SIEMENS

John Wilhite
PC-based Automation Product Manager

PC-based Automation's role in Today's manufacturing – and how it relates to PLCs

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What we will learn

- Learn the basics of industrial PCs: strengths, weaknesses, and useful applications compared to PLC's
- Discover how IPCs and PLCs working together can save on downtime
- Explore IPC's ability to handle high processing speeds, operate continually, and perform under extreme industrial conditions
- Find out if PC-based Automation is the best fit for your application
- What solutions Siemens has to offer
- Application Examples

What is PC-Based Automation?

PC-Based Automation combines the features of PLC-Control and open PC-Architecture on one industrial device!

Visualization

Open & closed-loop control

Office applications

PC languages

Data processing

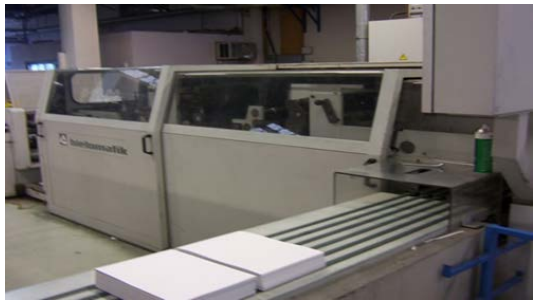
Networks

One engineering software: TIA Portal
→ re-use of existing software, increased flexibility

System-wide communications & diagnostics

Evolution of PC based Automation

The use of PC technology in the industrial environment is a success story. The foundation for this success is uniting the advantages of PC technology with the challenges of industrial manufacturing. In this way, plants with high requirements on processing speed, for example measurement and quality control systems, benefit from the computing power and openness of PC technology. Since these plants often operate continuously and in a harsh industrial environment, the PCs must also be designed to run under these conditions.



PLC vs. PC based Automation

Modern day automation systems are required to be networked, need more data storage, need to be more user-friendly, be able to communicate with each other and require an open standard. PLCs have been used traditionally for automation purpose, but they have not been designed to meet such extra requirements. PCs were always designed to perform tasks like data storage, communication, number crunching etc. There is an increasing trend in the industry to use industrial PCs as automation controllers.

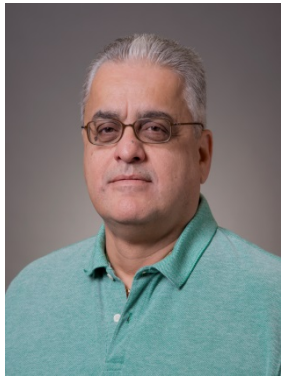
There are various advantages of using a PC based control :

Ease of implementation because of easily available programmer base
Ease of configuration, maintenance as PC know-how is easily available.
Networking of different controllers is possible.
Feature to communicate the automation/production data to other PC
Ability to store production data of a longer period of time.
Generate different graphs and reports for visualization
Graphically rich user-interface environment.
Multitask capability

PLC vs. PC based Automation

Today's new generation of engineers has seen PC technologies in every facet of their development, from smart phones to smart TVs to tablets to cloud computing. These commercial developments have found their way into the manufacturing world, from initial product design to fabrication to final product deployment to end of life and recycling of the technology and/or materials. **We are now experiencing the dawn of the digital factory and an increasing volume of plant floor data with smart devices. This trend is leading to increased use of PC-based automation.**

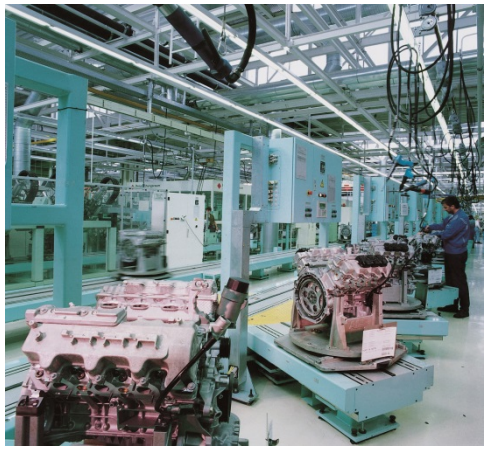
"While PC-based automation technology has been in existence for some time, industry's use of PLCs remained the overwhelming approach to factory automation," says Phil Aponte, marketing manager at Siemens. "Only with the emergence and understanding of the value of big data has PC-based automation solutions begun to emerge in their own right. The proliferation of smart devices on the factory floor is accelerating this development."



PLCs are sequential. They operate based on finite time. PC-based solutions can be sequential, but also can apply interrupt-driven algorithms for real-time operations. "They're more about information flow than control," says Aponte. As information flow has become increasingly key in today's globally dispersed, multi-tiered supply and manufacturing networks, PC-based solutions have found a growing niche.

PLC vs. PC based Automation

Most engineers will always look at PLCs, but the increasing emphasis on data, information exchange, and collaborative execution of processes is turning them towards PC-based automation in a significant way. “The commercialization of digital products is having ramifications in industry, particularly in terms of the demand for visual and high-speed data,” says Aponte. “These applications are more suited to PC-based automation solutions, and even traditional PLC-based functionality, such as safety, is now available with PC-based solutions.”



PC based Automation Basics

Fewer functional components needed for use in an application, making a solution smaller and less expensive. For example, an IPC can consolidate such elements as the PLC itself, plus its HMI, normal and fail-safe controls and any customization that might be required.

Integration of non-PLC functionality with traditional PLC control logic, while providing process and industrial engineers with more opportunities to tailor their applications to specific requirements. IPCs can run PLC logic just as a PLC can. An example of this in the oil and gas industry would be to integrate a monitoring and control application in a driller's cabin with a producer's enterprise resource planning (ERP) system back at headquarters.

Large data storage capacities on-board or connected (e.g., storage area networks) for various black-box applications that generate large amounts of data or in order to collect high-speed data from process applications. One SIMATIC IPC customer application, for example, generates 400KB of data every second – or 10.3GB per day – from an industrial, data-gathering application.

Typical PC-based Automation Applications

…for use in many different applications, e.g. for

- open-loop and closed-loop control in mechanical engineering,
- visualization in the food & beverage industry,
- measuring and testing in the automotive industry,
- data processing and communication in the semiconductor and electronics industry,
- intellectual property protection in emerging markets

Customer Requirements in Vertical Markets

Automotive

- Frequent production changes demand flexibility
- Data analysis for increased efficiency demands close monitoring / control integration
- Numerous Safety standards

Oil & Gas

- Harsh environment (heat, chemicals, vibration)
- High costs for repair / re-commissioning
- Monitoring & diagnostics often performed remotely

Food & Beverage

- Production lines often run continuously
- Frequent production changes demand flexibility
- Regulations require extensive data management

Renewable Energy

- Technology-driven applications require intellectual property protection
- Process must be closely monitored to minimize scrap rates

Machine Builders

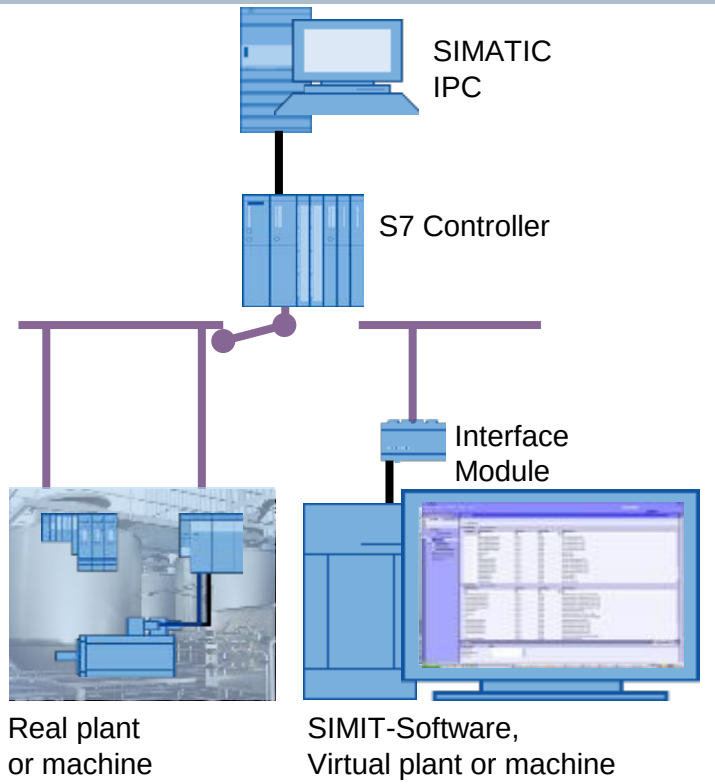
- Must maximize efficiency through innovative solutions
- New technologies demand cutting edge performance
- Machines often subject to heat, vibration, chemicals

Semiconductor

- High costs for maintenance / process interruptions
- Constantly changing market demands flexibility
- “Copy Exact” devices are often required for >5 years

PLC’s with PC based Automation

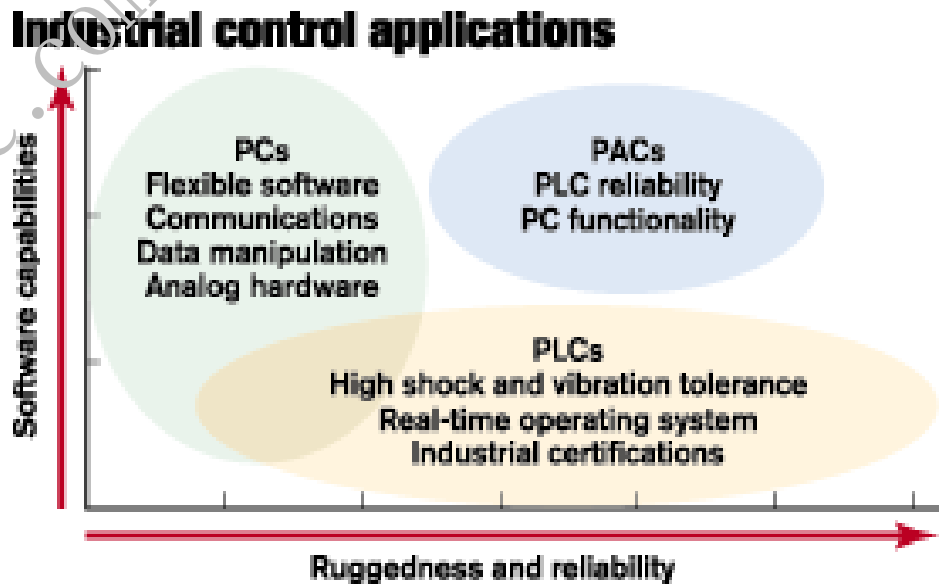
- Using PLCs and PCs in automation systems is *not* an either/or situation. Both PLCs and PCs have their places and advantages in tomorrow's factory as well as today's. In many cases, they will continue to work hand-in-hand in optimized combinations based on application requirements. Hybrid applications that blend discrete and process aspects are becoming more commonplace, challenging the capabilities of each control approach.
- So, what does all this mean? It means that PLCs have grown up. They have matured, evolved to the next generation. When the question is asked, "Which is better for industrial control, PLC or PC," the logical answer is both. With PACs, the flexibility, multifunctionality, and speed of PCs running control software are combined with the reputation for robustness, reliability, and installed base of PLCs.
- Do some plants continue to use PCs for industrial/process control? Do some continue to choose PLCs? Will they both be around to share the industrial control space?



Jack Smith, Senior Editor, Plant Engineering Magazine
PLC’s vs. PC’s in Industrial Control

PLC’s with PC based Automation

PC-Based Controls
PC-based controls are programmed on a Windows computer and used to communicate with and monitor an entire material handling system or specific material handling equipment.
Advantages
Not tied to any one hardware platform
Fast communication between controls programming and equipment
Supports more programming languages
PLC-Based Controls
A programmable logic controller (PLC) is a small computer, often located inside a larger electrical control panel, programmed to run an entire system or specific equipment. Unlike a typical computer, a PLC can only be used to handle programming language for machine automation.
Advantages
Durability: Industrially hardened and extremely stable (no Windows limitations)
Reliability: Low failure rate.
Long life: Life cycle of a PLC is 20+ years
Familiarity: Thousands of controls engineers are familiar with how to program the primary PLC manufacturers
Maintainability: It is much easier for electricians and controls technicians to troubleshoot systems using PLCs. They tend to be intimidated by PC-based controls. The ladder logic used in PLCs is familiar to them.
Easy integration: PLC manufacturers make their branded hardware easy to integrate with their PLCs, which also means lots of built-in features.



SIMATIC IPC – extensive options and expansion possibilities

SIMATIC IPCs	**Embedded industrial PCs** 	**High-end industrial PCs** 	**Industrial PCs** 
Remote operator panels	**Industrial Flat Panel**  DVI / VGA **Up to 30m**  Industrial Ethernet **"unlimited"**		**Industrial Thin Clients** 
Software for minimizing standstill times	**Detection of faults, and preventive maintenance** 	**Remote maintenance and administration** 	**Data backup and partition management** 
Industry-specific and customer-specific versions	**Customer-specific design** 	**IP65 all-round, stainless steel** 	**Intrinsically-safe (EX area)** 

SIMATIC IPCs combine innovative technologies and maximum reliability in industrial use

SIEMENS

Latest PC technology +

Future-proof thanks to modern interfaces and processors with performance reserves

High quality in production and development +

Reliable continuous operation from the start

90 million configurations from catalog +

Minimum order 1 unit,
flexible choice of design thanks to platform concept

Long-term availability and compatibility +

Up to 10 years after start of delivery

Integrated diagnostics +

Avoidance of standstills through preventive maintenance concepts

PC-based Controllers
Requirements of machine builders

SIEMENS

Flexible
Universal Controllers for the usage on industrial PCs

Scalable
Easy realization of different performance requirements

Avoid downtimes
Separation of Windows and controller software

Open
Easy integration of PC applications

High productivity
High performance of system reactions and data processing

Security
Protection of own know-How unauthorized access

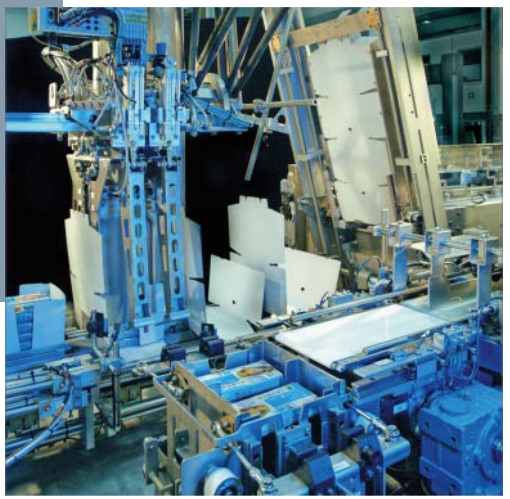
Machine building requires open and flexible controllers with high performance

SIMATIC ET 200SP Open Controller

Application Example: Control and Visualization of a packing machine

A packing machine folds and caulks cardboard boxes.

Various packing sizes can be chosen over the HMI.



Advantages:

- **Reduced number of components:** Only one device for controller with motion functionality, HMI-Program, I/Os and technology modules
- **Reduction of unit costs:** The performance of the controller and the visualization as well as the number of the I/Os can be perfectly configured to the requirements
- **Increased flexibility:** With the handling of options as well as the consistency within the ET 200SP CPUs a variety of machine configurations can be easily realized.

SIMATIC IPCs in the harshest environments

An industrial PC despite the heat of a steelworks

A **SIMATIC IPC** handles control & visualization in the direct proximity of an arc furnace

Customer: Moser Industrial Electric
Industry: Machine & plant building

Benefits for the customer:

- Reliable 24-hour continuous operation under high heat and vibration load
- Smaller control cabinet thanks to all-in-one device
- Saves on additional cooling of the control cabinet

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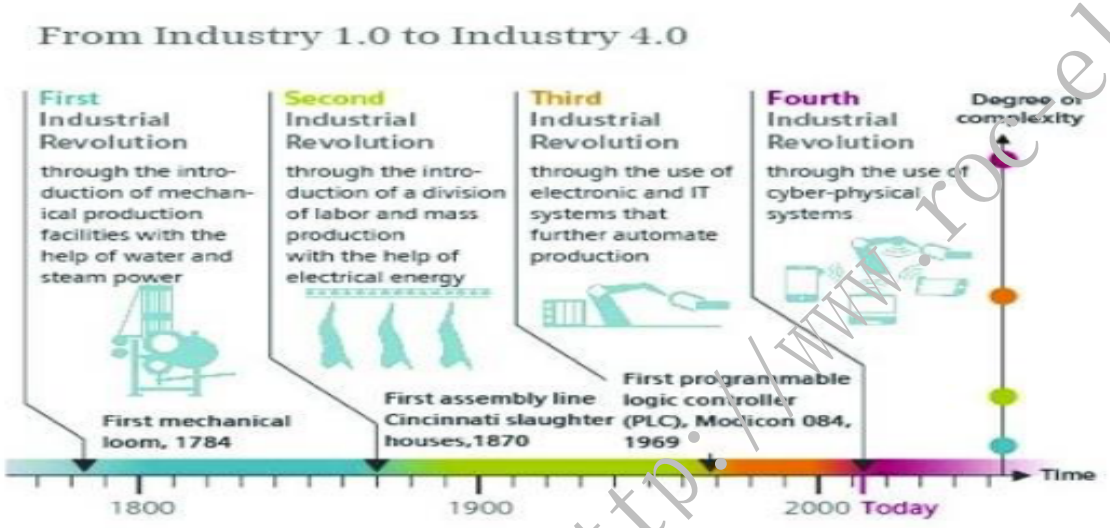
Industry 4.0

"Industry is on the threshold of the **fourth industrial revolution**. Driven by the Internet, the real and virtual worlds are growing closer and closer together to form the **Internet of Things**."

German Federal Ministry of Education and Research

http://www.bmbf.de/en/19955.php

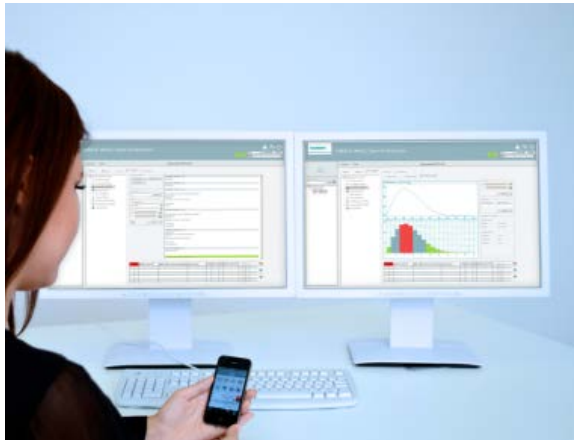


Source: DFKI (2011) http://www.siemens.com/innovation/apps/pof_microsite/_pof-spring-2013/_html_en/industry-40.html

"The term **Industry 4.0** was coined by the German government to describe the intelligent factory, a vision of **computerized manufacturing** with processes all interconnected by the **Internet of Things** (IOT)."

IHS website, January 2014

http://press.ihs.com/press-release/design-supply-chain/fourth-industrial-revolution-brings-challenges-big-data



SIMATIC IPCs for the tire industry
An industrial PC used for Logistics

Customer: Top five global tire company
Solution: Siemens Industrial Computers

A **SIMATIC IPC** handles control, protocol converting, and data storing

Customer challenges:

- The customer wanted to implement a new system that could be standardized for global use,
- achieve openness for the later expansion, address throughput efficiency, and minimize
- installation costs.
- The basic task of the IPC in the field is to collect available data as well as to control the
- I/O in the production line.
- With the integrated Ethernet interface as well as the optional interfaces for the fieldbus and
- serial buses, the IPC is able to communicate to the shop floor and the MES level.

Benefits for the customer:

- The proof of quality, the serialization of charges for further traceability, and logistics up to the shipment
- Long-term available basic components
- Data acquisition, visual inspection, and server capabilities for storage of required data

Thank you for your attention!

Questions?

John Wilhite

770-871-3820

john.wilhite_jr@siemens.com

usa.siemens.com/ipc