

The Siemens logo is displayed in a white box with a teal border. The background of the entire page is a photograph of an industrial facility with large cylindrical storage tanks and complex piping. Overlaid on the image are various digital graphics, including binary code (0s and 1s), a line graph, a bar chart, and a triangular chart. The Siemens logo is in a bold, teal, sans-serif font.

*Ingenuity for life*

White Paper

# Upgrading from SIMATIC S5 to S7 Controllers

## Greater efficiencies and cost-savings for Oil and Gas Operators

### Abstract

Oil and gas operators still using Siemens SIMATIC S5 controllers could be missing out on the many digitalization capabilities and benefits of the more modern SIMATIC S7 controller technology, in particular the S7-1200 and S7-1500 controllers. Enhancements include faster execution speeds, more compact sizes, integrated security and safety features, greater scalability and improved communications and diagnostics. The TIA Portal, a common software engineering framework, can cut development times as much as 30 percent. By migrating to the SIMATIC S7 platform, oil and gas operators can gain new efficiencies, cost-savings, more operating visibility, a sharper competitive edge and, ultimately, improved profitability.

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## Modernization: Six reasons to migrate from the SIMATIC S5 to S7 platform

When introduced in 1979, the Siemens SIMATIC S5 controller platform set a high standard for features, capabilities and performance in the control and automation of oil and gas operations. Its deployment across the industry has spanned upstream exploration and production as well as midstream transmission and downstream refining operations.

In fact, vast numbers of Siemens SIMATIC S5-enabled systems are still providing reliable value in oil and gas applications worldwide, just as they are in factories and process industries. But with the oil and gas industry's urgency to boost efficiencies and lower costs, using outdated controllers might be hiding a growing raft of issues that should be addressed sooner than later:

- **Opportunity costs of sub-par performance and inefficiencies**, compared to what today's much more advanced SIMATIC S7 controllers can provide, including faster cycle times;
- **Rising costs of spare parts, maintenance and repairs** from third-party suppliers, undermining margins and profitability;
- **Limited operational visibility and diagnostics**, impacting the speed of decision-making as well as asset utilization and availability;
- **Limited scalability**, making the expansion of capabilities and operational reach via modern communication protocols is difficult or impossible to implement;
- **Shrinking pools of skills and expertise**, as more and more experienced workers retire.

On the other hand, the Siemens SIMATIC S7 portfolio, especially the latest S7-1200 and S7-1500 controllers, can provide a wide range of enhanced digitalization capabilities in much smaller form factors with ruggedized options for harsh environments. Compact size is especially important in oil and gas applications, which often must operate in cramped quarters, such as off-shore platforms. Mechanical system upgrades are often good opportunities to upgrade controllers, too.

The advanced capabilities of SIMATIC S7 controllers can transform oil and gas operations in ways that can turn these issues into advantages resulting in faster operational execution, a sharper competitive edge and, above all, greater profitability via lower costs and higher productivity. Among those advantages:

1. **Open yet common architecture for plug-and-play interoperability.** The Siemens SIMATIC S7 controller platform offers an open, common architecture – Totally Integrated Automation (TIA) – that supports plug-and-play interoperability for faster, easier and less costly systems integration, installation, commissioning, maintenance and service. It also enables users to more readily incorporate technology innovations, so they can take advantage of those innovations much sooner.
2. **Framework software engineering.** To reduce the complexities of software engineering for complex applications like what oil and gas applications typically require, Siemens developed the TIA Portal. It's a powerful

and integrated development framework for applications using Siemens TIA portfolio components in general and SIMATIC S7 controllers in particular. It offers all the software tools needed for every step involved in designing, commissioning, operating, maintaining and upgrading automation systems, from simple to complex. Users can cut development, configuration and deployment time from weeks to days. Many customers report engineering cost reductions of 30 percent or more

3. **Real time and remote diagnostics.** With advanced solid-state electronics, SIMATIC S7 components can dramatically reduce the frequency of faults, shutdowns and other issues that can afflict older systems. In addition to S7 components, the SIMATIC TIA portfolio offers modular automation system components such as PLCs, HMIs, drives, network switches that have integrated diagnostic functions. This enables oil and gas operators to have 24x7 system-wide visibility for reliably detecting, automatic reporting and clearing faults quickly. Faster and better remote diagnostics can help reduce costs associated with unexpected shutdowns because troubleshooting and repair are much easier.
4. **Fast, highly scalable communications.** SIMATIC S7 controllers and their supporting infrastructure components have built-in switching with two or more data ports. This feature enables components to be easily daisy-chained together. It can eliminate the cost and bother of buying additional switching hardware as well as paying for long wiring runs back to a central switch. In addition, they can communicate via industrial Ethernet at speeds up to 1 Gbps, thousands of times faster than the 56 Kbps speeds of legacy automation systems. What's more, Siemens SCALANCE and RUGGEDCOM wireless communications components can eliminate onsite cabling altogether, while also providing distant wireless communications options, via both cellular and WIMAX networks.
5. **Integrated, multilayered security.** Security across an oil and gas operation's network – at I/O, control and MES levels – is critical and must be protected from hackers, viruses and other malware. If networks are compromised, the costs and safety hazards can be huge. SIMATIC S7 controllers and their TIA support components, when installed, operated and maintained according to Siemens Operational Guidelines, provide layers of protection to the automation solution. Component configuration can be realized with relatively little administrative effort, thanks to the design and engineering capabilities of TIA Portal.
6. **Integrated safety.** For decades, oil and gas facility engineers have had to hard-wire standard safety features like e-stops, door and gate interlocks, light curtains and safety PLCs as "bolt-on" accessories to a separate safety system. This approach is widespread and costly in many ways: extra wiring, controls, maintenance, and spare parts, to name a few. But SIMATIC S7 controllers with safety integrated can simplify complexity by reducing the issues related to having separate operational and safety systems; installation and configuration requirements; maintenance; and, last but not least, human errors. This can provide a lower total cost of ownership (TCO) because less engineering, hardware, training and spare parts are needed.

## SIMATIC S7 Overview: Options for a wide range of oil and gas applications



The Siemens SIMATIC S7 portfolio provides powerful controllers that can address most all oil and gas application requirements. These SIMATIC S7 controllers are also available as fail-safe versions for implementation of extremely critical applications. SIMATIC Controllers are offered in the following four scalable ranges:

- **SIMATIC S7-1200 basic controllers** are ideal for compact needs with integrated communication and technology functions. Both standard and safety integrated models are available.
- **SIMATIC ET 200S distributed controllers** are used for applications requiring a distributed architecture and when available space is limited. They combine the advantages of a SIMATIC S7-1500 with the compact design of a SIMATIC ET 200SP distributed I/O module.
- **SIMATIC S7-1500 advanced controllers** can automate not only complete production facilities, but also applications that demand the greatest performance, flexibility and networking capability. This version also offers a compact option for tight spaces.
- **SIMATIC S7-1500 software controllers** provide for PC-based Automation when maximum precision and speed are needed. This controller operates independently of the PC's operating system during operation for greater cybersecurity and dependability.

### Moving from the SIMATIC S5 to S7 platform – two migration scenarios

When introducing the SIMATIC S7 platform, Siemens took care to ensure that customers' S5 migrations could be as painless as possible with minimal disruptions. First was to enable them to reuse much if not all their existing intellectual property. Second was to provide tools to help port that code. And third was to assure them that they could migrate at their own pace.

With proper planning, experienced assistance and a phased approach, oil and gas operators can upgrade their facilities' automation capabilities with the latest S7 controller technology yet risk little or no disruption to current operations. These two scenarios can help explain how that's done:

#### 1. Overlay legacy S5 systems with new S7 systems

In this case, the new SIMATIC S7 automation system will overlay an oil and gas operator's legacy S5 system. Or if system expansion is needed, the new automation system is installed to co-exist with the legacy system. Either option requires careful coordination between the new and old, while enabling a smooth transition to new technology.

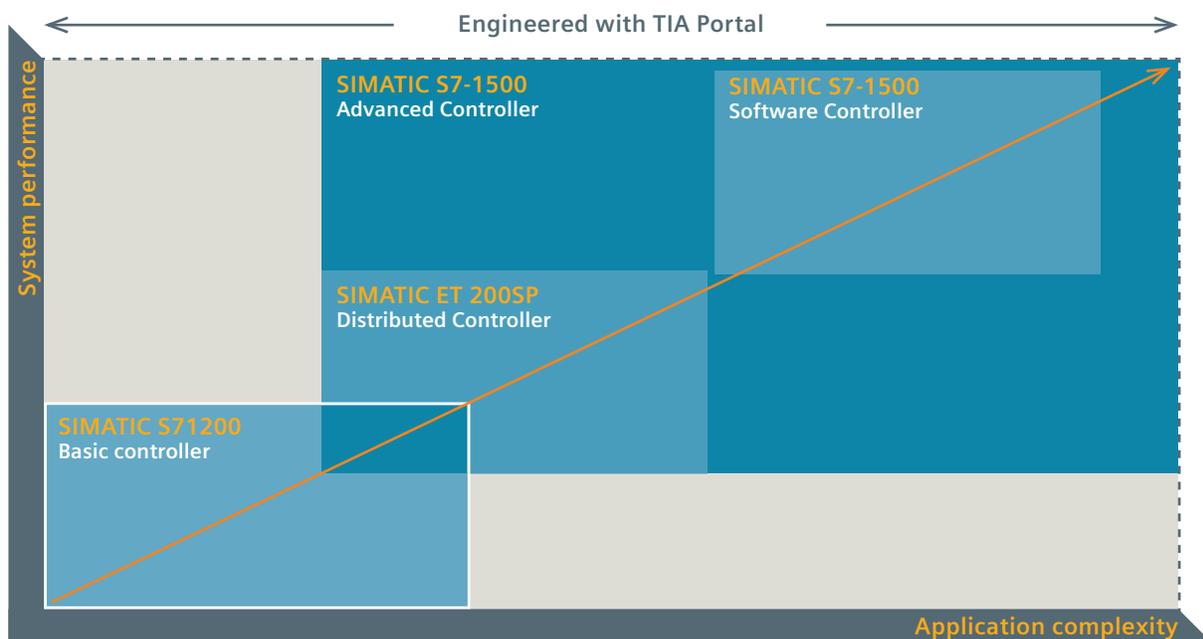


Figure 1. The latest SIMATIC S7 Controller family features: S7-1200 basic controllers for small to midsize applications; S7-1500 advanced controllers for medium and complex applications; ET 200SP distributed controllers for decentralized applications; and the S7-1500 software controller for PC-based applications.

As Figure 2 shows, the new and old systems can be unified under a new, common HMI. Using the engineering libraries in the TIA Portal, developers can design the HMI to deliver the same look and feel for both systems. They can mimic the functionality and behavior of older systems, too. Both of these capabilities can help cut the learning curve for technicians and operating personnel.

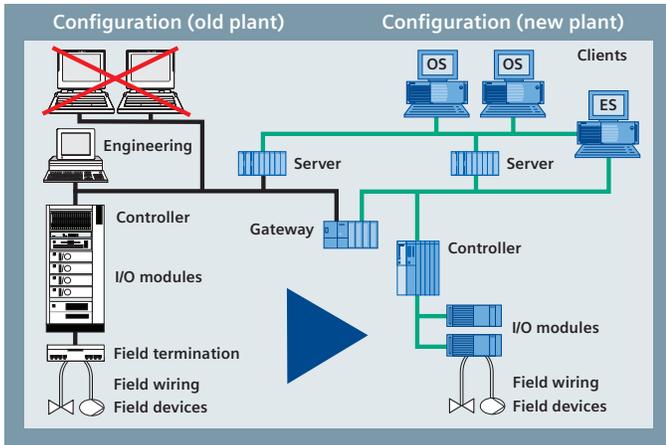


Figure 2: Overlay legacy S5 systems or expand with new S7 systems.

**Major benefits:**

- Adds production capacity and application flexibility
- Facilitates introducing new technologies and applications into operations
- Enables connectivity to MES and ERP systems, plus tighter IT integration
- Allows legacy S5 systems to be brought under control of a common HMI
- Provides operating personnel with an easier transition to new HMI technology
- Improves security

**Migrate from an S5 system to an S7 system**

Today, the best choice for oil and gas operators is to move from an S5 automation system to a new SIMATIC S7 automation system. If necessary, the legacy S5 system can stay online to ensure production goals are met, until a cutover is required. In this scenario, the investment in wiring, hardware components, existing I/O and field devices, plus application engineering, can all be reused, based on an evaluation of which of those components hold the most future value.

**Major benefits:**

- Provides the maximum lifespan extension of the process automation system
- Minimizes total cost of ownership (TCO) by allowing reuse of the most valuable existing assets
- Improves security

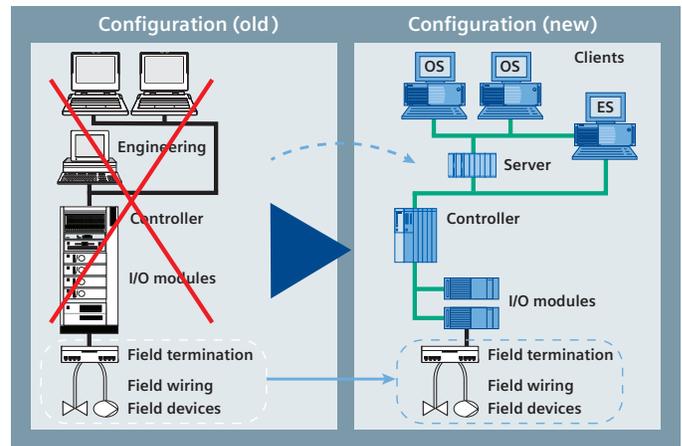


Figure 3: Replace entire S5 system with a modern S7 system.

**Moving to the SIMATIC S7 platform can help boost oil and gas profitability**

Oil and gas operators seeking new efficiencies but still using SIMATIC S5 controllers in their systems and applications will be well-served to migrate to the advanced, new-generation SIMATIC S7 controllers.

The increased capabilities in automation, control, communications, maintenance, diagnostics and operational visibility that come with the SIMATIC S7 platform have been proven in thousands of extremely sophisticated and complex deployments worldwide.

Of course, that’s not to mention the TIA Portal’s software engineering time- and cost-savings, which customers consistently report to be 30 percent, often more.

With the oil and gas industry’s urgency to drive new efficiencies throughout their operations, it’s time to consider migrating to the SIMATIC S7 platform. Such a move can help operators become not only much more competitive but also much more profitable.

1 Siemens Operational Guidelines can be found at: <http://www.industry.siemens.com/topics/global/en/industrial-security/support/Pages/white-papers.aspx>

Security information  
In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens’ products and solutions only form one element of such a concept. For more information about industrial security, please visit <http://www.siemens.com/industrialsecurity>

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