System 800xA – The Power of Integration

System 800xA Engineering Overview

Power and productivity
for a better world™

Introduction

System 800xA Engineering provides real-time information integration for better and faster access. Working within a common engineering environment, 800xA Engineering supports a consistent information flow from design, through installation and commissioning, to operation and maintenance. It lays the foundation for continuous improvements in lifecycle and operation dimensions of information flow, resulting in efficient engineering and enhanced productivity.

In general, 800xA Engineering provides:

- A fully integrated engineering environment for development and reuse of system standards, such as incorporating control logic, operator displays, field devices, asset monitoring, maintenance support.
- A single source of truth for all data within the system.
- A comprehensive set of libraries to streamline the engineering workflow.

800xA Engineering, as described within this overview brochure, provides complete information control to every engineer through each workplace. The workplace supports the complete automation project including planning and data acquisition, configuration management, commissioning, and operation.

Having an integrated environment for the full lifecycle of engineering leads to minimized system implementation costs and allows knowledgeable resources to focus their attention on value-added engineering instead of configuration.

Integrated Engineering Workplace

Easy and intuitive navigation

The Engineering Workplace

The Engineering Workplace is a single workplace for all engineering tasks as example:

- Graphic display configuration
- Control application design
- Safety application design
- Control system configuration
- Field device and instrumentation configuration
- Control System and field device maintenance
- Trend and history configuration
- Integration with CAE tools as Intergraph SmartPlant® Instrumentation

Aspect Objects approach

Through the use of patented Industrial^{IT} Aspect Object technology, System 800xA provides tight integration of plant devices and applications. System 800xA's platform provides a common portal to all system information required to install, operate, and maintain the system. This portal assimilates all information, traditionally contained in disparate applications, into a single, intuitive user interface, while promoting the reuse of best practices.

800xA Engineering, coupled with this tightly integrated environment, is designed to facilitate one-time data entry for all areas within the automation system, from field devices to asset optimization, while ensuring built-in data consistency. Providing a single source of accurate and real-time plant information results in maximum engineering performance, quality, and reliability. This integrated environment results in fewer startup delays, reduced maintenance costs, and more effective engineering practices.

Easy navigation and consistent data

The single, intuitive user interface brings together all plant information allowing for:

- Easy navigation via context menus
- One-time data entry

Providing single source of accurate and current plant information results in:

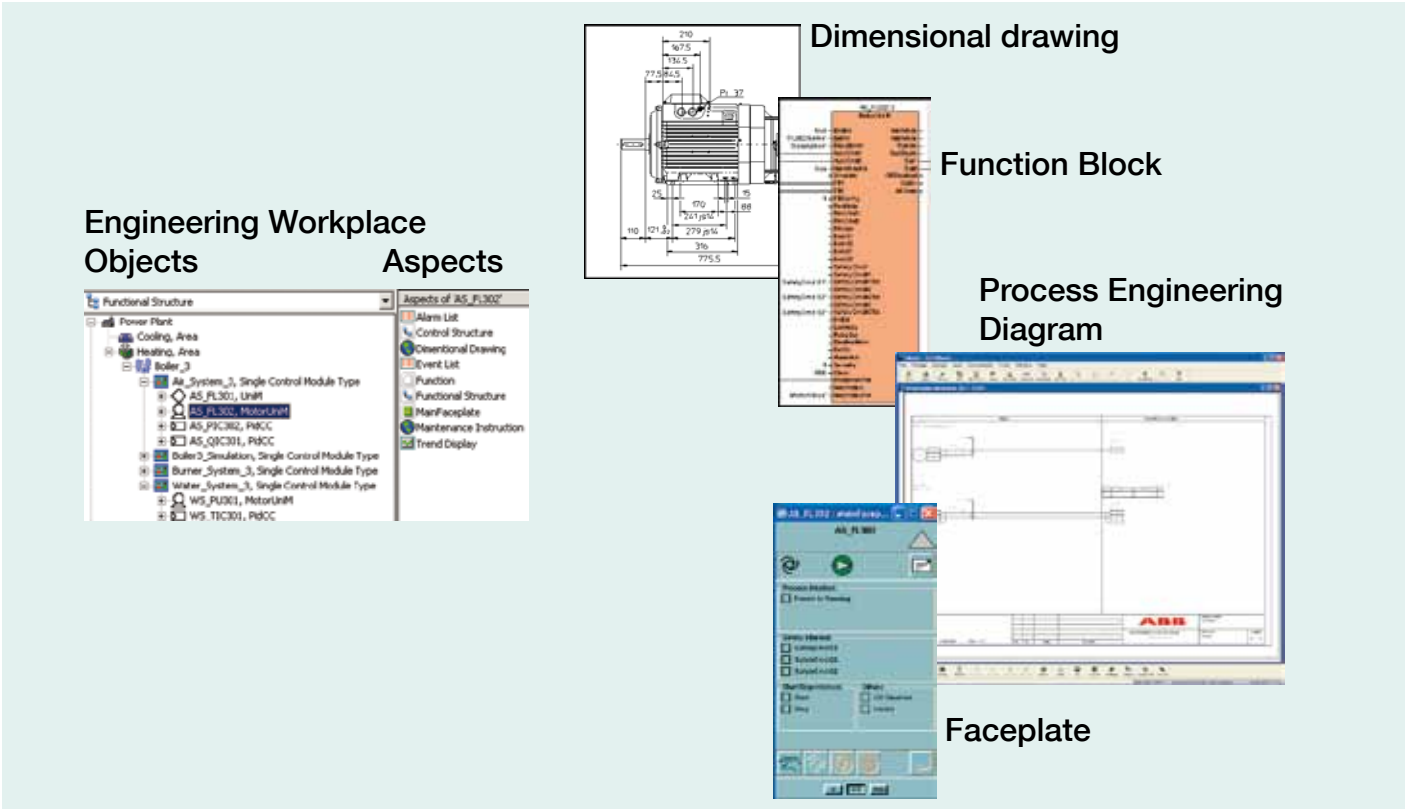
- Maximum engineering performance
- Better quality
- High reliability

Summary of benefits of integrated Engineering Workplace

The engineering environment with single point of access for all system information provides the following benefits:

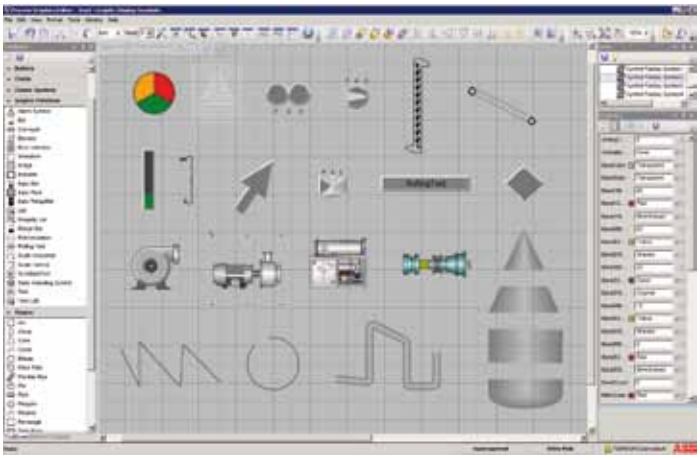
- Consistent information through one-time data entry and object-oriented design
- All types of relevant information can be accessed via right mouse click
- Easy and intuitive navigation throughout the entire project

Typical Engineering Workplace (Plant Explorer) view with Objects, Aspects and a few examples of views.



Graphics Editor

Process Graphics Editor



Graphic displays symbol editor

Graphics Editor is a fast and effective tool to create graphic displays.

Highlights include:
- State of the art editor providing functions such as undo, drag and drop, find, replace, zoom, docking windows, toolbars, etc.
- Comprehensive graphic symbol library
- Out of the box predefined graphic elements delivered with function block and control module types
- Full-vector graphics that allow distortion-free scaling with maintained resolution
- Scalable and parameterizable graphic symbols that allow efficient adjustments such as orientation
- Intuitive and easy to use expression editor
- Display documentation tools for keeping a record of all engineered graphics
- Solution library that allows storage and retrieval of reusable solutions with drag and drop
- Migration tools for ABB and other vendors displays

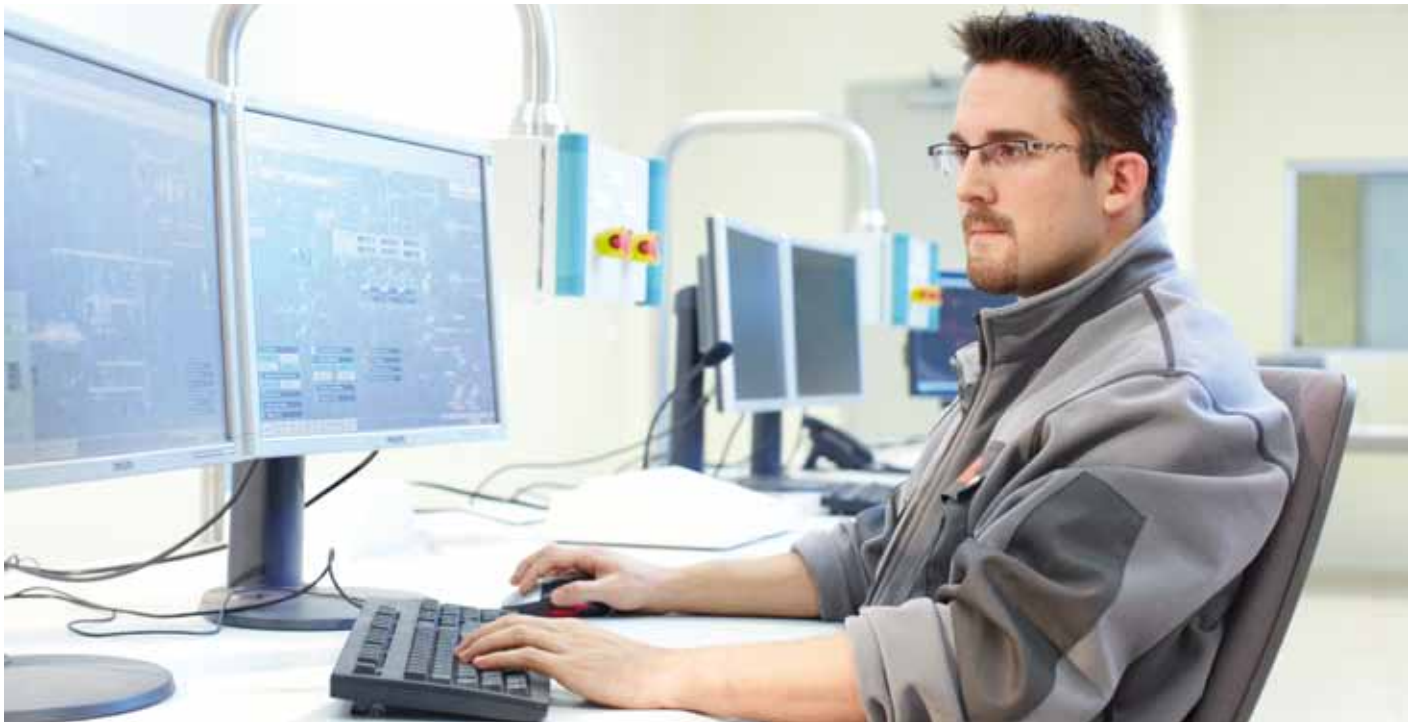
State-of-the-art editor

The Graphics Builder with its intuitive user intervace provides:
- Easy-to-use expression editor
- True vector graphics enables scaling while keeping the correct resolution
- Copy and paste for full graphics and parts of it with powerful find and replace especially for data references
- Copy of expressions or part of expressions to re-use graphic building blocks
- extended support of Grouping, Zoom, Rotate, Alignment, Mirror, Undo
- Design and Live Mode (showing real data)
- Test mode where input signals can be set without affecting the real process value

Extensive symbol library

Creating an accurate pictorial representation of the process in graphics is easy using the extensive symbol library. The components are also used to provide user control access for different actions, such as starting a pump sequence or lowering the setpoint of a flow controller. Hyperlinks to other graphics and objects can be defined within graphics.

The symbol library includes:
- Support of current Factory Symbol Library
- Display elements like elevator, rolling figures, conveyor, scrolling text display
- Trend displays with time and data value
- Pie charts symbol library



Solution library

To save a graphic solution for reuse later in a new solution, it can be dragged and dropped into a personal solution library. To re-use the solution, simply drag the element from the personal library and drop it in its intended location. Process Graphics 2 allows the creation of any number of personalized solution libraries. A smart find-and-replace function speeds up routine graphic building tasks even further.

Powerful expression editor

The expression editor is very easy to use. Expressions are created using a simple and intuitive syntax. Standard copy and paste functions are part of the tool.

Detailed documentation of process graphics

Process Graphics offers a simple solution for creating a permanent record of every process graphic created. The Display Documentation tool takes a snapshot of any engineered graphic and converts all its details to a standard Excel file. Simply click on this file to view a full list of all included objects and references.

Runtime graphics environment

For more information on the runtime graphics environment please refer to the System 800xA Operations Overview.

Function Designer

Efficient Engineering Workflow

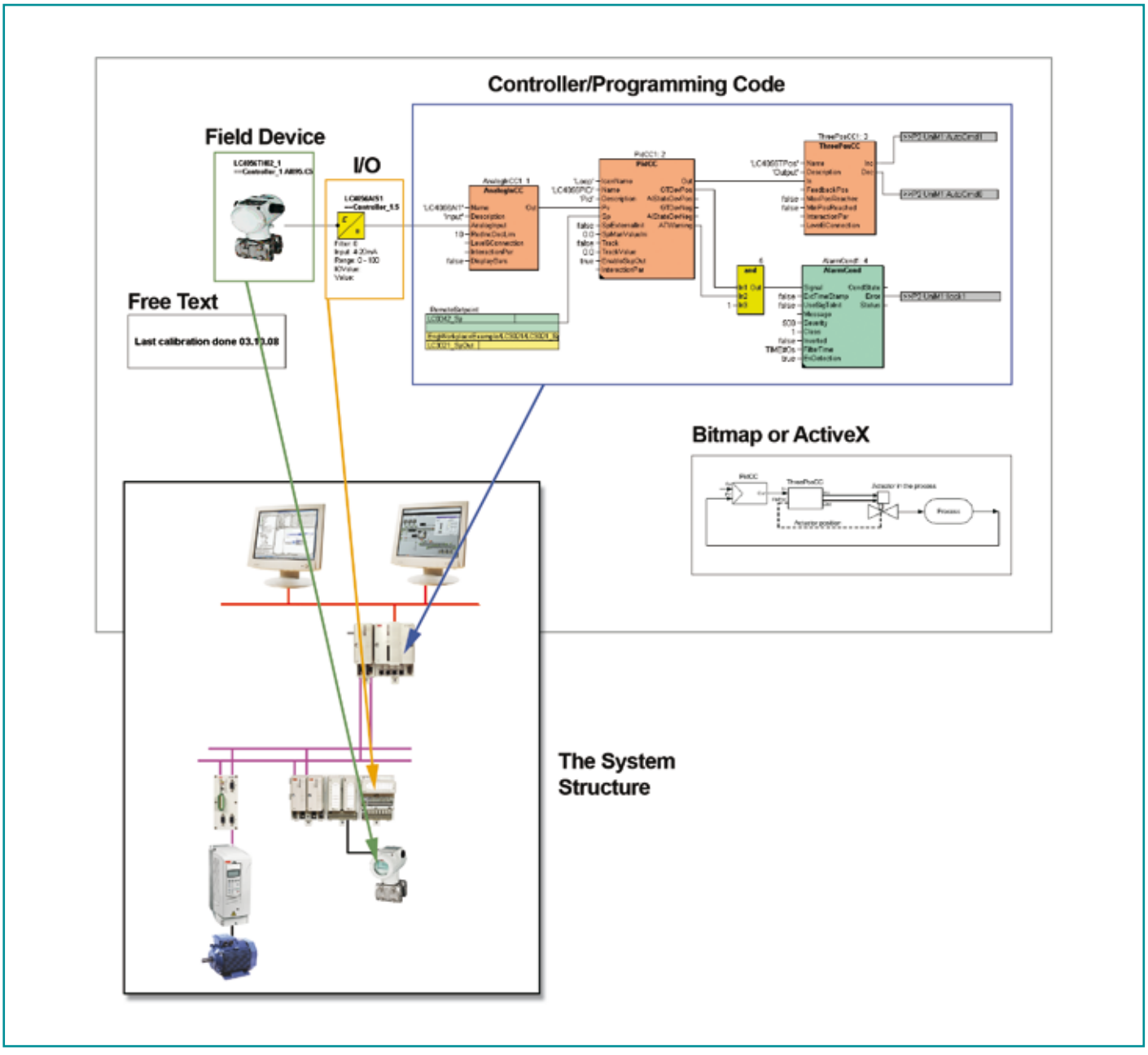
Engineering for process engineers

Function Designer is a graphical control application engineering tool designed for process engineers. It does not require software programming expertise and is intuitive to engineers in the plant design as well as in the maintenance phase.

Function Designer Scope

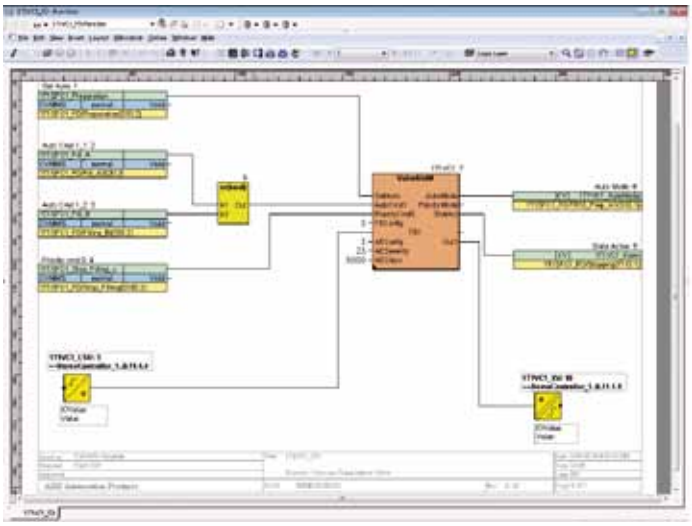
- Logic and control blocks as Functions, Function Blocks and Control Modules for AC 800M
- Sequences with Steps, Transitions and Actions
- I/O Signals representing configuration of devices and HW channels
- Variables with automatic cross referencing
- Automatically generated page connectors
- Graphical elements as text boxes and shapes

Easy access to devices from functional planning



Powerful cross referencing and navigation

- Connections between blocks on different pages automatically create page connectors with reference texts and the engineer can navigate between the pages using cursor keys
- Variable cross references between diagrams are built up in the background and the user can navigate via double click or selection if more than one reference is available
- Aspect Objects provide the Engineering Workplace's context menu and those can be used to navigate to all aspects of such objects e.g., Faceplate, Trend, Event / Alarm list
- I/O Signals hold the configuration of the connected IO or device channel and show the hardware reference as well as they allow navigation to the configuration and maintenance dialogs, especially FDT/DTM for device maintenance



Graphical design

Function design documentation

Ready to print with built-in templates, which provide a background frame and for different page sizes (e.g., Letter, DIN A4). User defined templates can be added to customize the need to local and customer requirements.

Simplified engineering for heterogeneous automation system architectures

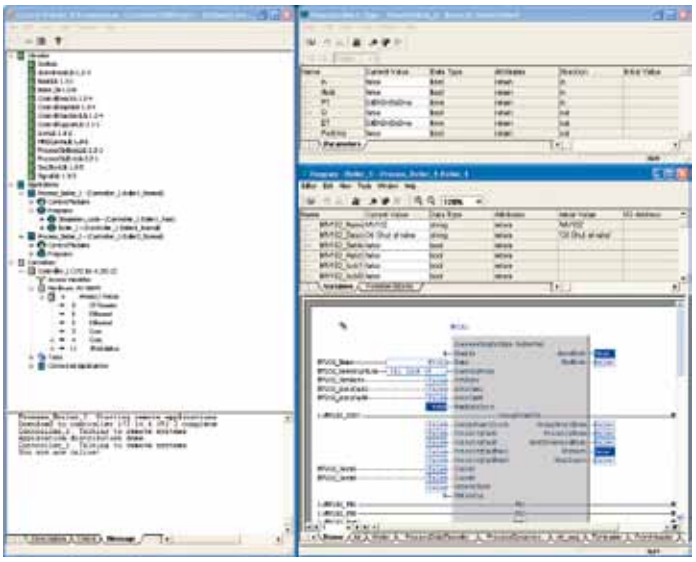
Function diagrams can be engineered resource independent and Controller and I/O allocation can be done in subsequent steps. Diagrams assigned to one controller can easily be moved to different resources to adjust to process separation and CPU resource optimization

Well integrated in Engineering Workplace

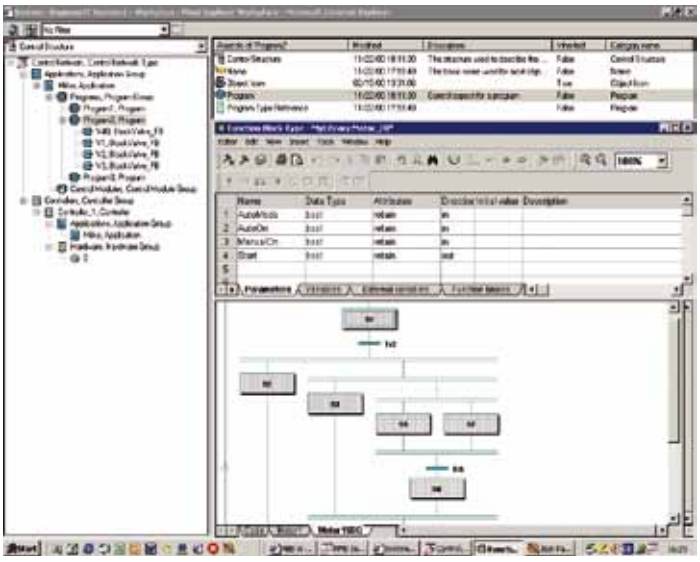
- Creation, modification and deletion of diagrams utilizing ABB's Excel Add-in Bulk Data Management
- Integration with CAE tools via Process Engineering Tool Integration (System 800xA Engineering PETI)
- Audit trail to identify who did a change when and where
- Change Reports utilizing data serialization tools
- Test and debugging utilizing AC 800M Soft Controller technology

Control Builder

Efficient configuration



Function Block Diagram



Sequential Function Chart

Control Builder can be used to configure AC 800M control and safety applications. In addition to editors compliant with IEC 61131, the Control Module Diagram Editor is provided for object-oriented design and engineering of control applications.

IEC 61131-3 engineering

Control Builder is a powerful tool for creating control solutions and reusable control libraries for the AC 800M controller. It is all done in a Windows-based environment, offering a wide range of control functionality for ABB's industrial controller AC 800M. It supports all five programming "languages" according to IEC 61131-3.

Supported programming languages are:
- Instruction List,
- Structured Text,
- Function Block Diagram,
- Sequential Function Chart,
- Ladder Diagram

Object-oriented programming using Control Modules

For scenarios where the plant design is driven by highly repetitive units, the Control Modules are available. With Control Modules, user defined types covering a unit like a reactor can be designed and efficiently parameterized and instantiated multiple times.

Out of the box function block library

An extensive library of functions available with Control Builder, containing everything from simple AND and OR gates to ready-for-use self-tuning – adaptive – PID controllers. Also included are unique elements for direct interfacing with variable speed drives and for easy handling of all the software-related redundancy features the AC 800M controller offers.
Basic functions can be combined into user-defined functions in order to adapt or aggregated such functions. User defined functions can be grouped into libraries for simplification.

Communication variables

In order to simplify the control application design and to reduce engineering effort, communication variables are available.
Once declared, those communication variables can be used in any controller in the system and communication is built up in AC 800M compiler automatically.

Test and debug

Beside the availability to execute the control application in a virtual "Soft Controller" for test and debug, Control Builder offers a set of features for on-line testing, tuning and simulation:
- Status inspection: The status of I/O signals, variables, etc. can be inspected on line. No manual tagging is required.
- Force: I/O signals can be selected and forced to a chosen state
- Overwrite: All variables can be overwritten on a single-cycle basis, after which the program takes over again
- Tasks: Single-scan executions can be selected in the Task Properties window

Base functions

Configuration change control
Effective change management enables businesses to meet evolving business needs. Within an automation system, changes to configurations must be carefully controlled to ensure all modifications are traceable or who has changed what, when and where.

Reservation – multi user
Exclusive access to configuration ensures that it can be opened read only or in edit mode. The reservation function enables the edit mode and ensures that other users can not simultaneously change the configuration.

Audit trail and electronic signature
Audit trail events are generated for all changes made during the synchronization process. System 800xA provides complete audit trail and electronic signature support for those industries that require regulatory compliance. Details are described in the 800xA Batch Overview.

Documentation and difference report
Besides the option to print the configuration, it can be exported into “Afw”-Files. Such files can be archived in 3rd party configuration storage systems and compared to the current system configuration. Difference reports show detailed differences especially for control applications, system configuration and graphics.

Library and recipes versions
With the 800xA system, users are able to create their own library of user defined blocks and elements. Those libraries need to be maintained throughout the complete lifecycle of the installation. Configuration Management on Libraries is built into the system and supports features such as lifecycle (design, closed, released) and the capacity to have multiple versions online available in the system. Details on Recipe versioning can be found in the System 800xA Production Management Overview.

Distributed engineering
In order to work in a globally distributed environment or to test and debug configuration changes, one can work in independent Engineering systems. Such systems allow to testing and debugging of configuration changes in a “sandbox” prior to the deployment of such changes into a running control system.

In order to control and synchronize changes between systems the Engineering Repository feature can be used. Configuration data from multiple systems can be exported, imported and compared with multiple independent systems. Actions are being logged and the difference report feature support standard function as filter “changes only” and print.

System 800xA provides a flexible, distributed engineering environment through the use of application servers. These servers manage project data and make it accessible to on-site connected users or isolated off-site engineering environments. In a multi-user on-site environment, a variety of engineering tasks may be performed on a target system simultaneously.

The results are applied to the target system automatically via the application servers. In an off-site environment, engineering tasks may be performed off-line in an isolated manner from other users. When the off-site tasks are completed, the user modifications can be applied to the on-line system through the application server’s import/export features.

The import/export feature allows for selective transfer of configuration data between systems. In addition, it is possible to compare configuration data between the different systems and create reports on the differences.

Base functions

Bulk data management and reuse

Bulk data management

The ability to efficiently manage large amounts of data is a crucial part of any automation system. The 800xA system meets these requirements through a tight integration with Microsoft® Excel. By using a series of Excel add-ins, the bulk data management features couple the full productivity benefits of Microsoft Excel with System 800xA.

The basic bulk data management functionality allows users to configure a worksheet to read and write aspect and object properties, supporting an iterative analysis and design process. In addition, the bulk data management features allow the import and assignment of external data such as signal lists, tag names or documents. System data can be exported at any time to simplify data validation and modification.

The track changes function provides the ability to compare two sets of data in order to identify changes. This function allows users to check for and introduce changes in a controlled manner.

Object oriented reuse

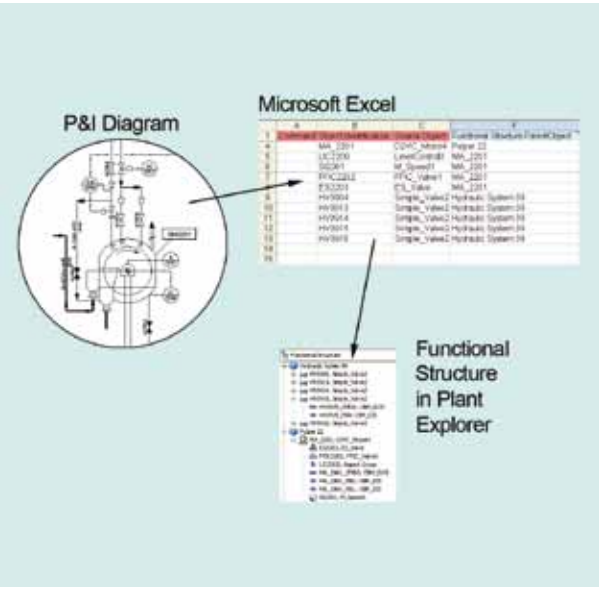
Consistency, reliability, availability and lower costs are the main goals of all automation system users. The key to achieving these goals is the ability to reuse knowledge or “best practice solutions” across multiple projects or organizations. System 800xA provides a scalable, modular framework in which applications can be easily built from a comprehensive library of standard reusable components without having to be “re-engineered”.

Most reuse solutions address only process control strategies and their implementation. With System 800xA, solution standards also incorporate extended automation entities such as faceplates, graphic elements, trends, document links, CMMS data views, field device diagnostics, and asset and performance monitors. Unlike other reuse solutions, System 800xA is not limited to loop level standards. Standards can be defined at any level across the entire plant, loop, machine, line, unit, and area. During the deployment of the functions, each object is adapted to specific needs. Using bulk data handling methods, items such as control parameters, tag names, trend rates, alarm limits, graphic elements, and I/O devices can be modified. Later during commissioning or operation, these object instances can be easily modified, by applying the change to the base object. Through inheritance features, each function is automatically updated to reflect the change.

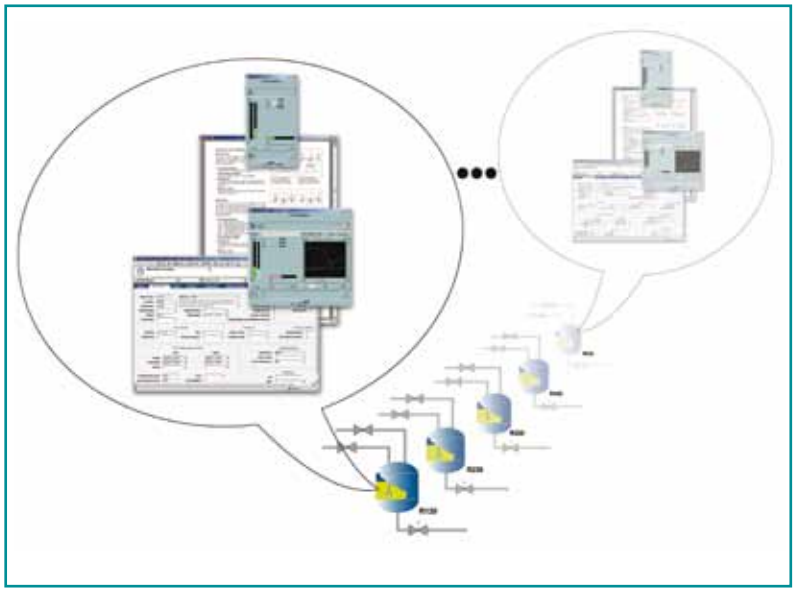
System 800xA’s reuse capabilities result in maximum engineering performance. Individual benefits include:

- Reduced engineering time
- Improved quality
- Reduced maintenance
- Proven, consistent and flexible solutions
- Best-in-class enterprise-wide deployment

Automatic creation of Functional Structure through import of customer data



Reuse of a reactor including all involved Objects and Aspects



Process Engineering Tool Integration

Opportunities to improve operational performance begin early in the design phase when crucial design information is entered into engineering databases. Transfer of this data to a control system requires a significant amount of time, and typically requires the use of hard-copy documents, data conversion techniques, and manually re-entering data.

A key element of System 800xA's integrated engineering environment is the ability to efficiently exchange data with common process design engineering tools, such as Intergraph's SmartPlant® Instrumentation (SPI). Through the use of 800xA's process-engineering tool integration, the 800xA system structure, I/O assignment, documentation links, and basic control configuration, can be created directly from process design engineering databases. In addition, operational changes, such as ranges, units, and settings, can be continually reflected back to the design database throughout the entire plant lifecycle.

ABB's unique direct, on-line bi-directional, data exchange between the process design and automation system environments allow Engineering Procurement Contractors (EPCs) to improve performance during the engineering phase of a project, and supports owner-operators in maintaining their "as-built" status. This comprehensive, total life-cycle approach reduces overall project engineering costs.

Summary of benefits of process engineering tool integration:
- Streamlined configuration and deployment
- Reduced discovery costs
- Information reuse
- Improved as-built cycle

800xA Engineering includes an optional advanced feature set that provides additional levels of productivity enhancements.

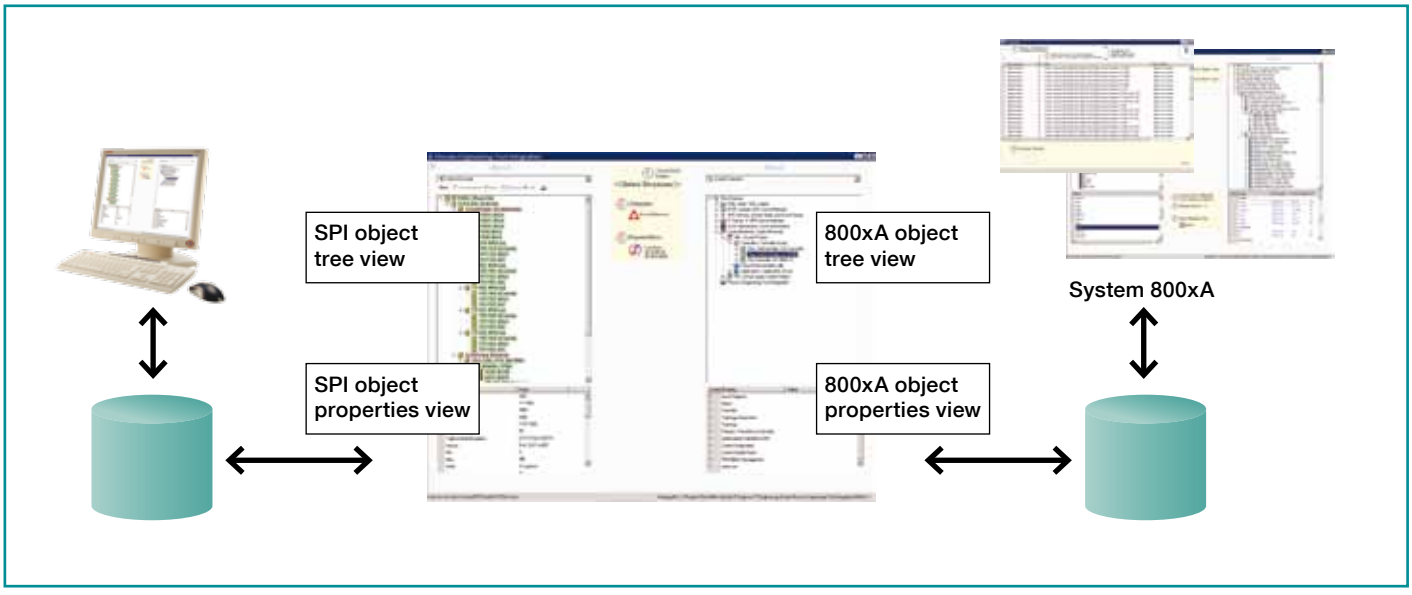
Reuse Assistant

Extends the 800xA Engineering reuse capabilities. The tool uses a knowledge based question and answer wizard to assist the user with the implementation of predefined control solutions.

Script Manager

Provides the ability to write scripts, which utilize the 800xA automation interface. Through the use of scripts, users can:
- Perform extended logging and tracing
- Create user application specific dialogs and menus
- Develop dependencies between objects and structures
- Execute scripts manually or automatically based on event
- Trigger scripts on events or changes.

System 800xA integration with Intergraph's SmartPlant® Instrumentation (SPI)



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