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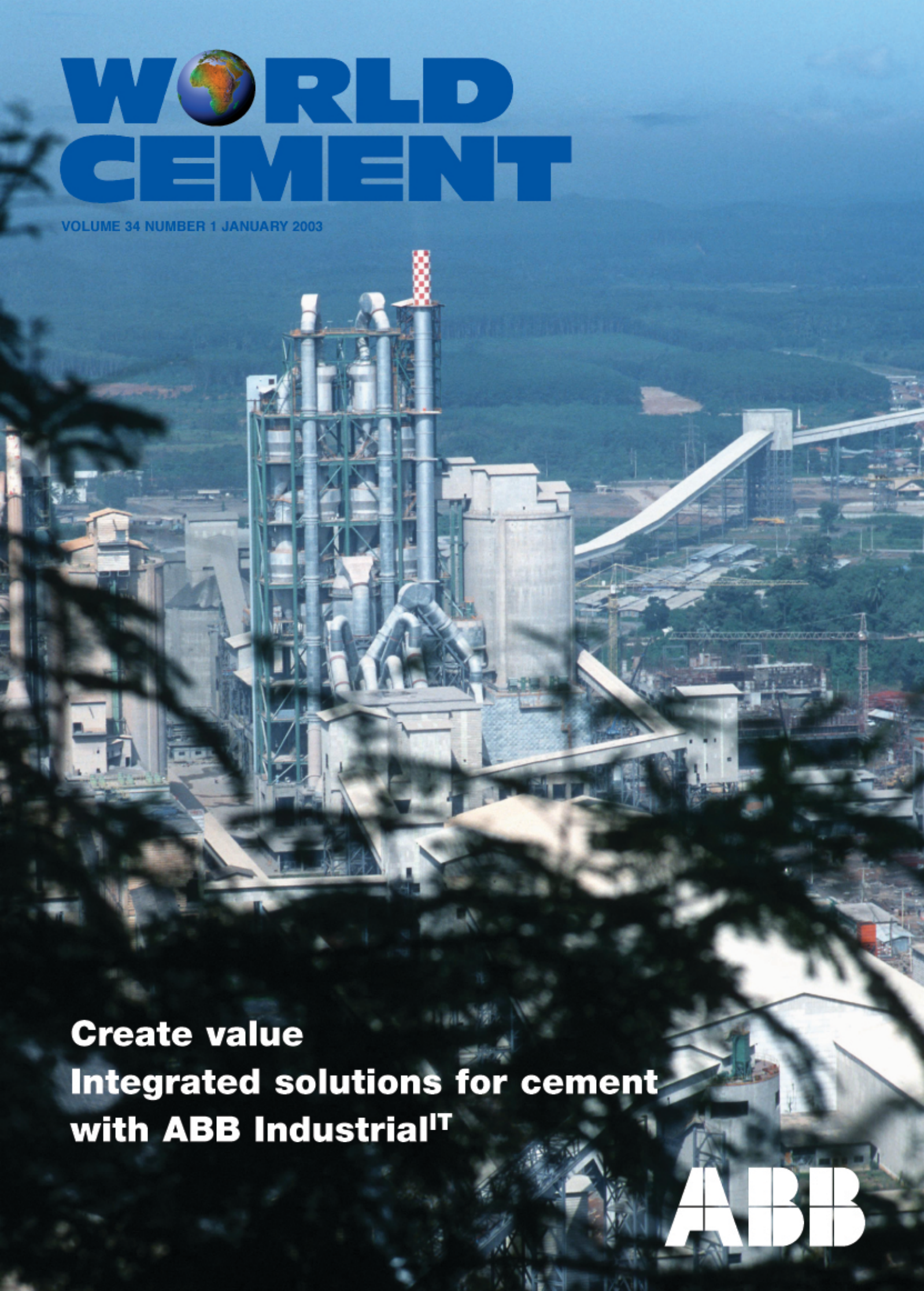

Process Control: The Next Generation

Adrian Schenk, Senior Sales Manager, ABB, Switzerland, looks at new innovations in the area of process control.

Introduction

Modern information technology is still progressing in cement plants. In the age of the Internet, business developments are more transparent. But the business climate has also become more demanding. Electronic commerce is being used in several industries creating a great competitive pressure in the following areas:

- Reducing running costs.
- Limiting maintenance stops.
- Increased delivery speed.
- Fast reaction times and servicing individual client's demands.

Alternatively, in many plants, several proprietary systems are running in parallel with compatibility issues. These systems are from different generations, with different technical levels and philosophies. Relay logic systems may be controlling the plant side by side with computerised systems. The system documentations have often not been updated 100% and contain overlaps and unnecessary redundancy.

It is critical to the business that decisions are taken on time and the status of assets known. The quality and quantity of information available to companies regarding their assets has increased tremendously in recent years. Very often manufacturers are also uncertain regarding which set-up will best meet the current and future needs of the plant.

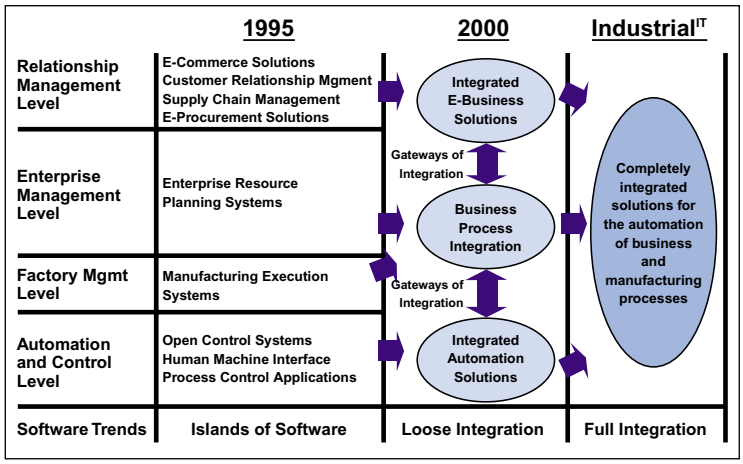

Figure 1. From island to integration.

History

Until 1995, customers who used control systems were mainly interested in pure control-, interlocking- and safety-functions. On the horizontal axes, integration had only just started, very often the individual plant sections were islands. Analogue processing was sometimes still separated and operating comfort was secondary.

In the vertical axes, different vendors sold MES- or ERP-Systems independently. This means several systems were working in parallel, more or less by themselves. In the next phase, the interest in connecting the islands increased.

Companies started to link systems horizontally as well as different brands of systems vertically via gateways. Remember the integration capabilities had still not been fulfilled. Interface communication was a risk and the links worked usually at a lower performance.

Today the demand on plants to fully integrate all IT, as already explained, could not be satisfied with the available concepts. More powerful integration capabilities were needed. ABB's Industrial Information Technology (IIT), is an example of such complete integration (Figure 1).

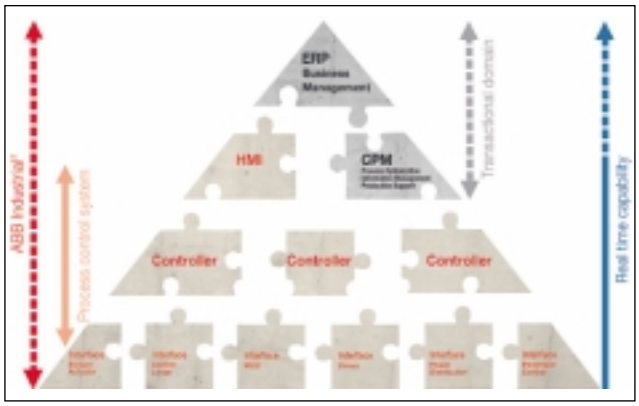

Figure 2. Expanding beyond the real time domain.

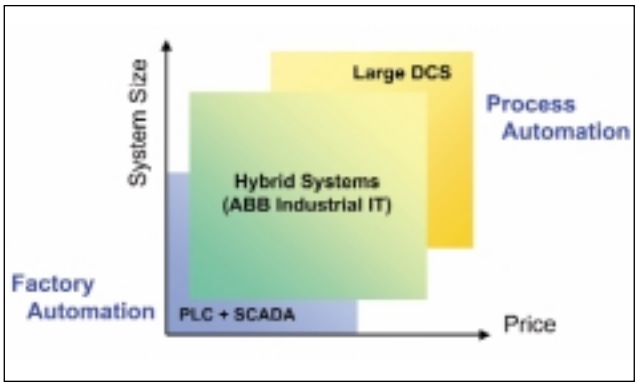

Figure 3. Hybrid systems cover a large area of PLC and large DCS systems.

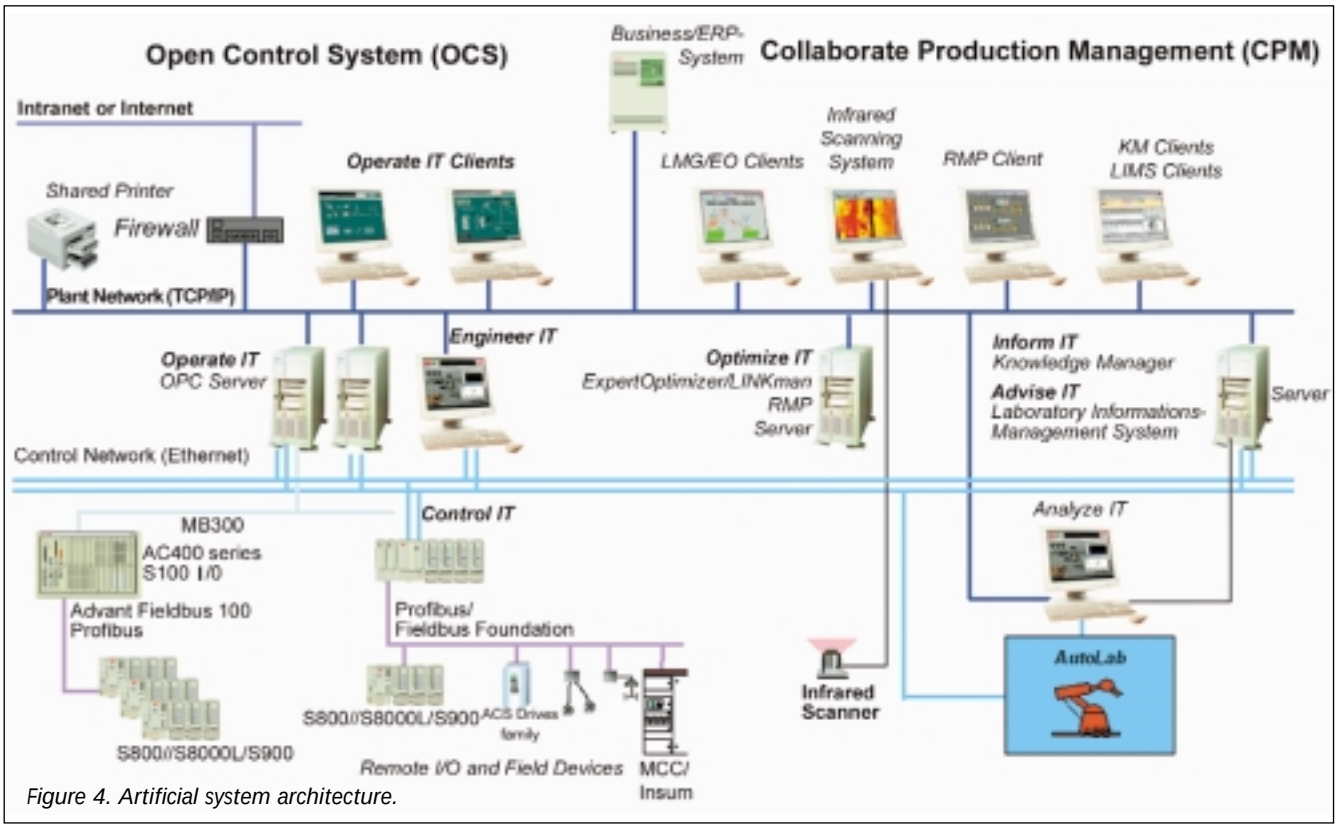

Figure 4. Artificial system architecture.

Expanding into the transactional domain

Tight integration requirements need to satisfy other demands, such as the following:

- Computer systems with business backgrounds have traditionally not been time critical. They have a transactional character.
- Computer systems with control backgrounds have traditionally focused on real time effects only.
- Modern process control technology needs to look beyond these borders. It needs to be able to merge real time functionally with transactional functionality.

Due to the increasing demand for flexibility in production, real time consistency has also grown into all the business related processes of a plant. The span of vertical functions has become enormous (Figure 2).

Integration

Modern systems still need to be able to cope with the traditional role of serving the field devices and drives as well as, most importantly, being set at a competitive price. Total integration with Industrial IT provides access and control for any kind of electrical equipment used in the process. It includes substations, power distribution, MCC's, generators, drives system communication systems, monitoring systems, 3D-party subsystems, quality systems, collaborative production management systems, expert systems, optimisation systems, enterprise management systems and business systems.

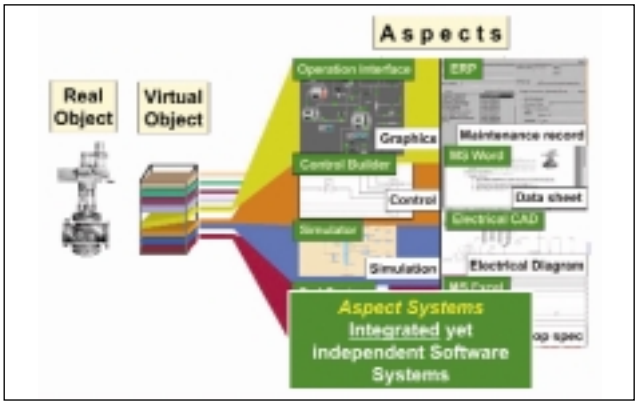

Figure 5. The real object and the virtual object and its assigned Aspects.

Process control system challenge

It is a challenge for every PCS manufacturer to cope with the needs of the future. Among others the following criteria have to be met:

- Integrating diverse products from its own product line and from other vendors in real time.
- Compatible information structures for every imaginable component of the system.
- Bundling information flow.
- Information technology enabled.

System positioning

In the past, PLC vendors have extended the functionality of their existing products to be able to cover larger projects. Meanwhile DCS vendors have introduced more cost effective solutions for smaller systems.

The overlap between the two types of systems has created a market for new hybrid systems (Figure 3).

Well-designed hybrid control systems will in future cover a large part of the traditional PLC and DCS target markets. They are economically scalable to any project size. That means an investor can start at a small scale with a hybrid system, e.g. for one plant section only, and later grow with the same technology to cover one or more complete production lines.

System architecture

Every main product belonging to the IIT System is shown in Figure 4, including how it is integrated.

I/O units, controllers and process portals are connected via open Bus systems and SW-Standards, such as Profibus, TCP/IP and OPC form the traditional process control section of the IIT System.

Several products that perform CPM functionality, such as Expert Optimizer or Knowledge Manager, are fully integrated. On the same open Bus standards or via a firewall business- or ERP-products and functions can be imbedded, if desired.

Objects and Aspects System

ABB's solution to take advantage of advanced integration is the 'Objects and Aspects System' (Figure 5).

A comparable example from the office automation would be the installation of a new printer for a PC. This is made much easier since all the information needed (fonts, drivers and diagnostic software) is provided with the product on a floppy disk or CD ROM. These various files are the 'Aspects' of the printer.

ABB's commitment is to provide similar information in standard electronic formats with its robots, motors, drives, switchgear and instruments. Depending on the product, up to 20 or more Aspects (characteristics) might be provided, either directly with the product or via online links to other platforms. A common software programme (such as a .pdf for instructions or AutoCad for 2D drawings) will always be used for each type of aspect and will ensure compatible formats. Together, these Aspects form a dynamic 'model object' containing links to all the important information. In IIT terminology, this software shell is called an 'Aspect Object'. Products from the company and selected partners that are certified, will be permitted to display a special 'IndustrialIT enabled' symbol. Every real object in the plant is mirrored in the distributed Data Bank (DB) with a dynamic virtual object, which can be accessed from various interactive aspects. This retrieves traditional control aspects such as process graphics, control programmes, simulation mode and loop diagrams as well as any other aspects that have been imbedded into the system. These can include manuals, system specification, maintenance records and Internet sites. The issue of missing reference pointers from one document to the next can be solved with Aspect Object. The system allows maintenance teams to trace faults, get to the relevant details through wiring diagrams, and become directly connected to manufacture maintenance manuals and online ordering for specific spare parts.

The tool Aspect integrator lets the operator use the automation system as a launching pad for any application. This includes external independent SW systems.

Technical Information System (TIS) for Holcim

Holcim was looking for real time integration of its business oriented systems with the process. This is an example of an application integrating ERP and the quality system with process control. All business relevant information is fed onto its TIS (Figure 6). From there, quality-data is exchanged with the business warehouse and the standardised SAP system. In order to carry out this work, Holcim chose the ABB IIT System including ABB CPM functionality. TIS is now being installed in Holcim's plants worldwide.

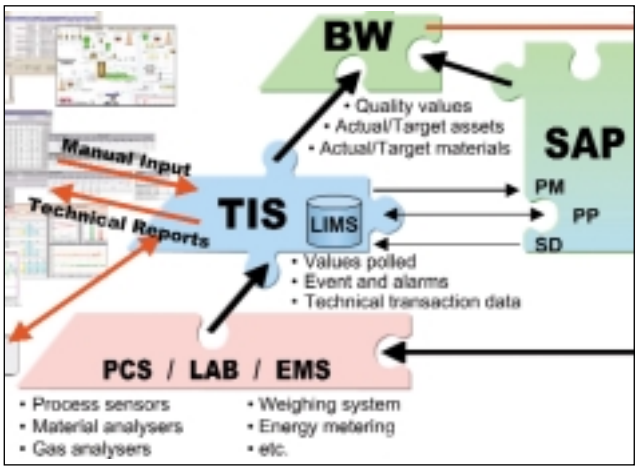

Figure 6. A clipping of the information flow from Holcim's TIS application.

Figure 7. The Ras El Ma plant in Fez, Morocco.

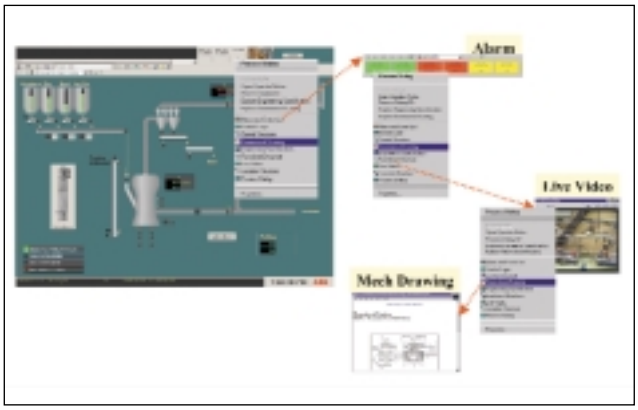

Figure 8. Selecting an object of interest and clicking for one aspect to the next one.

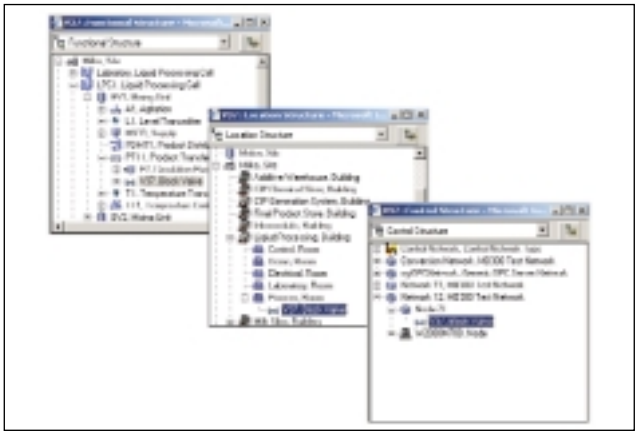

Figure 9. Various views of the ABB plant explorer.

Ras El Ma, Fez

In June 2002 ABB received an order to modernise the grinding and packaging lines of the cement mill in Ras El Ma, Fez, Morocco (Figure 7).

The control functions will be completed in an industrial IT system consisting of nine AC 800M and seven process portal operator stations. All servers, the process portals and the control network are fully redundant. The number of I/O channels used is 7150, of which 3100 are new. Some 4050 I/O channels remain from earlier deliveries. The equipment was due to be delivered in 2002 and it will begin operation in March this year.

Navigation examples

In an operation situation, the operator monitoring the plant can investigate the condition of a specific valve, if for example it had caused trouble in the past. By double clicking on the dynamic object the operator can access a context sensitive menu that shows the various available aspects of that valve (Figure 8). With one mouse click he can then enter any of these aspects such as the alarm history or position a live camera to that valve to view the situation locally. In order to discuss the case with the maintenance team the operator may even want to look directly into the mechanical drawing with another mouse click. This can be used to get more information about the construction or dimension of the valve of interest.

Plant explorer

Another example of navigation is shown in Figure 9. Similar to the MS Office file explorer, ABB has introduced the powerful Plant Explorer. It is an aspect presenting the objects in a tree structure. The interesting feature about Plant Explorer is that the tree structure can be presented in various hierarchies. There is one aspect for the functional structure following the process functions, another aspect for the location structure, grouping the objects by physical location and finally the aspect for the control structure, following the sequence of the application programme.

Benefits

Due to powerful complete integration, a modern IIT cement manufacturer can benefit from the following features:

- Faster data access times.
- The possibility to integrate existing systems.
- The power of tailored real time views and reports by user function.
- Seamless information exchange with CPM applications and business systems.
- The modularity to start small and merge into existing installations.
- Having an immediate view into field details.
- Savings in documentation and maintenance engineering costs are significant.

Glossary

IIT: Industrial information technology.

PCS:	Process control system.
ERP:	Enterprise resource planning.
PLC:	Programmable logical controller.
DCS:	Distributed control system.
CPM:	Collaborative production management.
MCC:	Motor control centre.
TCP/IP:	Transfer C.... protocol/Internet protocol.
OPC:	Ole for process control.
TIS:	Technical Information System (Holcim term).

Enquiry no: 3