Realize more value from System 800xA
Apply Asset Management for more benefits

Whitepaper by David Huffman | October 2014

In a marketplace where the competition almost exclusively limits their asset management to transmitters and valves, ABB has taken a bold step to think much bigger about the concepts of assets within the facility framework.

The core infrastructure of System 800xA provides system owners with the opportunity to expand the concepts of asset monitoring and optimization to very large entities within the enterprise, easily up to the level of entire processing units and beyond. Asset management in System 800xA can be a combination of features that includes Asset Optimization (AO), Computer Maintenance Management System (CMMS) integration, and Collaborative Production Management (CPM) components for Enterprise Resource Planning (ERP) system integration. Individually, these components provide intrinsic value to those who use them. In combination, they create a world class asset management solution for a wide range of small and large enterprise assets.

But where do the benefits really come from? There are five sources of benefits from System 800xA asset management:

- Timely and easy access to critical information to prevent production or quality losses directly within the System 800xA user environment, eliminating the need to access separate systems on separate user interfaces and, in the case of operations, taking attention away from the primary role of running the process.
- Workflow improvements that reduce the initiation times for maintenance and corrective actions leading to mean time to repair (MTTR) and overall equipment effectiveness (OEE) improvements, helping drive toward best-in-class conditional and predictive maintenance management.
- High degree of integration with CMMS and ERP eliminating large amounts of manual data entry, preventing human data entry errors, and providing critical information transfer.
- Routing of alarms and alerts to the proper users for attention rather than using the process alarm system for all the notifications; eliminating nuisance alarms for the operator and alerting the key personnel that can take action.
- Having critical asset information available to decision makers in real time by disseminating that information through standards-based connectivity to the enterprise.

Because of the core integration design of System 800xA, asset information is available to any user who needs it, directly in the system workplace environment and can be available at almost any level within the enterprise.
Within System 800xA, information can be presented in meaningful, context sensitive ways thanks to the ability to have workplaces designed to meet the requirements of almost any job function whether it’s operations, maintenance, engineering, supervision, or management. There is no need to go into a second system, either on separate computer workplaces or via some remote connection to access the information. Work processes to deal with asset problems are greatly simplified, saving what might be critical time to diagnose and execute a repair to maintain production or quality.

Remember, assets are not limited to instruments and positioners. An asset may be a unit where a critical Key Performance Indicator (KPI) is not being maintained, which could mean financial losses on a large scale if not corrected quickly.

**What is an asset in System 800xA?**

Assets can be almost anything within a facility that needs performance monitoring. Some typical assets might include:

- Instrumentation and valve positioners
- Control loops (continuous performance monitoring)
- Analyzers
- Variable Frequency Drives
- Control system network infrastructure (intelligent switches), system servers and workplaces (PCs) or other critical IT assets even outside of the control system
- Mechanical / rotating equipment (pumps, compressors)
- Heat exchanges
- Process equipment (reactor performance)
- Utility utilization (critical electrical equipment performance)
- Production Unit (critical KPI monitoring)
- Electrical subsystems (Low voltage MCC and UMC motor starters, medium voltage and high voltage substation relays)

**What is an Asset Monitor in System 800xA?**

An asset monitor can be thought of as a 24x7x365 watchdog on the status or performance conditions of an asset. For a given asset class, a monitor is a software component tasked with reading information from the data source and reporting information that violates some conditional limit. Some examples are:

- HART instruments provide information across the 4-20 mA wired connection (or via WirelessHART for capable devices) to I/O modules or multiplexers that then gets interpreted according to the HART protocol standards.
- FOUNDATION Fieldbus and PROFINET devices provide their information across their network infrastructure.
- Some equipment might have proprietary networks (analyzers or vibration monitors)
- IT infrastructure items (switches, PCs) can be monitored using simple network management protocol (SNMP)
- Process equipment and higher level unit performance is usually done with calculations and analyses based on traditional process data.

An asset optimization server function inside of System 800xA manages the frequency of the various monitors. It is rare to have monitors running at a frequency that compares to that of control cycle executions, mainly due to data availability cycles for what is mostly asynchronous data. Typically some monitors will be scheduled for 5 – 10 minute cycles, others at once per hour and others maybe as slow as once per day. System owners typically decide what is appropriate based on their need to know when a fault has occurred. For example critical instrumentation using HART might be checked every 10 minutes, while an analyzer that has a 20 minute cycle time could be evaluated every cycle, but might only be checked once every hour or two, if not longer.

An asset monitor for a given class of asset may have one condition to evaluate, or there could several tens of conditions for each asset in the class. Each individual condition within the monitor can have its own individual priority for alarming or alerting. In most cases devices report information in some form of cryptic status word(s), but the asset monitor presents the information to the user in a tabular style using standard language to describe the fault condition. Where information is available from the asset manufacturer to provide solution information about the condition, that information can also be provided to the user.
user from within the asset reporter display. This solution information availability is key when using CMMS integration because the suggested solution may be transferred directly into the work order automatically from the work order creation dialogue.

**Utilizing asset monitors for instrumentation**

Instrumentation and valve positioners are the typical items considered for asset management because that is what most system suppliers can work with. How this is done and what types of devices will frequently differ across systems. In System 800xA, we have simplified how these devices are monitored and provide users with a wide range of options in selecting technologies. ABB operates a Device Integration Center (DIC) to test compatibility and create the device objects that make adding new devices to an 800xA System easy for project teams and system owner support staff. System 800xA uses FDT (Field Device Tool) functionality to access information from HART and PROFIBUS devices and uses EDDL (Enhanced Device Description Language) for FOUNDATION Fieldbus providing a wide freedom of choice and the opportunity to use the best technology for the application.

Intelligent devices can now provide a significant amount of diagnostic information before they fail. On the low end of this is the simple device temperature. In climates where temperatures can drop below freezing or are more like desert conditions, the device temperature can indicate if a freezing or overheating condition is occurring and allow time to remedy the problem before damage occurs to the device.

On a more sophisticated level, differential pressure devices are now capable of alerting for impulse line plugging, a very useful monitor in dirty service installations. Typically the more sophisticated the devices, the more valuable the diagnostic information. Imagine how much lost product might have been prevented by knowing a device is going bad before it fails, or a savvy operator or production engineer just happens to figure out that “things don’t look normal” and eventually a bad device is found to be the culprit.

The other side of having frequent device status information is not having to perform preventative maintenance on a schedule, or working on devices when a “hunch” that something is wrong was incorrect. A Shell Oil study of several facilities across their fleet, looked at pressure transmitter maintenance records and found that about 66% of the time maintenance was performed on those transmitters when there was nothing wrong. Using device asset management to reduce maintenance costs is savings that goes directly to the bottom line of an enterprise.

It generally it does not make financial sense to monitor every device in the plant, but production critical devices should be monitored. Without an asset management system, that would mean that technicians need to go to the field and connect handheld monitors to the devices to accomplish this. The frequency of such analysis is generally only on a monthly basis or less. The chance of catching a fault near the time it happens is nearly zero.

Having a separate asset management package provides the ability to monitor devices more frequently, but it is still separate from the control system, and is not normally monitored by the operations staff because it takes attention away from the responsibility of running the process.

The integrated asset management within System 800xA creates the proper level of attention for operators, for the low level devices, only providing alarms or alerts for process critical devices when properly filtered using standard system alarm functionality. All other device asset information can be routed to appropriate personnel, using the same filter functions, for them to take appropriate action. When faults are received, the integration of a CMMS can further increase the benefits. This will be discussed at another point in this document.

**Loop performance monitoring: A larger instrumentation view**

When was the last time your critical control loops were tuned? Are they running optimally right now? Regardless of the answers, if you are not looking continuously, then chances are, for a high percentage of loops, the answer to the second question is “No.” Loop performance monitoring is capable of notifying when loops are not running at or near desired performance levels.
Almost all production facilities have a noticeable range of operating conditions that are considered normal. However, it is likely that most of the control loops were only tuned at one point in that spectrum. Additionally, many processes have physical deteriorating conditions (fouling, yields, equipment wear, etc.) that changes the way the plant performs in between turnarounds. As the plant moves through these cycles, loops will frequently drift away from optimal performance and this will impact financial performance due to variations in product quality.

Analyzers and VFDs

These items are in many ways similar to instrumentation; they are critical to operations but not always monitored at high enough frequency to detect a change in status before a failure occurs. They also rarely have a standard way of monitoring, unlike instrumentation. But System 800xA can still monitor these types of assets.

Asset monitors can be created based on the specific equipment requirements. As part of the asset management features of System 800xA, a toolkit is available to create custom asset monitors. Once created, these asset monitors can be used as many times as necessary across the enterprise. As more and more clients begin to use the asset monitor features of System 800xA, a library of these types of solutions will become available for general use. ABB generally provides the services for creating specialized monitors through the Consult IT Services group.

For these devices, the asset monitors would be designed to monitor the status words and any alarm reporting values that would typically be shown on the device panels. Rather than needing an instruction manual to decipher the information, especially from older models, the data would be presented in more understandable plain wording as described earlier.

The key benefits in this category center on early detection of problems and a simplified work process to identify the problem and initiate a solution.

IT Infrastructure

Modern control systems have a large percentages of computers, network hardware, printers, and other peripherals. Faults and failures within that infrastructure can impact a process the same, or perhaps more profoundly, than a fault or failure in the control level hardware. Most IT devices report status information using the SNMP (Simple Network Management Protocol). Switches can report problems in delivering packets; computers can report disk loadings, processor loadings, application information and much more; and peripherals, like printers, can send messages about out-of-paper, ink levels, or paper jams. Much of this does not sound exciting, but particularly for network switches and system servers, knowing in advance that problems are developing can be key to keeping a system up and running at peak performance.

System 800xA offers a specialized “PC Network and Software Monitoring” asset monitor option for the purpose of tracking the performance of IT assets both in the system and for key assets off of the control network. A single license enables tracking all of the IT assets on the system. Benefits are derived from early warnings of things like disk errors, low disk space, and high network collisions that could eventually lead to failures. Having advanced notice of these problems allow for proactive intervention to fix the problem before any significant financial impact is incurred.
Mechanical / Rotating Equipment

It is common practice to have vibration monitoring systems (VMS) on critical rotating equipment in facilities today. But in many installations these systems are independent and separate from the DCS, or if interfaced, commonly only have a single alarm that alerts the operator to some abnormal condition.

The problems still need to be evaluated from the VMS, taking attention away from the process. Using System 800xA asset management to fully integrate the VMS so that the critical information is available inside the user workplaces can greatly improve response to degrading conditions.

In many cases, vibration alerts are not critical information for the operator, but rather are of key concern to maintenance personnel. Alarms and alerts from System 800xA asset management use the same alarm and event features as all system alarms which can be filtered and directed to specific users or groups. It also means that even in cases were maintenance may not be available on site during off hours, such alarms and alerts can be directed to mobile devices (cell phones, maintenance pager, etc.) to notify on-call individuals of the problem.

As with all assets, the Asset Reporter becomes the primary interface to the information directly within System 800xA. The same tabular information with priority, condition, and possible resolution are available for use.

This same asset status information is available through a web service so that if remote notification is required, a simple view of the condition can be accessed through any device that is capable of being connected to the plant information network using a web browser.

Other process equipment

Custom asset monitors can be provided for almost any type of equipment were performance monitoring and early notification of degrading performance would provide financial benefit to the organization. Reactors are just one example. Depending on the type and the process, there can be any number of possible performance concerns to monitor. If those conditions can be reduced to a combination of measurements from devices around the reactor and/or laboratory sample data, an asset monitor can be created to watch over that condition(s) on a regular frequency. Early detection, reporting, and corrective action of the problem can have significant positive financial impact.
Production Key Performance Indicators (KPI’s)

Like the process equipment within a unit, the units themselves can have custom asset monitors that keep track of KPI’s. In many facilities, tracking this information is the responsibility of unit supervisors or process engineers with offline tools like spreadsheets. In others, KPI’s are calculated continuously and displayed to system users. In some cases, alarms are even used to alert the operators that things are not performing as expected with regards to the KPI’s. With system calculated performance, the information is available all of the time regarding KPI values. But when things are not up to expectations, the potential solutions need to be readily available to the operators and supervisors so that they can correct the problem. One must also consider if using the process alarm system is the proper place to provide asset notification?

Using asset monitors allows for alerts to occur in a filtered category other than process alarms, perhaps significantly improving on “nuisance” alarm performance. This data presentation format allows for providing potential solutions within the asset reporter forms and possible cause and solution information can be updated if new solutions are identified. If the KPI information is currently in a manual system, then having it online could provide large opportunities for improvement.

Electrical Subsystems

Managing electrical assets open new opportunities for process plants. With the proliferation of ethernet communication interface protocols like IEC61850, PROFINET IO, Ethernet/IP, ModbusTCP and others, it is now extremely easy to access the status and performance information from low voltage motor control centers (MCCs), smart motor starters (UMCs), and medium and high voltage intelligent electrical devices (IEDs) found in electrical substations.

Depending on the process, electricity is generally the number one or two largest variable cost for the facility. The entire plant depends extensively on this resource and in most facilities, the status information is normally hidden away in an isolated electrical monitoring system, accessible by only a handful of people.

Visibility of the condition of electrical assets can provide extremely important information, allowing action to be taken against minor problems before they turn into much larger problems that either limits or shuts down plant production for hours or even days. And in cases where production facilities generate their own power, overall visibility of the electrical infrastructure can provide for intelligent load shedding when either external or internal sources of electricity go off line.

CMMS connectivity intensifies the benefits

Asset monitors, by themselves, create a large amount of value by providing real time asset condition information directly within the System 800xE user environment. This can be focused to appropriate user categories for action, and can include valuable information about how to resolve the problem without the need to look to other systems or locations.

Once a problem has been identified, what is the next step? In many instances, repairs using maintenance technicians are required and that generally means creating a work order request in the CMMS (Computerized Maintenance Management System). Typically, there is one, or both, of the following work flow paths to make this happen.

- In some cases, an operator or technician, fills out a paper request form that goes to a Unit Supervisor for approval before a work order entry can be made into the CMMS. Information about the problem is written on the paper form and then eventually transcribed into the CMMS.
- Some facilities have a separate workstation for the CMMS in the control room area or
maintenance area where an operator or technician can go and type in the work order request with information about the problem so that paper forms are avoided. Frequently the user is required to log into the system, and then navigate within the CMMS views and forms to reach the asset of interest, before being able to make their request entry.

In both cases, none of the actions are taking place within the DCS environment and may require significant amounts of manual data entry to convey the proper information. It is also likely that the work order that gets created does not contain any solution information.

**CMMS Integration**

System 800xA addresses the shortcomings associated with the separation of DCS and the maintenance system with CMMS Integration.

CMMS Integration creates opportunities to significantly improve maintenance related workflows and generate benefits related to OEE (Overall Equipment Effectiveness) initiatives and the closely associated maintenance measurements around MTTR (Mean Time to Repair). First, streamlining and improving the workflows so that repairs occur more quickly goes directly to MTTR and generally this means lower maintenance costs. These costs go directly to the bottom line for the business. This improvement also translates into higher equipment availability, improved production performance, and more first time quality; the three components of OEE and improvements that frequently mean more profits for the business.

With CMMS integration, rather than leaving the System 800xA workplace, the operator or technician takes action directly from their system workplace. Frequently, it is good practice to check that an unexecuted work order has already been entered from a previous occurrence of the same fault to avoid double entry into the CMMS. This can be achieved by selecting the context menu list from the asset reporter dialogue, and choosing the “View Active Work Order” item. This action causes a view of the active work orders for that specific asset to open in the user workplace. If a previous item of the same fault description is in the list, the user has no reason to proceed, other than perhaps to send a notice to a supervisor that a second occurrence has taken place and perhaps a higher priority of the existing work request is needed.

If no previous request is in the system, then, where an asset monitor has triggered a fault notification, the user simply right-clicks the fault in the asset reporter view and selects the “Create Fault Report” option. This opens a dialogue that contains the identification of the asset in both the distributed control system (DCS) and the CMMS (they can be different), the asset description, the fault description as it appears in the asset monitor, and the solution information, if available, is visible in the dialogue. There is also a field where the person making the request can type in additional information. Selecting the “Submit” button on the dialogue creates the work order request in the CMMS and the dialogue reports back the work order request identification number as verification to the user.

Approval of the work request, assignment of crafts, and execution in the field still needs to take place as usual within the CMMS. But even this process can be shortened with CMMS integration. When the work request is reviewed and crafts are being assigned, the important information is already in the request. The fault is accurately described and if possible solutions are displayed, enabling the proper crafts to be immediately assigned. The information allows for appropriate tool and replacement part selection to be done before going to the field to accurately solve the problem the first time. Without this information, critical time is lost because “information gathering” must occur with a non-productive field trip before work can begin.

Faults information may be sent directly to a technician at a maintenance workplace for review. Unlike the operations workplace, the maintenance view is structured for the maintenance workflow. Connectivity to spare parts information, repair manuals and other resource information directly through the workplace can reduce MTTR significantly.
Regardless of the type of user that needs to work with both the DCS and the maintenance system, CMMS Integration is a tool for improving workflows and creating opportunities for improvements that improve MTTR, OEE, and profitability.

**Extending asset management beyond the plant: Enterprise Connectivity Solutions (ECS)**

The need to use asset condition information often extends beyond the plant fence line into the corporate offices. When critical decisions need to be made involving more than one asset (unit or process cell), getting current status information about all of them often requires obtaining current status reports, making phone calls and/or other steps that take significant time.

The situation can be made worse if those assets are located around the world and the people being questioned are not local or may not have immediate access to the current status information.

System 800xA ECS ERP (Enterprise Resource Planning) connectivity provides the solution. Tested and proven against SAP and SSA Global Technologies, ECS provides an easy to use, configurable framework based on the ISA95 connectivity model and is designed around standards-based software components to make initial implementation and lifecycle management of the connectivity easy to perform.

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ECS can be used to move any type of plant information to the enterprise. If the ERP system can track “asset status” information, then such indicators could be moved to the ERP system as transactions. When status changes occur with each of the tracked assets, accurate, realtime information is sent directly to the enterprise level. This too represents benefits derived from workflow process improvements.

**In conclusion**

ABB holds a more expansive vision about asset management than any of its competitors. System 800xA can provide the same intelligent instrument and valve positioner device information and configuration functions that others do, but that is a very limited view of the asset space.

System 800xA extends well beyond that small scope, and our asset management solution delivers benefits in workflow improvements with opportunities to deliver MTTR and OEE improvements. Working with a broader base of assets greatly increases the ability for System 800xA owners to reap significantly larger benefits associated with high value process equipment and entire process units.

Complete asset management functionality directly with System 800xA for plant users eliminates the shortcomings of dealing with multiple systems. Finally ABB enables valuable asset information to be available at the enterprise level where potentially larger benefits can be derived from access to current asset status to make fast and accurate decisions to beat your competition.

For more information please contact:

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