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ABB Ability™ Symphony® Plus S+ Engineering

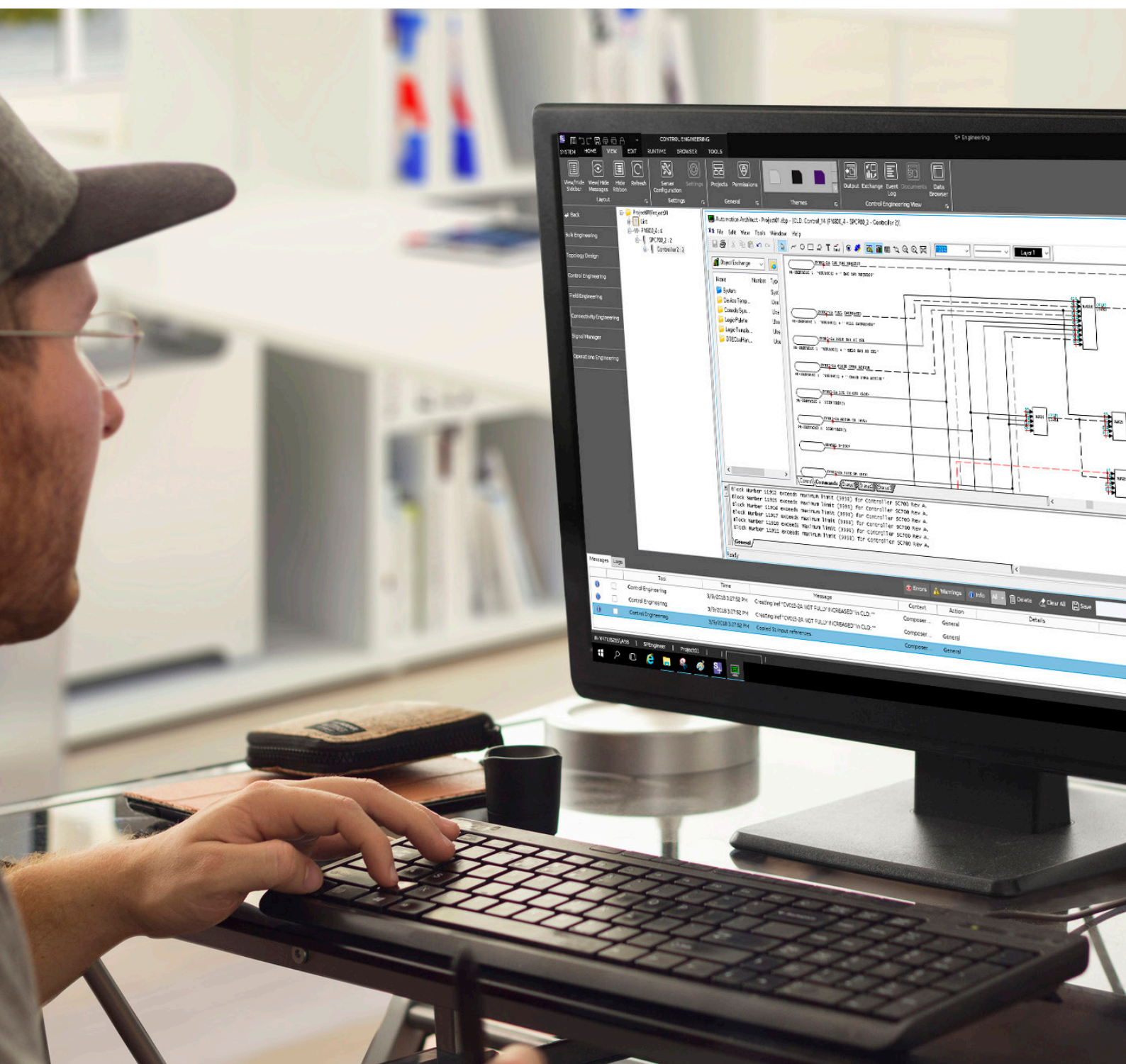


ABB Ability Symphony Plus S+ Engineering

Over the last decade, new technologies have influenced immense changes in the process industries. These changes have led to significant advances in instrumentation, protection, controllers, I/O modules and other plant automation components.

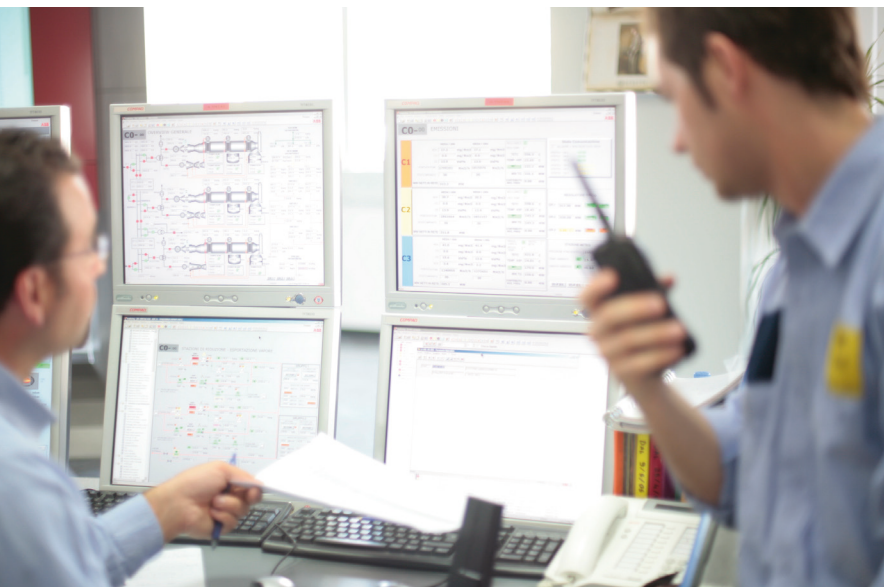
Integrated control systems make it essential that engineers have a unified platform to engineer and manage all these subsystems. The Symphony® Plus S+ Engineering tool brings together these various automation aspects into one environment. It provides a single platform to manage data from multiple sources. Changes made at one point in the system are reflected throughout the system. This goes a long way in reducing the time spent in engineering and commissioning the control systems of today and the future.

Simultaneously, the industry has seen a sizable shift in the demographics of plant operators and engineers. Engineers in this age of everything mobile, need and expect intuitive navigation features for interacting with the system. Designed with such a futuristic user base in mind, S+ Engineering offers an ergonomic platform that engineers expect.

Market competitiveness in the process industries has squeezed delivery schedules tighter and tighter, changing the way projects are executed,

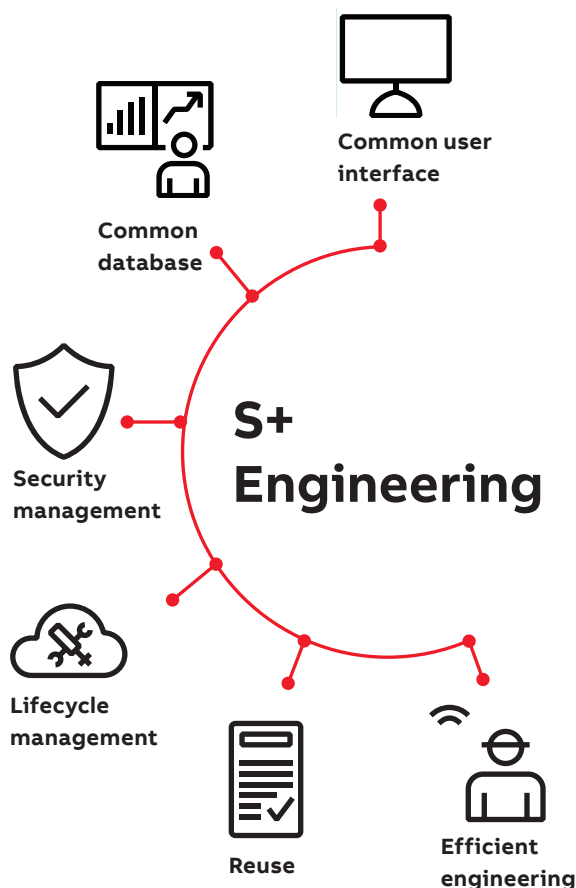
and with it, the demands on the engineering tools. With the decentralization of engineering and project tasks, productivity features like streamlined work flows, multi-user access and flexibility to make changes during start-up and commissioning are critical to the successful execution of today's projects. S+ Engineering, with its unified engineering workbench, provides the ultimate flexibility in efficient engineering, empowering EPC (Engineering, Procurement, and Construction) contractors and end users alike with the tools and methods to reduce project design cycles, shorten commission and start-up times, and minimize operational maintenance costs.

In summary, S+ Engineering offers all the necessary functionality needed to engineer, configure, administrate, secure, commission and maintain every component in your Symphony Plus Control System - from control and I/O, field instrumentation and electrical devices to network architecture, and operations, engineering, and advanced system applications.



01 Collaboration at every stage of the project

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02 Building blocks
of an efficient
engineering platform



Robust – efficient – comprehensive

S+ Engineering applications use client/server technology to support multiple users operating in a networked environment. The configuration server hosts/manages the configuration information. It can support up to ten simultaneous client connections and provide users with shared access to a system's configuration information and real-time plant data (via separate or combined communication server). This configuration server stores the data in a single database per system. Providing a single source of truth for all data within the system, S+ Engineering eliminates duplication of data entry, simplifies database management and automates configuration tasks. Information can be imported and exported in many of the commonly used file formats.

Changes in the runtime environment are deployed smoothly and securely. The strict separation of engineering and runtime enables offline engineering, makes the engineering workflow flexible, and integrates externally delivered lots without process interruption. During commissioning, S+ Engineering's multi-user and remote access capabilities are critical to on-time delivery. Especially during hot commissioning and project finalization, the ability of the engineer to commission and de-bug from loop level down to controller base functionality through a common tool ensures timely and on-budget startup.

S+ Engineering's seamless tool integration, powerful workflow automation and comprehensive bulk import/export functions improve overall engineering efficiency. Integrated version control, version comparison and rollback framework offer progress tracking and significantly reduce commissioning time. Using intelligent bulk interfaces, S+ Engineering allows for full control of engineering data consistency in each phase of the project life cycle.

S+ Engineering allows for easy reuse and upgrade of previous generation Symphony, INFI 90 OPEN, INFI 90, and Network 90 control applications. In addition, the extensive reuse concept of S+ Engineering allows users to optimize plant design with field-proven solutions based on ABB's in-depth experience in the power and water industries.

Intuitive engineering interface – for today and tomorrow

S+ Engineering's comprehensive workbench provides a comprehensive range of engineering tools. These tools provide a visual environment for easy configuration of control system strategies and global configuration databases. Management of system libraries of reusable software components as well as integration and management of intelligent field devices is also readily accomplished through a single, unified platform.

User management

S+ Engineering workbench's simple and intuitive interface allows engineers to configure user information for the Windows and Engineering databases. It allows for creation of user profiles along with their roles and project access permissions.

In cases of multiple projects, entire or partial list of users along with their roles can be copied over from an existing project to streamline the workflow.

This is accomplished by automatically assigning individuals to one or more specific user groups for administration, engineering, measuring, setting parameters, simulation, releasing, loading, maintenance and viewing only. With S+ Engineering's granular authorization management, one user may have edit rights but cannot put anything in operation, while another user may set parameters and simulate values but cannot make changes to function diagrams. When a user is logged in the engineering environment, the roles are automatically switched based on his/her activity and role assignments. This user authentication feature also makes S+ Engineering very secure.

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S+ Engineering

Project administration

The newly integrated S+ Engineering tool allows a very simplistic way of managing automation projects. Users with their project administration privileges can perform the following activities in just few clicks.

- One shot project creation of System, Control, Device and Electrical engineering
- User assignments to projects
- Offline and online back-up of projects
- Project database maintenance
- Upgrade of projects from previous versions

Multi-user engineering

Multi-user engineering provides high level of flexibility and efficiency in system configuration, documentation, commissioning and maintenance. Engineering tasks can be accessed by multiple users at the same time. Engineers can reserve a complete application or parts of it for their exclusive access, enabling multiple users to work on the same project at the same time without interfering with each other's work.

All engineering tasks can be performed concurrently in S+ Engineering; from definition of process points and loops to function design, system and cabinet layout and all the way to service, diagnostics and library processing. This enables different users to complete their engineering tasks without having to wait for others to complete theirs.

Audit trail

Effective change management enables users to meet evolving business needs in a safe and secure manner. Within the automation system, changes to system configurations must be carefully controlled to ensure all modifications are traceable and accountable. S+ Engineering provides complete audit trail support for those industries that require regulatory compliance. When deployed, S+ Engineering's audit trail functionality tracks and archives user actions including system changes made at any engineering workstation onto a central database. These events can also be archived in the system's historian for long term security audit purposes.

Intuitive navigation

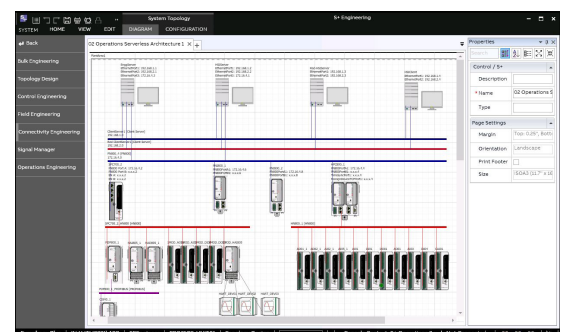
The workbench's graphical user interface, object-related context menus, navigator windows and many help functions provide intuitive user guidance. Within the engineering environment, users can freely navigate from a tag to its associated control logic diagrams (CLD). Cross navigation with S+ Operations Human Machine Interface (HMI) is also seamless. Users can right click CLDs to call-up a faceplate and operators in the S+ Operations environment can right click on graphic to go to the associated logic document. Links to 3rd party documentation like PDF user manuals, excel reports, etc. are also easily established.

System Topology Engineering

S+ Engineering Workbench's System Topology builder allows users to visually build the control project through simple drag and drop.

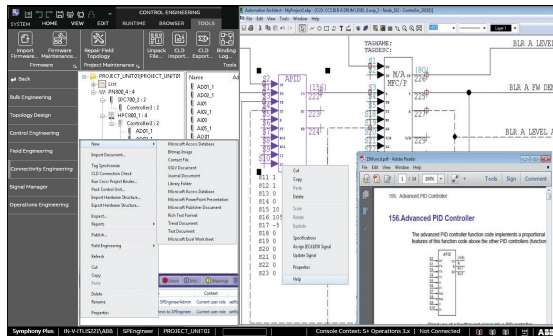
Some of the features that make this a very valuable tool are:

- Drawing of logical and detailed network architectures
- Automatic configuration of the communication ports based on connected network
- Publish network address to reachable PC nodes
- Share topology information to Install & Update tool to trigger central installation
- Shares topology information to S+ Operations
- Effortless documentation and report generation



03 System topology

04 Single-click access
to system documentation



Online documentation

Thanks to consistent forward documentation together with modification and version management, the system's documentation is always up-to-date. Technical product documentation is readily accessible online.

S+ Engineering provides users with standard Windows help. In addition to this, all S+ Engineering documentation is provided in electronic form. The instruction manuals for the software are provided on the Symphony Plus software DVD in PDF format along with an enhanced version of Adobe Acrobat Reader that supports a sophisticated search engine.

Third-party documentation is managed by S+ Engineering's object navigation and can be accessed by just a single right click of the mouse. It combines documents in user-defined hierarchical folders. Integration of document viewers is also supported.

International language support

S+ Engineering applications have been developed to support various languages. Configuration documents developed using S+ Engineering tools/applications will accept and preserve user inputs in any language supported by Windows operating system that is hosting the software. When a user creates a project, S+ Engineering's configuration server sets the default language for the project to match the default language of the user creating the project. Users that require international language support for specific applications that are add-ons to the base S+ Engineering software should contact their local ABB office.

Integrated control engineering

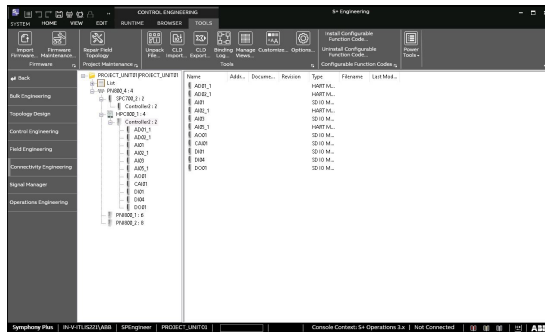
S+ Engineering contains all the functionality necessary to develop and maintain Symphony Plus control system configurations. It is fully compatible with Symphony Plus Harmony Rack control & IO as well as the new Symphony Plus SD Series control & IO. Support for the 800 series Turbine Control modules is also built in. S+ Engineering reduces the burden on engineers by making them more efficient. The ergonomic design is extremely valuable in day-to-day engineering environment.

Explorer	Automation Architect
Intuitive means of organizing, navigating and locating system configuration information	Visual creation, editing, monitoring and tuning of control logic
Microsoft Explorer style left pane menu provides hierarchical view of your S+ System	Drag and drop Function Codes from libraries into the control logic document (CLD)
<ul style="list-style-type: none"> Select an object from the left pane to bring up detailed information. Document view will show the associated configuration documents like CLDs, P&IDs, wiring diagrams, cabinet drawings etc. Simply double-click to launch the appropriate application to view/edit the document. Data Browser view shows all the associated tag data. From here, you can view, define and modify tag data for entire system. Changes are saved in the S+ configuration server. Save your control strategy as a macro. Next time you need it, simply drag & drop the macro rather than re-engineering the logic again. Connect multiple function blocks to specify the signal flow of your control strategy and see a visual representation (instead of lines of code). Multiple control logic sheets can be grouped into a single CLD. For example, every control logic sheet associated with the control strategy of a boiler can be grouped together into one CLD. 	

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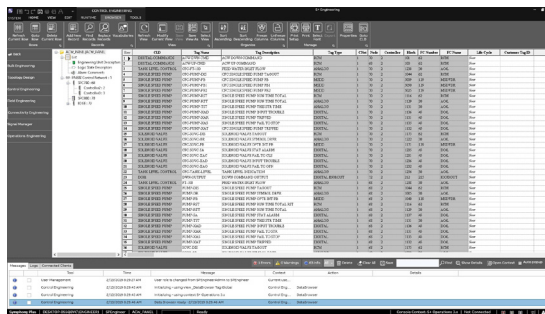
S+ Engineering

05 Document view



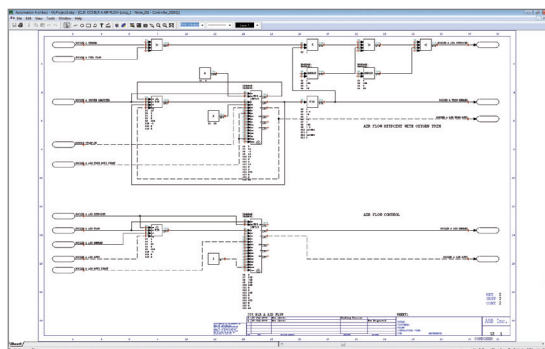
Explorer is the primary application of S+ Engineering. It provides an intuitive way of interacting with system configuration information. The ability to associate documents with the system architecture saves a lot of time and complexity for the engineer. In the document view (Figure 5), critical documents like P&IDs, cabinet arrangement drawings, graphic displays, field wiring diagrams etc. are readily available without leaving the Explorer window.

06 Data Browser



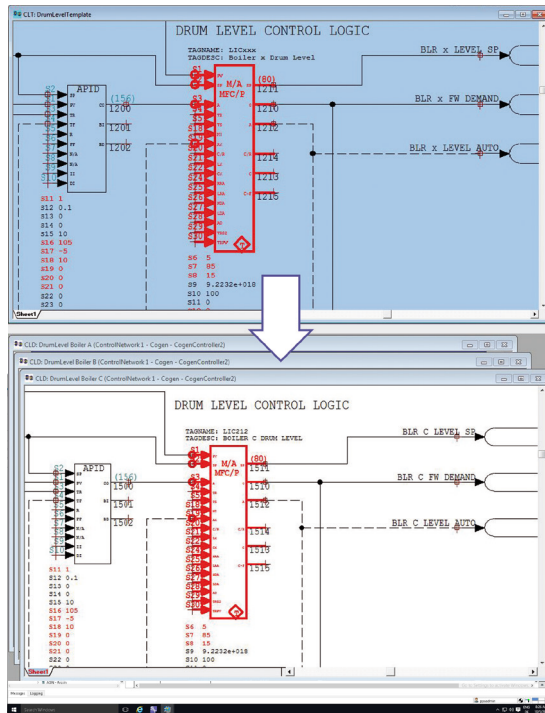
Changes made to tag data from the data browser view (Figure 6) are saved on the S+ Engineering's configuration server, which is the central repository for all tag information. This eliminates the need to replicate the same changes in multiple databases. The data browser window allows database filtering which makes configuration easier and faster by eliminating unnecessary information from the user's view. Engineers are able to import and export tag data and perform automatic search and replace operations based on complex queries. The ergonomics of the software allow a user to navigate directly from a tag to its related configuration document.

07 Automation Architect

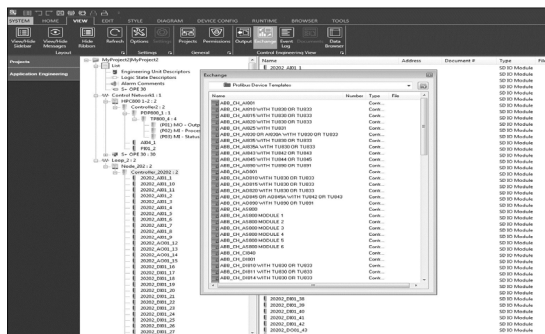


The ability of the Automation Architect (Figure 7) to visually represent the control strategy greatly improves the decision making by the engineer. The time invested by engineers in creating a control strategy can be leveraged by saving it as a macro for future re-use. High level control strategies can be created by dragging and dropping standard function blocks or user defined function blocks from the library.

08 Control Logic templates



09 Object Exchange



Control Logic Templates (CLTs)

Every engineer can affirm that being able to start from a reliable and proven template can dramatically reduce the time and cost associated with implementing a control strategy. It also improves the quality of control strategy software by minimizing the risk of errors of starting from scratch. S+ Engineering allows users to define and maintain Control Logic Templates (Figure 8).

Control Logic Templates (CLTs) define reusable standard control strategies that are typically used to develop a process automation system. They can be thought of as blueprints that define the structure of a control strategy. They are maintained by object exchange and can be used to quickly define control logic documents.

The control logic template linking functionality allows users to define logic that is controlled by the template or that can be modified on each configured instance. Any subsequent changes can then be spread to all linked instances. When a template updates its linked instances, it will preserve instance-specific configuration. This template management feature allows efficient maintenance and utilization of reusable standard control logic.

Configurable Function Codes (CFCs)

Another such feature that allows engineers to create and re-use their expertise is the Configurable Function Codes (CFC). The CFC allows engineers to create specific control logic using standard Harmony function codes and then save it as a package. This package (CFC) can then be used in the rest of the control logic design as a standard Harmony function code. This eliminates the need to re-write the entire contents of this CFC every instance it is used in the control scheme. This CFC can be represented by a custom shape, control logic, defined inputs, defined outputs, defined specifications and tag mapping.

This ability to package the intellectual property and easily re-use it in same or different project greatly minimizes the chances of error, simplifies logic troubleshooting and results in overall improved quality of the configuration.

Libraries

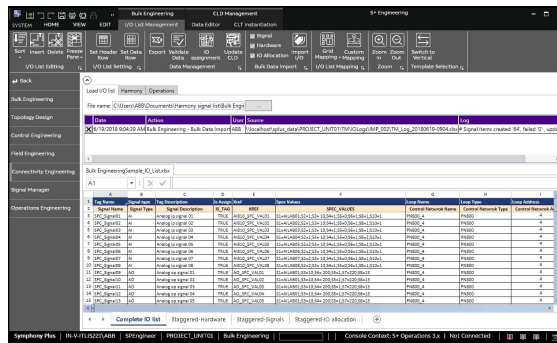
Engineering libraries are the basis for all S+ Engineering applications. All components, devices, P&I diagrams, symbols, operation and control processing function blocks, I/O configuration, coding and dimensions are included in these libraries.

The object exchange (object library, Figure 09) window presents the user with a view of re-usable components (called objects) that can be used to create control system configurations. The standard ABB library consists of some pre-defined function codes and standard shapes/symbols. Users can use these objects in their control strategy but cannot delete them. However, users can also define their own objects such as function codes, macro logic, shapes/symbols or even control logic templates (CLTs) and save them in a separate folder.

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10 Bulk engineering

11 PROFIBUS/HART device integration



To support re-use of the standard objects and the intellectual investment in the user defined objects, the library supports cut-copy-paste functionality. Users can share objects between different projects within the S+ Engineering system to save time, reduce errors and for best practice sharing.

Bulk engineering

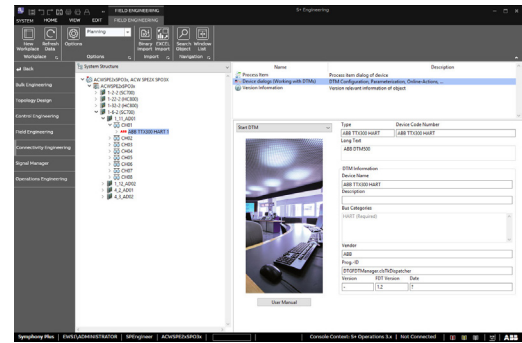
The ability to efficiently manage large amounts of data is a crucial part of any automation system. S+ Engineering provides intuitive ways of bulk data handling.

Users can import process point or I/O spread sheet from which they can configure:

- Signal list and properties
- Control hardware
- I/O assignment as well as I/O template instantiation
- Control Logic Template instantiation

Multiple revisions of Signal and I/O lists are handled by logical update of the engineering database to avoid re-importing of the entire list for every change made to the list. This allows the user to perform bulk configuration changes and editing in the familiar MS Excel environment and then import it into the configuration server seamlessly (Figure 10). Mapping of the columns in excel file to the fields in the I/O list management is done by simple drag-and-drop of field names. This one-time mapping can be saved for use in subsequent lists for other areas of the plant or future use.

S+ Engineering also includes a drag-and-drop I/O assignment capability. This is especially useful during commissioning stages when the users need to modify few signal assignments in a short



amount of time without affecting the rest of the database.

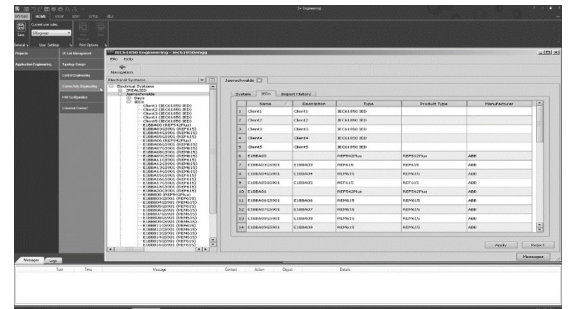
PROFIBUS/HART device integration

S+ Engineering fully supports configuration, commissioning, maintenance and management of intelligent field and electrical devices (transmitters, actuators, motor control centers etc.) using PROFIBUS and HART communication protocols. The data or variables inside intelligent devices can be accessed by function blocks in a S+ Controller in a similar way as traditional IO channels data is accessed. This smart device data can be used in real-time control strategies.

The functionality extends beyond the function block access. The Field Device Tool (FDT) provides a graphical environment to configure and manage intelligent devices using device type manager (DTM) technology, in a similar way of configuring a printer by its Windows driver (Figure 11). Users can use the DTM to check basic information of device, set device parameters and characteristics, change device internal calculation mechanism, perform simulations for testing etc. all of this can be done in real time and within a user friendly graphical presentation environment.

For conventional device description files (GSD), a basic PROFIBUS DTM is available to allow standardized offline configuration. HART devices are configured and parameterized via standard HART protocols without the need for additional tools by using a standard HART DTM. The device integration feature also includes automatic net calculation and loading of process items by using the device-specific channel configuration generated from DTM.

13 Electrical device integration



S+ Engineering supports SD and HR Series controller bi-directional, real-time communications with Modbus TCP devices, such as third-party PLCs, electrical devices, process panel, or HART wireless transmitters. The Modbus points can be used in the same manner as physical I/O points, either in the control application algorithm or HMI interaction. The plant operator can monitor and operate third-party system/device in an integrated way as native DCS I/O or data.

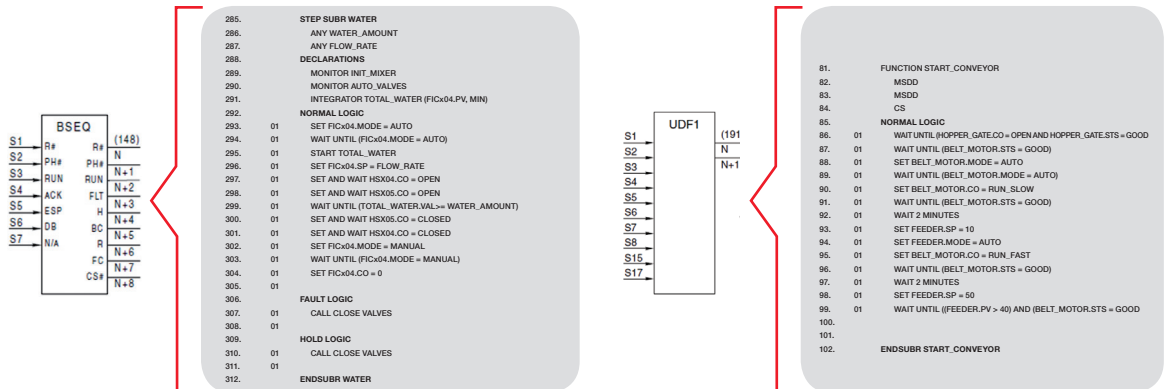
For new plant, upgrade, or expansion project, SD Series soft controllers can dramatically reduce commissioning and start-up time and costs by permitting thorough testing and pre-tuning of control loops prior to its implementation in the field. Managed within S+ Engineering, SD Series soft controllers uses the same control logic (i.e. function block configuration) as the physical SD Series controller. With a couple of clicks, users can have the control logic running either in soft controller or physical controller, monitor the live data change, tune the parameters in the same manner.

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S+ Engineering

14 Batch sequence
(BSEQ) function code

15 User-defined
function code



Batch Data Manager

Batch Data Manager (BDM) is a family of engineering tools for creating, editing, managing, downloading and debugging batch, sequential and user-defined function code configurations.

It enables the engineer to create batch and sequential control applications using clear and concise natural syntax control statements. BDM programs can be used to change controller set points, turn discrete devices on and off, change modes and perform a host of other supervisory operations. In effect, function codes execute base regulatory and discrete device control while the BDM program performs supervisory control and process operation.

One of the components of BDM is Batch Tools for Batch Sequencing. Batch tools for batch sequencing include a full-featured text editor to create and compile batch programs that are downloaded to the batch sequence (BSEQ) function code (figure 14). The unit procedure editor and the master recipe editor allow users to create unit procedures and master recipes in a graphical format. Recipes are created and downloaded to the controller in their entirety before the batch begins. All the information needed to execute the batch is self-contained in the controller. As an added layer of security and quality control, the newly created recipes can be flagged for approval before being downloaded to the controller. All events related to recipe approval workflow are logged into existing BAL. This execution model provides high system integrity, and prevents inadvertent download of a faulty recipe that could pose a quality or safety risk. It is especially useful when a limited number of products is produced or for sequence

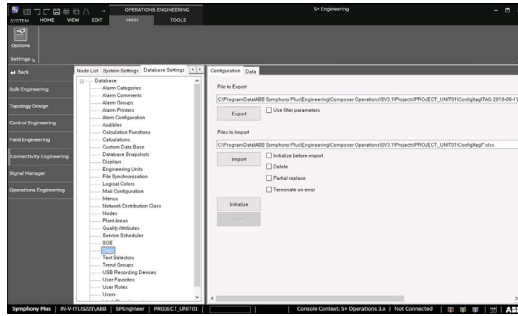
control applications where the sequence is rarely modified.

Another key component is the User-Defined Function code (UDF) capability (figure 15). UDF codes also include a full featured text editor to create and compile UDF programs using natural syntax control statements. UDF programs can be downloaded to UDF-specific function codes and incorporated into control strategies in the same manner as any other function code. The UDF program does not require a recipe or an operator's input; it begins executing when the controller begins executing. This feature is especially useful for users who need to create function codes unique to their process, or for sequence control applications that execute continuously and do not require a recipe.

Troubleshooting for Batch 90 and UDF programs is made easy by the Dynamic Debugger tool. Dynamic debugger enables engineers to:

- Observe process data such as variables and set points, as well as intermediate computational values from the program including timers, ramps and integrators.
- Override normal operation of pumps, valves and control loops, and direct their activities from the debugger
- Stop normal program operation and single-step the program to analyze data without affecting other programs or function block execution.
- Assign breakpoints. The program can be designed to run to a certain point and then stop execution, allowing engineers to systematically analyze logic.
- Perform online recipe parameter editing when used with the unit procedure editor or the master recipe editor.

16 Operations engineering



Operations engineering

S+ Engineering includes fully integrated operations engineering for S+ Operations HMI. S+ Operations can be configured within the S+ Engineering environment, with seamless data exchange and integration with other S+ Engineering components such as Bulk Engineering, System Topology, Signal Manager, User Management, in a consistent user interface as HMI server. This allows automation of configuration processes by re-using the existing engineering or system data. Then all the configuration or modifications can be remotely deployed to the S+ Operations run-time servers. Parallel deploy, incremental deploy, and difference viewer functions are supported to make the remote deployment highly efficient and fully under control.

Besides traditional DCS application, S+ Engineering is also the ideal tool for S+ Operations SCADA application by seamless integration of all vertical communication protocols configuration, for example OPC, IEC 61850, IEC 104, Modbus, etc, and Object model based signal and tag data handling.

Evolution without obsolescence

A DCS is a significant capital investment. Plant engineers add to this investment by enhancing the control system components, tuning and refining control application code and developing knowledgeable staff who operate and maintain the plant and control system. One of the results of these initial investments is the creation of site-specific control strategies and procedures that enable the plant to maintain high availability and excellent operational performance. S+ Engineering enables users to retain all this intellectual property built over years of experience and which is unique to the plant's operations. S+ Engineering allows controller configurations from any Symphony Harmony, INFI 90™, INFI 90™ Open, or Network 90 controller to be re-used with some modifications.

Users can leverage the years of knowledge and time spent by their engineers instead of starting from scratch! S+ Engineering's Automation Architecture functions in the same way as in previous versions of Composer. This eliminates the cost of re-training plant personnel.

Automation Sentinel, ABB's control system software management and support program supports S+ Engineering throughout its life cycle. With this software users can keep their control software up-to-date and maintain a flexible path forward to new system software technologies. It lowers support costs and provides users with predictable software management costs for annual budget planning. Automation Sentinel also provides users with access to the most current system documentation and the latest software updates.

In summary, S+ Engineering reduces deployment costs and reduces total life cycle costs associated with system evolution. It preserves decades of intellectual know-how specific to the plant by allowing the existing configuration to be re-used.

17 Evolution without obsolescence

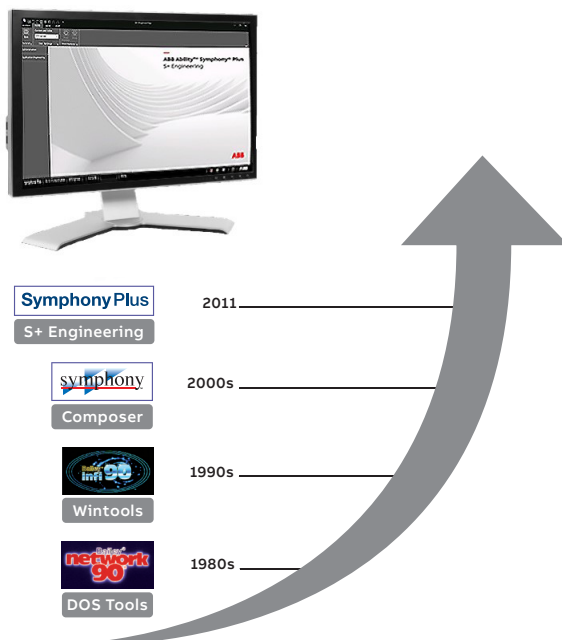


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