishing line shutdown after the system drew attention to the lack of pressure control on a critically important 170-lb steam valve on the Flakt dryer. Since the valve was not operating properly, plans were made to replace it, requiring the finishing line to shut down for a minimum of three hours. However, the detailed picture of the valve's performance provided by AMS Device Manager of what was actually happening at the valve enabled the mill to pinpoint the root cause of the problem—sticking at a certain point in its stroke. With this knowledge, the control system operators were able to work around the problem until the valve could be replaced about a week later during a planned outage—preventing a costly unplanned shutdown."

8 Replacing Instruments and Valves

Instruments can last for years, so when they fail and need to be replaced, the process needs to be simple.

8.1 Traditional Approach

1. Operator notices a problem with an instrument or valve and calls for maintenance.
2. Work request is written and submitted.
3. Scheduler assigns the work request to a work order and gives it to a maintenance technician.
4. Documentation is reviewed to determine a suitable replacement device.
5. Replacement device is located.
6. Failed instrument is removed.
7. Replacement device is installed.
8. Replacement device is configured.
9. Device replacement is documented in the instrument file.

8.2 New Approach

1. The Alert Monitor scans assigned instruments and valves for status alerts.
2. Alerts generate a CMMS detailed work request via the AMS Enterprise Server.
3. Scheduler assigns the work request to a work order and gives it to a maintenance technician.
4. Failed instrument is removed.
5. Replacement device is installed.
6. The Replace Device wizard is used to locate an acceptable spare HART device and transfer the configuration of the failed device to the replacement device. For FOUNDATION fieldbus instruments and valves, decommission the device and select a replacement. AMS Device Manager automatically documents the device replacement.

8.3 Savings

Task	Traditional	New
Determine a suitable replacement device.	2	2
Locate a replacement device.	5	5
Remove the failed instrument.	10	10

Install the replacement device.	10	10
Configure the replacement device.	20	5
Document changes and events.	20	Automatic
Time spent walking, locating, and returning items.	15	15
Total	**82**	**47**
Cost: $80 burdened hourly rate	**$109**	**$63**
Savings / instrument or valve		**$46**
Average 40 intelligent instruments and valves (10%)		**$1,840**

8.4 Testimonials

- **DuPont** "…scanned approximately 550 control valves in the past three major turnarounds—188 valves in 1991, 214 valves in 1992, and 441 valves in 1995. In the past, a preventive maintenance program would have pulled a majority of these valves for shop overhaul and inspection. Only 116 (14%) of the surveyed control valves were pulled from the process line for valve repairs. The rest of the control valves were repaired in place or required no attention."
- **Major Refinery "**Saved $22,800 through better turnaround planning based on valve diagnostics and reduced number of valves pulled for rebuilding from 30 to 3"

9 Turnarounds

Outage planners have a predetermined operating window in which to complete maintenance activities. Mechanical equipment or vessel repairs requiring cranes, scaffolding, and heavy equipment usually determine the schedule. Because of limited time and resources, outage planners spend a lot of time, in advance of the outage, building spreadsheets to match the availability of cranes, scaffolding, test equipment, tools, and personnel with the tasks to be accomplished. Often, equipment that actually needs attention is not examined due to scheduling conflicts or lack of awareness.

9.1 Traditional Approach

Most customers schedule maintenance activities during shutdowns based upon the following:

- Maintenance history of the device (e.g., fails every three years)
- Service life expectancy (scheduled device replacement)
- Process performance concerns that have become evident during normal operation but require a shutdown to investigate and/or repair.

9.2 New Approach

AMS Device Manager has several tools to help outage planners determine the best activities to be performed and when to perform them during an outage. This way, more can be done in less time.

- Evaluate instruments and valves during normal operation by reviewing AMS Device Manager Device Status windows.
- Use the AMS Device Manager ValveLink SNAP-ON application for complete control valve evaluations (with Performance Diagnostics) before shutdown. This allows only the actual valves in need of repair to be pulled from the process piping. Pretesting also provides information regarding component performance, thus allowing only the necessary parts to be ordered and the valve assemblies to be repaired only to the extent needed.
- Review the Audit Trail for indications of repeat problems with specific devices. Armed with that information, a root cause failure analysis can be performed and a permanent fix implemented during the shutdown.
- AMS Device Manager can also help to optimize the scheduling of activities. The AMS Device Manager database hierarchy is typically configured to match the actual plant areas, process units, and process equipment. This makes AMS Device Manager the ideal tool to identify instrumentation associated with a specific piece of process equipment.

9.3 Testimonials

- **BP** “Approximately 60% of valves are removed for maintenance unnecessarily. Savings arise from being able to selectively diagnose and remove only those valves requiring overhaul, carry out in-line repairs, and defer overhauls where no defects are indicated. On a typical offshore platform with 70 valves, this means potential savings of $80,000 to $160,000 per overhaul."

- **Cabot Corporation** "The AMS Device Manager knowledge we gained through that training could have prevented at least 15 hours of process downtime when the main feed line shut down. We now have a greater appreciation for the many capabilities of AMS Device Manager."
- **DuPont** "Summarizing the last three turnarounds, valve maintenance costs have decreased $100,000 per turnaround by using valve diagnostic technology. To date, control valve problems have been significantly reduced during plant operation."

10 Summary

10.1 Costs

As of June 2008, the price for a 400-tag AMS Device Manager system with many options is:

Option	**AMS Device Manager**
Server Plus License	$6,255
DeltaV System Interface	$7,735
ValveLink SNAP-ON Application	$5,115
Calibration Assistant SNAP-ON Application	$4,320
3095 Engineering Assistant SNAP-ON Application	$650
QuickCheck SNAP-ON Application	$5,355
Audit Trail	$3,540
Complete Set of Self Paced Training Manuals	$495
Foundation Support	$910
Total Cost	**$34,375**

10.2 Startup Savings

The most important savings that AMS Device Manager provides, which can easily add up to hundreds of thousands of dollars, include operational savings based on getting the process running days ahead of schedule.

Task	**Traditional**	**New**
Wiring Checkout and Loop Check	**38**	**7**
Configuration	**57**	**5**
Total	95	12
Cost: $80 burdened hourly rate	$127	$16
Savings for 400 instruments and valves		$44,400
Interlock Check	**58**	**9**
Cost: $80 burdened hourly rate	$77	$12
Savings for 60 interlock checks		$3,900
Data Organization	**13,620**	**2,810**
Cost: $80 burdened hourly rate	$18,160	$3,747
Savings per database setup		$14,413
Troubleshooting	**24**	**2**
Cost: $80 burdened hourly rate	$32	$3
Savings for 100 instruments and valves		$2,900
Total Savings		**$65,613**

In just 6 months, AMS Device Manager has paid for its original cost!!!

10.3 Annual Savings

The most important savings that AMS Device Manager provides, which can easily add up to hundreds of thousands of dollars, include operational savings based on:

1. Extending the time between planned shutdowns
2. Reducing the turnaround time

Task	Traditional	New
Calibration	**47**	**25**
Cost: $80 burdened hourly rate	$63	$33
Savings for 400 instruments and valves		$12,000
Troubleshooting	**24**	**2**
Cost: $80 burdened hourly rate	$32	$3
Savings for 100 instruments and valves		$2,900
Replacing Instruments & Valves	**82**	**47**
Cost: $80 burdened hourly rate	$109	$63
Savings for 40 instruments and valves		$1,840
Total Savings		**$16,740**

Every year after startup, AMS Device Manager pays for 50% of its original cost!!!

10.4 Foundation Support

The software support program is called “Foundation Support” because it provides a type of safety net, a foundation, which assures you are kept up-to-date with the latest version of AMS Device Manager software. Foundation Support also allows you to get the attention you deserve if you have questions about your AMS Device Manager installation. In addition, Foundation Support members have easy access to support information through the Web.

For only $910 for an average 400-tag system, Foundation Support is a great investment and may make a difference in your overall experience with AMS Device Manager. Remember that AMS Device Manager saves you $16,740 annually!