Flexibility guaranteed

Streamlining applications and process changes
with ABB's Extended Automation System 800xA libraries

John Croft

Today's processing industries are experiencing increased demands to reduce schedules and costs, while maintaining more stringent quality and safety standards. The trend towards consolidation of the process control, shutdown, facility, electrical control and maintenance management systems into a single unified platform continues, with increasing demands for access to additional, relevant and up to date information.

ABB's Extended Automation System 800xA responds to these demands. It integrates the process control with all extended automation applications and smart devices in a single operations, engineering and information management environment. By extending the device and equipment libraries within the System 800xA. ABB has introduced the world's first truly generic, reusable software library for batch applications in the pharmaceutical and fine chemical sectors.

The ability of ABB's Extended Automation System 800xA[1] to gather information from multiple plant sources and transform it into relevant information for a diverse set of users such as maintenance technicians, process engineers, production managers, or plant operators enables plants to perform smarter and better with substantial cost savings.

The advantages of using the System 800xA device and equipment libraries on a project result from using standardized configurable objects with preserved integrity and inheritance, while ensuring and maintaining the necessary flexibility.

Now ABB has taken things to a new level. To extend the device and equipment libraries, the company has developed a library[2] of objects and templates which effectively provide pre-engineered components to engineer a batch application with the minimum of configuration. Furthermore, these components can be used over and over again without any need for project specific controller programming. The ability to employ truly generic Phases, Unit and Equipment Module

Footnotes

[1] For more indepth information, please refer to www.abb.com/product/us/9AAC115756. aspx?country=US (November 2006)

[2] A library is a collection of foundation objects (component solutions) from which unique instances can be created. Each instance is effectively a clone of the foundation object.

structures, and device objects results in significant time savings in specification, engineering, testing and validation, all of which ultimately reduces the time to market for new products. Similarly it allows process engineers to make changes to existing recipe operations and Phases without the need for programming expertise.

Extending the equipment library

The extensions to the equipment library build upon the already proven libraries in order to deliver similar benefits for batch applications. They provide a comprehensive library of generic Phases, Unit and Equipment Module templates, together with a toolkit of components designed to optimize the specification and building of batch applications utilizing ISA S88[3] style Equipment Modules and customized Process Units. Generic Phases enable new products to be introduced by developing new recipes only, all in compliance with cGMP (current Good Manufacturing Practices) and FDA (Food and Drug Administration) validation requirements, thus minimizing the scope and complexity of testing. Because it has been designed to be integrated with standard device library control objects, the equipment library shares common terminology, engineering principles, security and naming conventions. This ensures the information displayed to operators is consistent while engineering and testing time is greatly reduced.

These extensions were possible because of the Aspect-Object™ design of ABB's Extended Automation System 800xA. They break new ground by distributing the control intelligence through a control hierarchy, thus enabling truly generic, pre-tested and reusable library objects to be provided for Units, Equipment Modules and Phases **1**. It is the only system that provides truly generic Phases that can be used out of the box. It removes a level of complexity, meaning that highly qualified programmers are no longer needed. A process engineer can carry out much of the application engineering at the recipe level. This way the system maximizes reuse at the phase level, allowing customer engineers to focus more on what they actually make rather than on the intricacies of programming.

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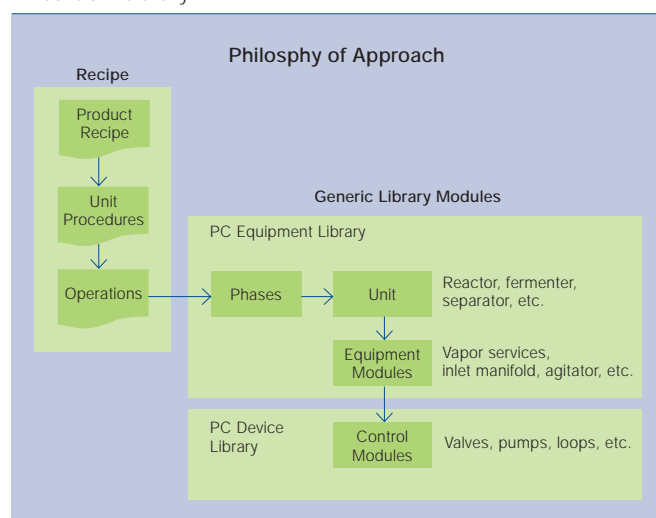
With other available systems, each batch application needs significant configuration and controller programming every time for every project, particularly for Equipment Modules and Phases. This incurs additional time and cost as these components
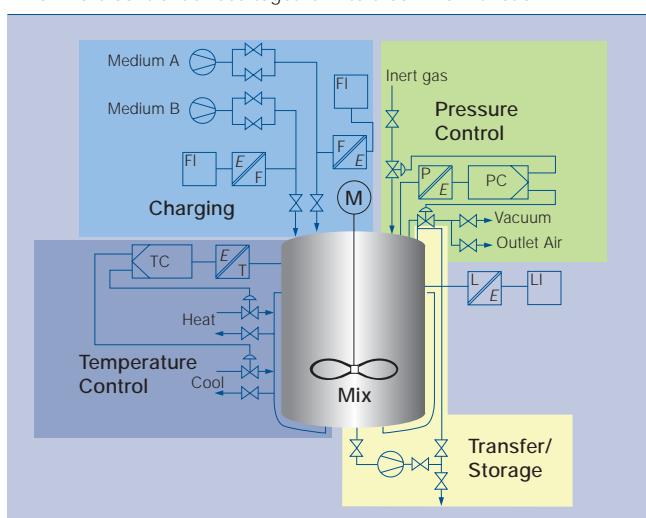
1 The library extensions distribute the control intelligence through a control hierarchy

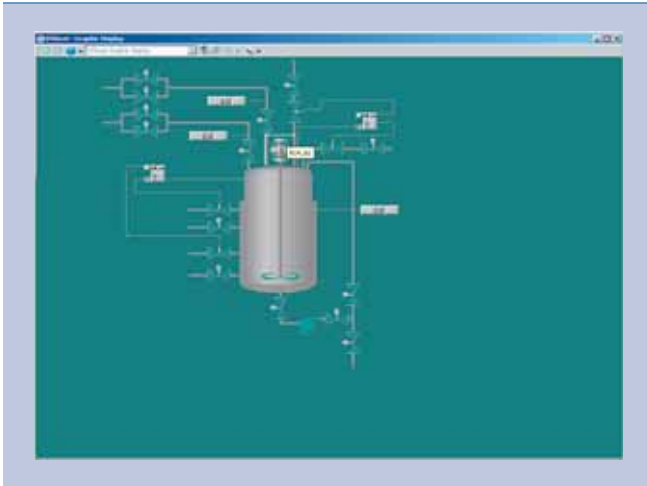
2 Devices are encapsulated in Equipment Modules, which combine one or more control devices together into a common function

Risk management

3 Units are configured to represent the physical plant units and comprise multiple equipment modules, associated process measurements and applicable process phases

will invariably need to be re-validated. In addition, the new libraries, allow manual control at all levels via faceplates, and they provide the granularity, transparency and diagnostics to enable efficient commissioning and maintenance.

The component objects provided by the libraries include Control Modules, Equipment Modules, Units and Phases. These objects are used to build up single devices, from Equipment Modules and Units, to operations and recipes that ultimately control the plant.

The use of an S88 structured framework and a pre-tested and proven component library makes specification, implementation and configuration of control systems less complex and less time consuming. The library components are also used in a hierarchical manner.

The libraries
The device library provides a large portfolio of tested process control devices such as motors and on/off valves. Each device is represented in the library by an object enriched with

"aspects", including controller code, faceplate and graphic display element which support device management over the entire life cycle. Devices have configurable general options, including alarm and state colors, user-definable functions and text with native language support. Devices are encapsulated in Equipment Modules, making the reuse of complex packages of device control simple, accurate and repeatable. Equipment Modules combine one or more control devices together into a common function **2**, which in turn can be used across several units to provide a high degree of reuse, as well as ensuring operating consistency through the plant, and reducing engineering and testing effort. Units are configured to repre-

4 The library of generic Phases requires no configuration. Parameters define the actions to be taken by a Phase to achieve a process action

Adjust PV

Adjust Alarm

Timer

Transfer

Quality Moitor

Factbox The ABB System 800xA extended libraries when applied to batch processes deliver:

Capital Productivity: Leveraging System 800xA's object-oriented technology, the libraries provide the ultimate balance between flexibility and standardization. This minimizes project specific library development and the project specific software, thereby minimizing the cost of developing a batch automation solution while maximizing the plant operability.

Global Responsibility: The library objects are developed under stringent Quality Assurance standards, tested and encapsulated to ensure functional integrity. This can greatly reduce project testing and compliance documentation, especially for validated projects.

Risk Management: The fact that ABB maintains the libraries minimizes risk by ensuring the future migration and upgrade path. It enables modifications and enhance-

ments to be made as plant requirements develop over time logically and consistently. In addition remote support and service is simplified which minimizes the risk to plant production.

Operational Profitability: The use of the libraries provides efficient commissioning and maintenance due to the transparency, granularity and diagnostics. Operator response time to process and batch events is reduced; they can immediately see the root cause affecting a phase, an Equipment Module or a Unit and can fully trust that the trip and interlock displays are correct and up to date with the configuration, because they are automatically built.
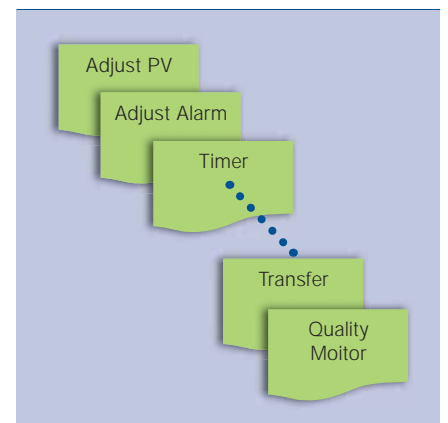
sent the physical plant units ▪3. They comprise multiple Equipment Modules, associated process measurements and applicable process phases. The Units include the state model for handling process upsets and control device physical errors, and they provide a feature for monitoring quality critical process values.

A library of generic Phases ▪4 is included; these require no configuration (logic is unchanged for each instance of use) no testing and no validation. The set of generic Phases was selected to maximize reuse. Parameters define the actions to be taken by a Phase to achieve a process action. All of the generic Phases are available to operations under batch recipe control and can be supervised by an operator from the Phase faceplate under manual control.

Operation procedures represent the process steps necessary to control the manufacture of a batch of products. They drive the plant via one or more process Phases by supplying suitable parameters. In addition, operation procedures generally handle the coordination of multiple phase initiations and non time-critical activities, such as operator questions, monitoring for phase start conditions, data recording.

The ABB library objects are developed under stringent Quality Assurance and Safety Assurance standards, and are tested and encapsulated to ensure functional integrity. They are main-

tained by ABB to ensure future migration and upgrade paths.

System 800xA in Korea

Engineers can select which foundation objects to use from the libraries to satisfy the requirements of an automation solution, and this makes the libraries applicable for most application sectors. Korea's Yeochun NCC Co. Ltd (YNCC)[4] demonstrated this by selecting, in a strongly competitive environment, the 800xA integrated process control and safety system to upgrade the petrochemical company's number two ethylene plant in order to improve the facility's performance. YNCC selected ABB and System 800xA due to features such as integrated control, safety and the advanced process/interlock visibility provided by the ABB Device Library and the distributed control system's Aspect Object technology.

According to the company, "Using ABB's expertise and the device library, the engineering will be simplified and made consistent across the solution, and commissioning costs will be reduced. Device library objects not only ensure the best practice in device engineering and control, but also automatically generate displays for operators of any interlocks that may be present that could delay production. As a proven and fully supported ABB library, YNCC is assured that future upgrades and enhancements to the system software will be implemented without issue and retesting. This optimises YNCC's capital productivity not only for the initial installation, but also over the life cycle of the plant."

Factbox   What do these libraries mean to:

The Financial Director?
"We can implement a full automation solution for our batch plant, with all its inherent benefits, for significantly less cost than previously. The solution benefits both CAPEX (capital expenditure) at the engineering and installation phase and OPEX (operating expenditure) throughout the entire life cycle of the system and plant."

The Business Manager?
"We have a plant automation solution that gives us the flexibility to introduce new products, improve productivity and make delivery promises with the minimum of risk. It enables manufacturing to be adjusted at short notice thereby allowing new products to be introduced much faster. Similarly we can scale up production utilizing proven solutions based upon these objects and the flexibility of the 800xA batch management package."

The Plant Manager?
"I have confidence that I can maximize my plant throughput, consistency and quality because my automation is based upon a proven solution route that is easily understood by my operations staff. We can sort out plant upsets quickly and efficiently ourselves. My operators like the control and supervision it gives them – they can feel in charge of the plant and can confidently optimize production. By having a consistent approach to the control I can utilize my oper-

ating staff flexibly – I do not need to select based upon system operating experience."

The Process Engineer?
"I can readily understand how the control is structured and therefore I can sort out most problems without the need to call in a control engineer or automation specialist – I feel more in control. I can easily modify existing recipes to improve productivity, quality or yield and can introduce new product recipes myself."

The Automation Specialist?
"I can authorize a batch automation solution that is secure and flexible with the minimum of risk. Because it adheres to S88, I need to provide the minimum of training to new staff."

The Control Engineer?
"I can focus on the processing requirements rather than the system when engineering a batch solution. I can engineer a batch solution with the confidence that the operations staff will be able to maintain it throughout its lifecycle – I will not get called out so often to sort out problems, such as which interlock is holding up production. I can focus on investigating control techniques and improving productivity."

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Footnotes
[3] ISA S88 batch production standards define good design and operation practices to improve control of batch manufacturing plants.
[4] Yeochun NCC Co. (YNCC), Ltd is Korea's leading petrochemical company.