System Migration onto Standard SCADA Equipment in Power Stations

Field Report
Grosskraftwerk Mannheim (GKM)

When:	2004 - 2005
Where:	Mannheim, Germany
Company:	Grosskraftwerk Mannheim AG

The starting point

Grosskraftwerk Mannheim (GKM) is one of the largest and most modern coal-fired power plants in Germany.

Process automation in blocks 3 and 4 is based on Siemens' TELEPERM ME systems, consisting of AS220EA programmable controllers, the CS275 system bus, the OS254 monitoring system, and the IS operator control and process information system (MADAM S) installed on SICOMP computers.

The functionality and hardware of the computers and operator stations on the visualization level is out of date, does not allow any open communication and is no longer in line with modern standards of efficient and ergonomic plant control. Proprietary components are discontinued by the manufacturer.

So, the operator control and monitoring system is due for modernization. Yet, this retrofitting must be achieved without intervention in the existing automation scheme.

Modernization steps

In order to preserve and secure the existing data stock when the SCADA system is modernized, the functions of the OS/IS systems to be replaced must be ported to a Windows-based computer system by means of sustained re-engineering and "soft" system migration. This means that thousands of I/O allocations must be safely and consistently transferred from the old system to the new system. Reprogramming or entering this information from scratch would inevitably entail a high error rate and considerable engineering expenditure. The system to be replaced continues to operate without interruption while it is being replaced step by step by the new SCADA system.

Emulating and migrating the existing data

The "old systems" run on a Windows computer using the SICOMP emulation tool M2000 - although without connection to the process. With this one-to-one emulation on the Windows platform, all structure information and I/O addressing of measuring values, analog and binary values, computed values, control panels, graphs, messages, KKS allocations (KKS = German Designation System for Power Plants) etc., can then be migrated from the old systems to Windows files. This data stock forms the basis for the migration database (SQL).

In this way, a complete database is generated by means of emulation and migration in which all of the original structure information is reprocessed for the new SCADA platform.

Cleansing of the data stock

A visualization system that has been running for a long time unfortunately develops its "own life". This means that inconsistencies between the automation system and the project data in the master computer of the visualization system become fixed over the years. To remedy such discrepancies in the forefront, prior to system migration, the data migrated from the process computers to the SQL database is logically and automatically compared with the programs of all automation systems. Incorrect parameters and data that is no longer used is corrected before the migrated system is put into operation.

Connecting to the system bus

The existing CS275 system bus is the interface between the process visualization level and the automation level.

The system bus with the AS220EA devices is connected to the new SCADA system by means of gateways.

In the new Windows-based SCADA system, the data and access structures of the AS220EA automation

equipment is converted to the structure of the new SCADA system. This has the advantage that the project engineer who configures and "wires up" the I/O addressing in the new SCADA system sees the "old" AS220EA automation devices just like a modern standard automation system.

Creating new process screens

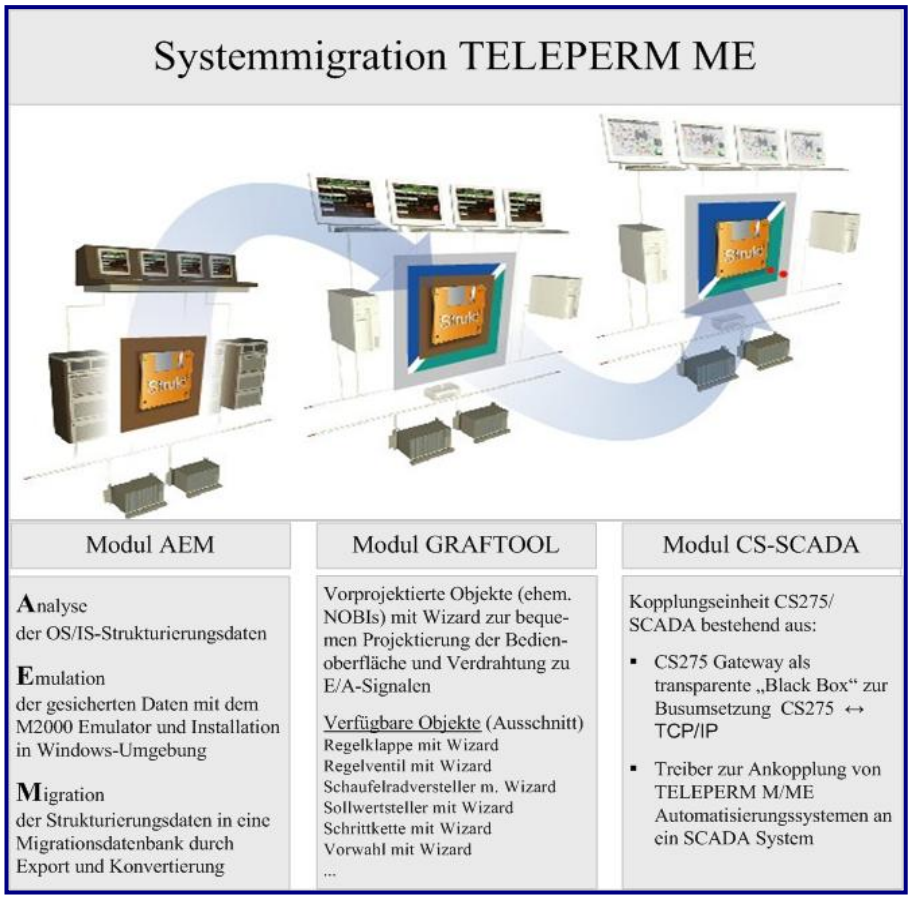
On the basis of the R&I plant scheme, an up-to-date visualization concept is worked out in close cooperation with the customer. This new scheme not only integrates today's ergonomic standards and visualization tools, but also takes into account the vast practical experience and knowledge of the block operators.

Automatic "wiring"

Owing to the previously migrated logic information and the generated migration database, the "wiring" of the variables into the process screens and the definition of the messages in the alarm system are largely automated procedures. Plant-specific objects (formerly known as NOBI), such as motors, butterfly valves, control valves, setpoint generators, preselection, actuator drives, group control, etc., are inserted in the process diagrams by using drag-and-drop operation, and are automatically connected with the variables from the migration database. This automatic standard procedure for creating process screens is extremely efficient helps to avoid errors and considerably facilitates commissioning.

Parallel operation

The new SCADA system is installed in parallel to the existing OS/IS systems and put into operation one section after the other (REA, DENOX, boiler, auxiliary plants...).



Conclusions and prospects

The possibility of consistently migrating the complete data stock of the legacy system to today's Windows platforms smoothes the way for the use of commercial off-the-shelf visualization systems.

The employment of standard technology offers additional economical benefits:

- ✓ Easy expansion of the functional scope by the company's own engineering staff
- ✓ Easy connection to other systems for decreed data evaluation and reporting
- ✓ Easy integration of new control technology developments and standards
- ✓ Uniform administration, maintenance and system expansion due to the use of identical standard computers for all areas of the power plant
- ✓ Reduced administration and modification costs
- ✓ Reduced training costs for operating and maintenance personnel
- ✓ Reduced hardware costs due to the use of standard interfaces

With the use of a standard visualization system (Siemens SIMATIC WinCC) and the "soft" migration of the existing data, the process control level of the power station block is based on standard technology. Thus it directly benefits from new developments in non-proprietary information technology.

Within 8 months, IPKS GmbH supplied and installed a turnkey plant, complete with redundant fiber optics cabling and redundant computer hardware. All functions previously running in the “old” SICOMP computers were migrated onto a Windows platform. IPKS could guarantee the continuous operation of the power plant during all stages of data migration, installation and commissioning.