

Integration of Advant OCS and industrial drive systems

The integration of drive systems and process control continues to be an important issue for paper mills, rolling mills, etc, which require a high level of synchronization between the drives. Innovations in drive technology and strong demand for new approaches aimed at improving plant efficiency and cutting costs have further widened the scope of integration needed. ABB has developed a new technology, based on ACS 600 variable-speed drives and Advant® OCS, which helps to meet this need. As many types of drive system receive new connection capability, the advantages offered by the new ABB technology can be extended to a wider range of applications. Such integration represents a further step towards a future promising fully scalable solutions with seamless communication.

As the use of microelectronics becomes more widespread in industry, the opportunities for introducing advanced innovations are increasing at a fast pace. By integrating the drive system and the process control system, full advantage can be taken of the new, added functions. Process data are measured with improved accuracy for even more exact process control, while the ready availability of information permits a total overview of the process.

Reasons for integrating

By taking advantage of integration and predefined solutions, the time needed for project engineering and commissioning can be significantly reduced. The customer therefore benefits from shorter lead times and earlier production start-ups.

Detailed information on faults, interlocks and log data is made available to the operator, who has a better and more

direct overview of fault events as a result. Trouble-shooting can therefore be speeded up considerably, reducing maintenance costs and making it possible to plan for appropriate support to minimize downtime. Information of this kind from the drive systems also allows the operator to determine more exactly when preventive service is needed.

The integration of drive systems involves the use of common I/O modules. This has been achieved through re-use of the Advant OCS S800 I/O concept used in ABB drive controllers. The use of fieldbus solutions also results in lower wiring costs

Stig Larsson

ABB Industrial Systems

Pekka Tiitinen

ABB Industry

and a reduction in the hardware requirements.

The use of a common strategy for drive systems and open control systems allows 'one-stop shopping', with real benefits to the user, who can be sure that the development of products is pursued in a consistent and coordinated manner.

Physical configurations and communication

ABB drive systems can be connected to Advant OCS in several different ways. For small systems, built up around an AC70 controller **1**, the connection is made directly to the drive system through an optical ring. An important aspect is the simplicity of the connection. No extra hardware is needed in any of the devices, ie the functions are included in the basic products, minimizing communication delays and costs. Up to seven drive systems can be connected to the controller.

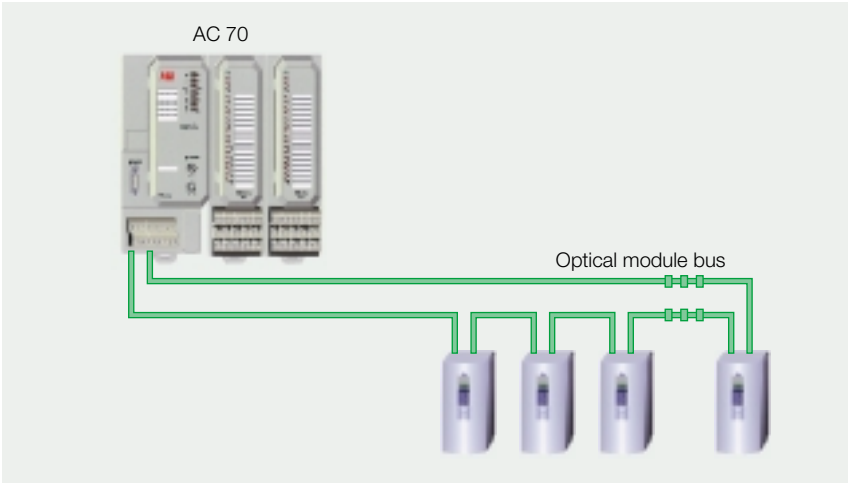
Larger systems based on an AC400 series controller **2** are connected to the drive system via a fieldbus (AF100) and a communication interface. Each communication interface can connect up to 24 drive systems through an optical ring, the number depending on the speed requirement for the data transfer.

In both of these configurations, communication over the link can be of two different types:

- Process values transmitted as cyclic data, with an updating frequency decided by the applications engineer
- Configuration data transferred using service data transfer, ie data transferred once only and acknowledged

Application-specific solutions

Different applications impose different demands on the type and amount of data transferred between the drive and control systems. Standardized exchange is suitable for the majority of applications, but highly customized definitions are essential



Small system configuration



Advant® OCS ocs stands for Open Control System

Advant OCS was introduced in 1995 as ABB's next-generation process control system. It is available in a wide range of sizes for continuous batch and SCADA applications, based on different combinations of hardware and software. The open architecture of Advant OCS ensures full compatibility with proven systems, such as ABB Master or MOD300. Customer investment in installed systems is therefore preserved.

Advant OCS consists of a family of computer-based units and a range of communications options, including fieldbuses and local and wide area networks. These combine effectively to form powerful automation systems which can be used in applications ranging from small machine control to total, plant-wide automation.

The Advant OCS system offers effective solutions for the main tasks of plant automation:

Process control

The range of controllers extends from small PLC units for a maximum of 64 I/O channels to advanced types for logic and regulatory control with up to 5,700 I/O channels per station.

Operator interaction

The man-machine interfacing equipment ranges from low-cost, monochrome video terminals to advanced operator stations featuring the latest technology in user-interaction, including high-resolution colour graphics and window techniques based on industry standards such as X-Windows System and OSF/Motif.

Engineering

Engineering stations and software packages support tasks such as configuration, documentation and fault tracing. Off-line engineering as well as on-line configuration is fully covered.

Information management

Powerful functions provide the right information for decision-making. An open platform allows for inclusion of standard or proprietary applications, for example for production planning, optimizing control, or administration. True plant-wide information integration capabilities are obtained through the use of open technology, including TCP/IP, SQL, DDE and X-Windows System.

Batch control

Standardized, ready-to-use functions are provided for the control of different types of batch processes. Batch stations efficiently manage recipes, materials, storage locations, production orders and processing equipment, and provide intelligent batch routing, process supervision and reporting.

Communication

Fieldbuses as well as wide and local area networks cater for different requirements, while communication stations provide links to external computers and communication networks as well as between control networks and the plant network.

Advant Controller 70 (AC70)

Advant Controller 70 is a small controller with logic and regulatory control capabilities and up to 384 digital I/O points or 192 analog I/O points.

for industrial sectors in which the drive systems are adapted to the specific process. This is also reflected in the way that the integration between ABB drive systems and OCS has been designed; optimized solutions have been developed for both cases.

The data transfer between the standard drive and the OCS is kept at a level that will be applicable in most cases and give the control system access to basic information, such as speed and current as well as alarm, fault and event messages. Diagnostic data can be used for control

Advant Controller 400 Series

This family of controllers for logic and regulatory control ranges from compact controllers with the capacity to handle up to 480 analog and digital central I/O points to top-of-the-line controllers for up to 5,700 analog and digital I/O points.

AS 500 OS

The Advant Station 500 Series of workstation-based operator stations featuring the AdvanCommand User Interface includes the Advant Station 510 Operator Station, Advant Station 515 Operator Station and Advant Station 520i Operator Station.

Advant Fieldbus 100 (AF100)

Advant Fieldbus 100 is a high-performance bus for connecting distributed I/O units when building powerful smaller system configurations with Advant Controller 110, Advant Controller 70, Advasoft for Windows and ABB drive systems. It is also used to connect drives, Advant Controller 70 and Advant Controller 110 to Advant Controller 400 Series. Both electrical and optical links are possible.

S800 I/O

S800 I/O is a distributed, modular I/O system which communicates with Advant Controller 100 or 400 Series over a fieldbus network or as a directly connected I/O to Advant Controller 70.

ACS 600

ACS 600 is a three-phase frequency converter for speed control of cage induction motor drives.

and for operator support. Setpoint data for speed or torque, in percentage or absolute values, can be sent to the drive. It is also possible to give commands to the drive, eg for start, stop or fault reset.

For engineered drive systems, ie systems adapted to a specific process, the data are typically decided upon by the engineering unit responsible for the application or by a project engineer. For such cases, a flexible solution is available which allows the transferred data to consist of up to 30 arithmetic or 480 Boolean values, or a combination of these, in each direction and for every drive. There is a typical set-up for each type of ABB drive, minimizing the necessary project engineering.

The data structures for both engineered and standard drives have been modelled to allow use of the same definition as for Profibus drives.

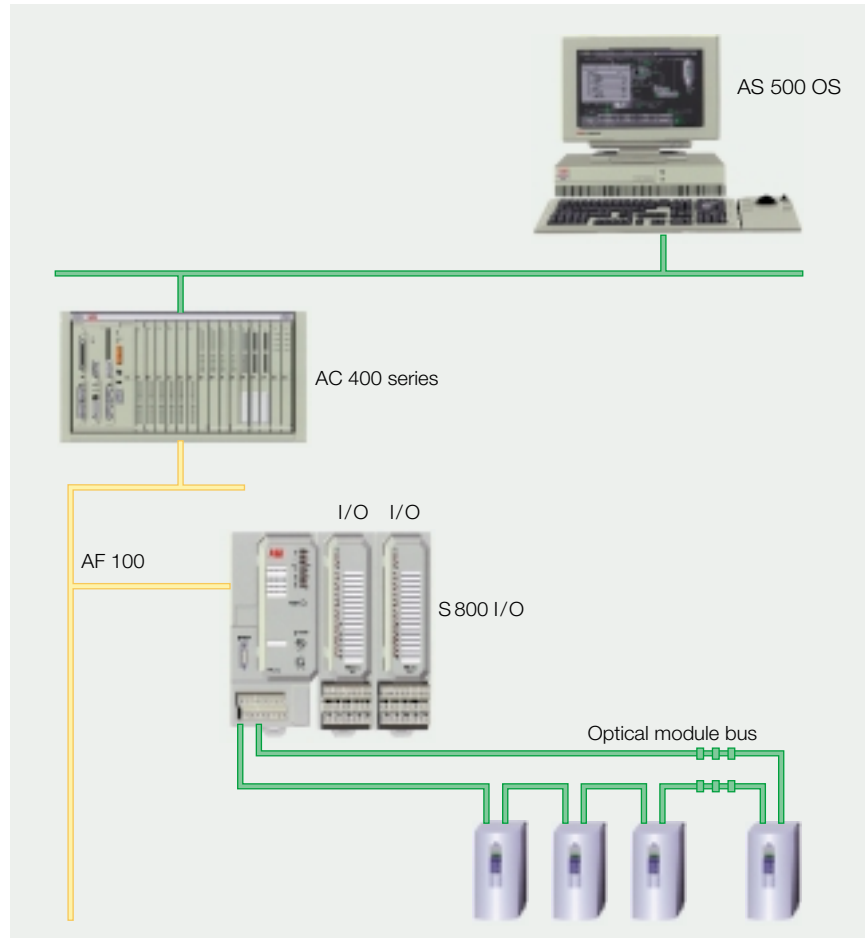
Powerful tool for the operator

One of the main benefits of integration is the powerful tool that it puts at the disposal of the process operator. Through the increased data transfer, the operator can control and monitor the drive systems with displays and dialogues which are consistent with those used for other objects controlled with the OCS.

The operator support offered by the Advant OS500 series includes a number of different drive-specific displays and dialogues as well as the possibility of using standard displays and functions, eg system status, alarm and event handling, and trend curves. 3, 4 and 5 show the drive-specific displays. In addition to these, process display objects representing the drives can be inserted to give the operator information on drive statuses during monitoring and control of the process.

Engineering effort is minimized

The configuration of the standard drive has been designed to be as simple as

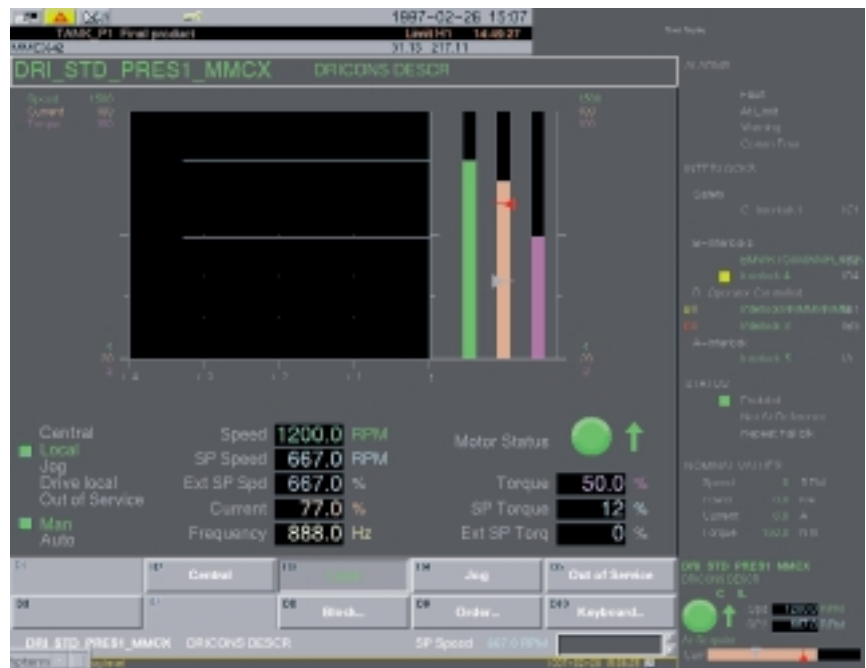


Large system configuration

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The drive object display shows detailed information that includes setpoints and actual values, operating status, selected control mode, interlocks, and alarm, fault and event messages.

3





4 A group of objects can be combined to form a process group display, with each drive represented by setpoints and actual values. Interlocks, operating modes and annunciation of alarm, faults and events can be shown.



5 Close-up object display appearing in lower right-hand corner of the operator station monitor when the drive system is selected from any display. It shows actual values, interlocks, alarm statuses, etc.

possible. Settings in the drive system consist of no more than changes to a few parameters, while the application programmer in the Advant controller uses a predefined type circuit that includes all the information about a standard drive. In the case of the AC400 Series controllers, the definition of the information available to the Advant Operator Station 500 is also included in the type circuit.

Applications in engineered drive systems require a specific set of values to be sent to and from the drives. This is made possible by application programming, using the same product-independent tool for programming the drive system and the controller. Use of a common tool ensures safety and ease of use when handling the application programs. At the same time, flexibility is guaranteed.

Typical solutions are available for engineered drives, and will be developed for a range of applications.

Commissioning tools for drives

Drives Window is an advanced and comprehensive tool for commissioning and maintaining ABB drive systems. It offers

functions for setting parameters, monitoring signals, and for capturing and viewing data, events and faults from loggers residing in the drive. The tool can be connected to several drive systems simultaneously.

Future outlook

The continued evolution of microelectronics promises further cost reductions and the possibility of even more seamless integration in the future. This potential is likely to be used to create a fully scalable model for applications programming, giving application engineers the opportunity to choose the right level of automation equipment for each application.

In the smallest systems, the application can be adapted for a single drive. As a next step, several drives can run a common application on a fieldbus network. If required, the small-scale applications may include a coordinating device – either a dedicated controller or a PC that doubles as an operator station.

Medium-size and large systems will have one or more controllers and operator stations which communicate over a high-speed control network.

This scenario will require fully fledged fieldbus solutions as well as efficient engineering tools, with functions for partitioning the application over different nodes in the network. The tools must also handle the configuration of the communication system so that this becomes transparent to the engineer.

Integration of Advant OCS and industrial drive systems represents a huge step forward in the direction of seamless integration and introduces a new level of efficiency into industrial control.

Authors' addresses

Stig Larsson
 ABB Industrial Systems AB
 Finslätten
 S-721 67 Västerås, Sweden
 Telefax: +46 21 181 526
 E-mail: stig.larsson@seisy.mail.abb.com

Pekka Tiitinen
 ABB Industry Oy
 P.O. box
 00380 Helsinki, Finland
 Telefax: +358 1022 22525
 E-mail: pekka.tiitinen@fidri.mail.abb.com