

Modernising plants without having to shut them down

A newly developed compact system allows plants to be modernised by replacing their S5 controls with S7 controls. This upgrade is even possible without the need to shut production down. Which doesn't only help reduce costs, it also makes them calculable, which wasn't previously the case because the otherwise necessary production downtimes made it difficult to accurately budget for the incurred costs.

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In the past it was previously necessary to replace the entire system when S5 automation equipment needed modernising. This meant that companies were forced to shut down production, which in turn would result in costs that were difficult to calculate beforehand. That's why ABC IT GmbH created the ABC X-CPU-2 m57, a central component group that significantly simplifies retrofitting.

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It does not only allow the Siemens Step5 (S5) and Step7 (S7) systems to be used for programming the new CPU, they can be both used simultaneously. But the best thing about the new system is that it allows individual components to be replaced separately. Which makes partial upgrades feasible and thus helps reduce costs. Something that many businesses might consider because the full switch to S7 doesn't deliver any additional benefits.

The X-CPU-2 allows plants to be modernised by replacing only specific components (Fig. 1). Thus making it possible for companies to precisely calculate the costs for the individual modernisation and conversion phases. This was previously difficult because the necessary downtimes and expensive and complex procurement of spare parts meant that it was difficult to stay within projected budgets, particularly as the work often didn't result in a full conversion from S5 to S7. A fact that has also often meant that the switch did not deliver any particular benefits to users as it generally didn't result in any improvement to plant productivity. Intelligent modernisation, on the other hand, only makes changes in those areas where they are actually needed. The money thus saved may then be spent on the maintenance and development of production.

Both cost and planning reliability guaranteed

Several parts of a plant, e.g. the complete bus system or operation and monitoring, may be partially modernised with the same budget earmarked for the conversion of S5 to S7. It is also possible to upgrade the communications layer from Sinec H1 to Ethernet TCP/IP. This means that the ABC concept for retrofitting allows plants to then be adapted to meet state-of-the-art requirements over a planned period of time thus making costs calculable and guaranteeing planning reliability.

Many areas of heavy industry use S5 systems, e.g. steel works and steel-processing companies. But it is difficult to carry out modernisation work on heterogeneous plants and plants operating with special component groups.

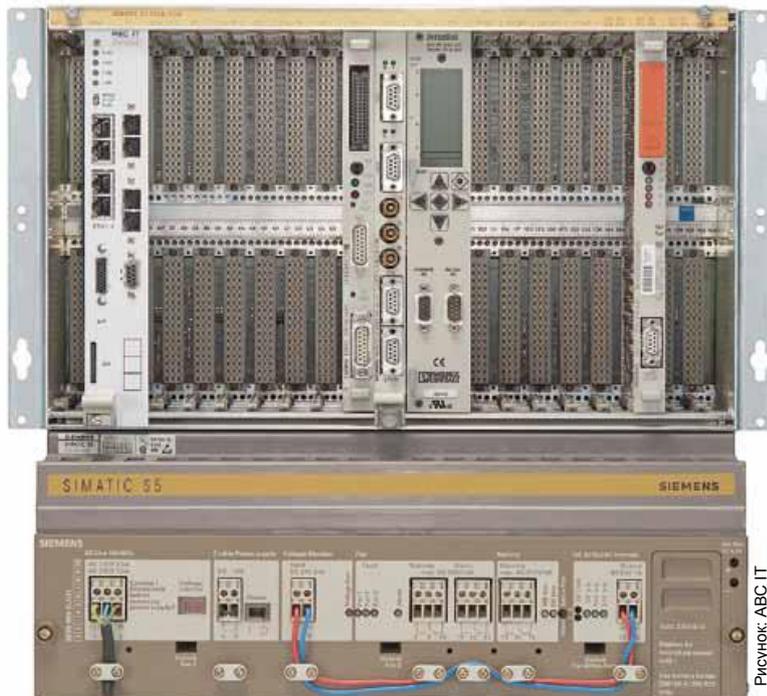


Foto: ABC IT

Fig. 1: The X-CPU-2 allows plants to be modernised through the replacement of individual components.

That's why the production system used in this example is still using the 155U S5 PLC system with a 948B CPU, the basic CP581-0EB12 component group and the CP58-2LA11 bulk memory. Both visualisation components had limited running times that could only be modified with great difficulty. The system was also being used with extension racks possessing digital I/O, relay and analogue output cards for which it was difficult to find spares and which were very expensive to repair. Also, the structure of the Siemens CPU 948 with 1.6 MB didn't allow the system to be simply migrated to a Basis S7-400 and then taken into operation (again), for example.

Modernisation targets coordinated with the customer

That's why ABC IT worked with the customer to coordinate the following modernisation targets: the CPU 948 was to be replaced with an X-CPU-2 to allow the systems to be programmed using Step5 and Step7. It was also deemed necessary to implement a new WinCC visualisation, to deactivate the old CP 581 (including malfunction alarm printer) and to replace the extension racks with modern field-bus components such as Profibus, Profinet and Ethercat. To be more precise, the digital I/O, relay and analogue cards were to be replaced with modules such as the Siemens ET 200 system.



Fig. 2: The X-CPU-2 m57 comes with 4 GB, three field-bus masters and the capacity to process S5 and S7 programs simultaneously.

The targets also included the deactivation of the Sinec L2 bus and the direct extension bus. The general aim was to make the plant more fit for the future without, however, necessitating a shut-down during the process, which in this case would have resulted in production losses totalling two million euros. This target was achieved with the expert conversion work that was carried out. Before the CPU 948 was replaced with the X-CPU-2, for example, the engineers

at ABC IT first carried out an analysis of the S5 software at no cost to the customer. Modifications were then implemented for the mixing operations and the program was then pulled from the existing CPU. The power to the control was then switched off, the new X-CPU installed and hooked up to the Ethernet network, the new S5/S7 program loaded with Step5/7 and then launched in a production test run..

If, during this process, it had been necessary to interrupt the commissioning work as a result of an error, it would have been sufficient to just replace the new control with the old CPU 948 to make the plant operable again.

WinCC Runtime was installed in parallel to the existing software

While the new visualisation system was being implemented, WinCC Runtime, which is able to directly access the ABC X-CPU-2, was set up in parallel to the existing software. The program was installed directly on the existing computer whereby the implementation during ongoing operations may be effected and by the users themselves. Once all the functions had been integrated, it was possible to deactivate the old visualisation and the new one could then be set up by the maintenance technicians. All the relevant data points and malfunction alarms were integrated to replace the previously existing malfunction alarm printer, new masks were created, a function test carried out and the old visualisation along with the basic component group, bulk memory and screen and keyboard control removed from Step5.

The extension racks were replaced with Profibus DP components. The existing distributed periphery was upgraded from Profibus to Profibus DP. An ABC extension board with Profibus DP was plugged on to an ABC X-CPU-2 and the bus then configured. It was then possible to remove the IM308 from the central rack so that all the Simatic S5 components in the rack, which then only contained the ABC X-CPU-2 were then executed decentrally via the Profibus DP. The ABC X-CPU-2 was fitted into a compact case and the S5 rack was removed. It was not necessary to change the Step5 program.

This method of modernisation made it possible to save more than 30% of the costs estimated for a complete conversion and it avoided the need to shut down the plant and thus prevented the production losses that would otherwise have been incurred. The modernisation work, which took only 10 days in total, was coordinated with the customer.

The conversion used ABC's X-CPU-2 m57 (Fig. 2) as the basis, which possesses a 4 GB internal memory, three field-bus masters and which allows S5 and S7 programs to be processed simultaneously – which is unique on the market. The central component group also comes with an Intel Atom N450 processor operating at 1.66 GHz and a 512 kB L2 cache. It also has four Ethernet interfaces (10/100/1000 Mbps), 2 GB memory on board, 64 MB remnant data, an integrated flash socket for SD cards, three serial interfaces and a diagnosis LED. The X-CPU-2 may be used in Siemens Simatic component groups (Series 115U, 135/155 U and 150 U/S/K).

The central component group comes in different versions. The ABC X-CPU-2 e57 compact system (Fig. 3), which is comparable with the Simatic S7 control, may, for example, be employed after a full retrofit of the S5 components, whereby the modular CPU may then be fitted into the e57 case. One to three field-bus masters (Profibus, Profinet and Ethercat) may also be optionally integrated.



Рисунок: ABC IT

Fig. 3: The ABC X-CPU-2 e57 compact system in use after a full retrofit of S5 components whereby the modular CPU is then fitted into the e57 case.

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