Siemens

High-performance IPCs –
New processors for industry
It has been around for over 50 years now – the Siemens Simatic brand. Previously almost synonymous with the term programmable logic controller, it now comes under the umbrella of Totally Integrated Automation (TIA) for the wide range of control and automation products from Siemens.

In the 1980’s and 1990’s, it was the S5 and S7 PLC series which played the major role in the brand’s success. In those days, real computers in production were exotic exceptions – being hardly distinguishable from office PCs. From 1986 onward, Siemens nevertheless also put its faith in PC technology and added industrial computer solutions to the Simatic brand name. As a robust basis for PC-based automation, the range today includes IPCs as 19” rack, box and panel PCs.

PLC or IPC – a question of creed?

Nowadays Siemens positions itself as an all-round provider in automation and drives. With its growing functionality and acceptance, PC-based automation adds an extra dimension to our portfolio as a parallel range to the classical PLC technology. That is why Siemens is focusing on a uniform concept for PLC and industrial PCs, especially in the fields of parameterization, commissioning and operation. “The user can load the configured control program without modification onto the IPC or into a traditional controller,” emphasizes Heinz Eisenbeiss. As Head of Marketing in the Siemens Industry Automation Division, he is responsible for the Simatic brand and the corresponding IPC solutions.

The flexibility on offer has been well received. „Machines with traditional PLC technology are often delivered to Asia,” Eisenbeiss says. „In Europe or North America, the same machine is used with PC-based technology.“ The reason is that there is a greater demand for a high level of functionality as well as for diagnostic and data processing capabilities, whereas, in threshold countries, the main expectation is for robust technology and ease of operation.
Portfolio keeps up with latest trends

The Simatic IPC family is constantly being extended to cover all current user needs. The most recently presented models are the first to bring the brand new Intel Core-i processors to industry. The CPU series of x64 microprocessors with integrated memory controllers is set to succeed the Core-2 family. Available as box and panel PCs, the new models are designed for fast measuring and open- and closed-loop control, as well as for HMI applications directly on the machine. The 19” varieties, on the other hand, are suited to fast processing of large amounts of data, for example in measuring and testing or in industrial image processing. They are available with mobile Core i3 to Core i7 CPUs. Depending on the design, the computing power is doubled compared to the previous models. However, the lower power consumption and higher energy efficiency is not only due to the new processors – the efficiency level of the power supply units used is over 80 per cent. The industrial PCs are compatible with their predecessors in terms of installation, interfaces and software. If required, they can be equipped with a Profibus or Profinet interface together with a 3-port IRT switch.

As far as bulk storage is concerned, the user has a choice: conventional hard drives as well as solid-state drives without moving parts or CompactFlash memory cards are all available for the Simatic IPC627C box PC and the Simatic HMI IPC677C panel version. Both devices have extension slots for PCI/PCI Express and an extra CompactFlash slot. The panel variety is available with 12”, 15” or 19” touch displays as well as with 12” and 15” key fronts; the front is available in stainless steel upon request.

The new Simatic IPC847C rack PC offers up to eleven PCI/PCI Express slots for extensions. The redundant power supply unit as well as the hard drive systems with failsafe capability, which can be replaced during operation, ensure a high level of system availability and data security. As an option, the rack IPC can be upgraded to an industrial workstation or server in control rooms in the manufacturing and processing industries. The second 19” device, the IPC647C, has an identical computing performance with three extension slots but is only half as high as the IPC847C. If the customer wishes, the operating systems Windows 7 Ultimate and Windows XP Professional can be pre-installed and activated. Windows Embedded Standard 2009 and Windows Server 2008 Standard are also available for certain models.

Integration as standard

Siemens offers a special benefit with its IPC solutions in terms of safety applications. “Safety standards specify very clearly how European mechanical engineering companies have to protect operators from injuries caused by moving machine parts,” stresses Eisenbeiss. All control functions, control information and control states in the control system therefore need to be constantly calculated in duplicate and compared. Historically, this function was ensured by means of separately wired systems. In the meantime, hardware PLCs with intelligent safety technology have established themselves on the market. Siemens goes even further and has recently had a 100% software PLC certified as a safety solution.

With WinAC RTX F, the company has proved that PC technology with failsafe software PLCs can be used right up to SIL 3 (EN 62061) or PL e (EN ISO 13849-1). Corresponding certification from TÜV Süd (German Technical Inspectorate (South)) confirms compliance with all safety guidelines and standards. “This was new territory for us: up to now safety systems have always been inspected and certified as a combination of hardware and software,” says TÜV employee Günther Greil. A soft PLC for safety applications independent of hardware was something new – the PC hardware no longer part of the safety function. The challenge was in ensuring failsafe running of the soft PLC on a normal IPC with a standard operating system. „For such demands too, we are placing PC-based technology next to traditional control technology, thereby offering our customers maximum freedom when it comes to safety,” Eisenbeiss explains. „In so doing, we are giving the user the chance to make his or her own choices. That is our recipe for success.”

The filling plant manufacturer, SIPA Berchi, uses the software-based safety PLC for its Tribloc isotonic bottling machine. Production manager Luca Tedeschi comments: „We only go for new technology if it brings our customers a clear benefit. In this case, we were convinced by the simplified engineering, commissioning and operation, together with increased the performance level.” As with the other modular Simatic S7 controllers, Step 7 is used as programming software supplemented by the Distributed Safety optional package for safety-oriented applications. In the newest version, the failsafe software controller is available with extended Profinet functions for higher application quality and simplified diagnostics. Predefined websites help reduce costs for diagnostics and increase plant availability.
Nowadays, PLC and IPC technology are both vying for business in the control application market. Weren’t the ideas behind them and the intended areas of application originally very different?

In the early years of industrial computers, their use was mainly EDP-oriented: for example for documenting quality or statistics. The first hard drives – with very low capacities seen from today’s point of view – opened up new possibilities. Over the course of the years, the IPC has developed more and more in the direction of applications – hardware standards and operating systems such as Windows have also become established in industry. PC technology started off with home PCs and moved on to the office and the control room before ending up on the machine itself. During this journey, computer and display merged to form a compact operating unit.

Does the PC meet all industry requirements?
Computers in a production environment naturally need to be much more robust than those in the office. It all starts with operation – an office PC never comes into contact with oil-smeared gloves. Nevertheless, industrial computers are becoming increasingly suitable for control jobs. The fieldbus systems which emerged in the 1990’s strongly supported this process. In my opinion, they opened the door for PC-based Automation. With current trends moving away from fieldbuses and toward Industrial Ethernet, IPC technology will take an even stronger hold in production.

Will this result in in-house sales competition with PLCs?
There are a lot of customers today who appreciate the high level of functionality offered by an IPC system, whereas others continue to rely on the classical combination of control,
visualiation and operation. It is like buying a stereo system: you either buy tuner, amplifier and CD player separately or you go for the entire functionality in a complete system, with the associated ease of installation and operation. That is why our Sales Department propagates neither the PC nor PLC as a universal remedy. Of course, some applications – such as data processing, quality control or measuring – are particularly predestined for PC-based automation. Either way, we always inform our customers about the benefits of each system.

**Doesn’t the need for long-term availability speak against PC technology in industry?**

In the office, one is confronted every half a year with new PC hardware and software. Machine engineering, of course, cannot go the same way: the lifecycles of machine models are typically around five years long. We supply our IPCs with the same features for three to five years, they can then be repaired for another five years, resulting in a service period of eight to ten years. In a new processor generation, the dimensions and interfaces of the IPC devices usually remain the same, so that a migration does not involve much effort for the user. Our brand new box and panel PCs, for example, are still compatible with the first generation from 1999 in terms of installation and interfaces. In the meantime, software providers and chip manufacturers have begun to react to the requirements in industry. For example, we are now involved as beta-testers in the specifications for new industrial operating systems. Thanks to close development partnerships, we can then position our customers’ concrete requirements.

**What benefits are you offering your customers as a result of these partnerships?**

We make sure that the corresponding technology brings our industry users a clear benefit. If that is not the case, we pass over a processor generation here and there. On the software side, we sometimes offer our IPCs with operating systems which have already disappeared from the office market. Some customers like to take the opportunity to skip an operating system generation to save development expenditure. We assume that a lot of users will change over from Windows XP to Windows 7, for example.

**What about reliability and failsafe performance? Isn’t the IPC clearly inferior to the classical PLC in this respect?**

A PC in an industrial environment has to cope with tougher conditions. Round-the-clock operation, ambient temperatures of up to 55°C and constant stress and strain due to shock and vibration; such conditions are not uncommon. Signs of wear cannot be ruled out under such circumstances. Failures may be due to the moving parts in the computer – hard drives and fans are typical examples. Contact problems within the computer can be another reason for malfunctions. We have taken action against both these factors in our IPCs. On the one hand, we are managing more and more without moving parts: conventional hard drives have been replaced by solid-state drives; new low-loss processors make active cooling components superfluous. On the other hand, as far as connection technology is concerned, we have been banking on high quality standards for quite some time now and have been equipping our devices with sophisticated functions and locking mechanisms which enable them to easily pass any vibration test. The most important thing is not to pass on development and production of core components outside the company. That is why all mainboards of all Simatic IPCs come from our own production facility in Karlsruhe, Germany. If anything is unclear, we directly consult our colleagues in Development and do not need to first confront a supplier from South-East Asia. As far as suppliers are concerned, we go for quality and work with established firms such as Intel or Microsoft.

**Low-loss processors are often used today. What about new storage media such as SSD and CF?**

That is right. CompactFlash cards have been around for a while and SSD memories in our microbox PCs have been well received on the market. There is also demand for so-called solid-state drives for other forms of PC. We have been monitoring this issue non-stop and very closely. This is one respect in which the IPC is ahead of its office equivalent for a change. The SSDs represent a technology of the future which we are bound to find in our notebooks quite soon.

**What services does the PC-based automation concept include?**

Our service and support concept is closely based on that of our entire Siemens control and automation technology and begins with extensive online support and corresponding service tools. In the event of a malfunction, we offer fast spare-part delivery and expert corrective maintenance through our 34 repair centers in 28 countries around the world. A support network of this kind for industrial computers is truly unique. What is more, we also equip our devices with helpful diagnostic functions. If the user knows the reason for the malfunction, he or she can often remedy the cause himself or herself. Early warnings, for example before a hard drive fails, mean that preventive maintenance can be done without loss of production.

**How strong is the demand for customized industrial computers?**

Tailor-made PC components are of course very practical for plant builders. Siemens has been very successful with such products for a long time. Our Online Catalog for PC-based automation gives detailed lists of all types and the available components together with the prices. The customer can put together his or her individually compiled Simatic IPC. We also accommodate special customer wishes: be it a device front with a customer design, plugging in additional cards, a particular operating system or complete operating stations.