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Oil & Gas Midstream Transport Automation

Improving throughput efficiency,
reliability and safety

Siemens Automation. Fueling Efficiency.

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Upgrade your midstream automation – a \$630 billion opportunity



The continuing success of North America's unconventional oil and gas production has spawned a big need to upgrade and expand existing midstream pipelines, in addition to build greater capacity.

In fact, the American Petroleum Institute forecasts that by 2025 the U.S. oil and gas industry will drive almost \$630 billion of cumulative capital investment into new infrastructure, including gathering and transmission pipelines as well as storage for natural gas, NGLs and crude oil.¹

Much of this investment will extend the reach of pipelines into new fields to bring their production to processing facilities and ultimately to market. Some capital will go to pipeline reversals. Other investments will go into pipelines connecting new and repurposed LNG export facilities.

Time to give midstream automation a fresh look — with Siemens

For pipeline operators, as well as OEMs developing midstream solutions, this coming build-out creates a compelling opportunity to consider how advances in automation technology can further improve the segment's efficiency, reliability, and safety, even more than today. Increasingly, they're turning to Siemens.

As a leader in automation and control systems, we have decades of experience working in the rugged extremes of the global oil and gas industry, onshore and offshore, as well as in petrochemical plants worldwide. What's more, we invest billions each year in our R&D efforts to keep our automation solutions upgraded with today's latest technology.

Boosting efficiency, reliability and safety across "horizontal production facilities"

As we see them, midstream pipelines are "horizontal production facilities" that can run hundreds if not thousands of miles. Their "product" is the efficient, reliable, and safe transport of oil, natural gas, and LNGs. For that, their control rooms need complete operating visibility all along the way.

These needs are every bit as exacting as those we've found in refineries, petrochemical, and chemical processing, and pharmaceutical industries which are among the many we serve around the world. But we also know that the requirements to transport oil and gas are much more rigorous.

That's because the midstream industry segment must meet the working demands of frequently harsh and remote environments. And that's not to mention the strict safety and security compliance requirements which come with being a highly regulated, critical infrastructure.

Tap our technology pipeline for your pipeline solutions

Siemens can help. We offer the Totally Integrated Automation (TIA) portfolio that includes modular PLCs, I/O, HMIs, Safety, analytics, instrumentation, power supplies, switches, drives, motors, wireless communications, and more. All with advanced diagnostics, rugged reliability and cyber security built-in, not added on.

Based on open system architecture, the Siemens TIA portfolio components feature uniform hardware and software interfaces, global standards for legacy and multivendor interoperability, and consistent data management. Hazardous certifications include UL, FM, ATEX and IECEx, while marine certifications include ABS and Lloyd's.

Our Siemens TIA components are highly scalable. This enables you to design, engineer and build automated SCADA systems which can span the length of your entire midstream infrastructure – from the LACT and metering units in the production fields to breakout stations and tank farms at pipeline terminals – or any points in between.

As part of this portfolio, the TIA Portal is an integrated engineering framework for all your automation tasks that will save you money, time, and effort. Siemens industrial customers around the world have used the TIA Portal to cut engineering and commissioning times by as much as 30 percent and, in many cases, even more.

Proven reliability, self-diagnostics, and serviceability

With pipelines mostly underground if not undersea, you need self-diagnostic components with the proven reliability that we design and engineer into every component in our TIA portfolio. If service is needed, plug-and-play modularity, and self-configuration makes repairs fast and easy. All this can help eliminate or minimize costly downtime and compliance penalties.

When you consider how new technologies can improve the automation of your midstream solutions, also consider how Siemens and our Totally Integrated Automation approach can boost their value even more – with greater efficiency, reliability, and safety.

Siemens TIA portfolio with the TIA Portal have proven themselves in thousands of automation deployments worldwide. This includes hundreds of oil and gas projects, on land and at sea, for E&P, and oilfield service companies of all sizes. Let us prove them to you.

¹ Oil & Natural Gas Transportation & Storage Infrastructure: Status, Trends, & Economic Benefits, by IHS Global Inc., published by the American Petroleum Institute. December, 2013. 2015-2019 data taken from Table A4, U.S. Oil & Gas Direct Capital Investments Forecasts (2014-2025), page 50.

Put the power of advanced automation technology to work for you



Increase reliability and efficiency with standardization

By deploying solutions from the Siemens Totally Integrated Automation (TIA) portfolio, you'll increase standardization of operations, thanks to the consistent architectural design of every component.

This can simplify your operations further, while improving reliability, enabling new efficiencies, and reducing costs. And if you choose to sole-source, you'll also streamline your procurement, maintenance, spare inventories, service, and support.

Don't worry about stranding your existing investments in legacy automation and control assets. The Siemens TIA portfolio's open architecture and protocols, such as PROFIBUS and PROFINET make it possible to collect data from the products of many different suppliers.

We design our hardware components for optimal modularity and replicability, so you won't outgrow them – just add more as needed. And with software now delivering most of their value, periodic firmware downloads will keep it all up-to-date. Plus, all downloads can be automated and done remotely.

When midstream OEMs and operators put advanced automation technology to work in their transport solutions and operations, they're turning to Siemens, a global leader in automation and controls, with its proven Totally Integrated Automation (TIA) approach.

Why? For these reasons:

■ Open, scalable system architecture:

The broad Siemens TIA portfolio – modular PLCs, I/O, HMIs, analytics, instrumentation, power supplies, switches, drives, motors, wireless products, and much more – provides uniform hardware and software interfaces, consistent data management, and global standards. Not only can these components interoperate with legacy systems and those from other vendors, but their plug-and-play design also offers fast, flexible scalability as needs grow.

■ Security Integrated, plus hazardous certifications:

As part of the U.S. Department of Homeland Security's designated critical infrastructure, pipelines need automation solutions that are secure against cyber-attacks. Siemens designs and engineers security embedded in TIA components so that it's built-in, not added on.

Our newest SIMATIC S7-1500 PLC, for example, has a Wurdtech Achilles Level II cyber security certification – the highest available. This ensures compliance with current and emerging cyber security standards, such as ISA99 and NERC/CIP.

In addition, TIA components needed in midstream applications comply with major hazardous and marine certifications, including UL, FM, IECEx, and ATEX.

■ Engineering time savings:

With the costs of technology, especially hardware, always falling, the percentage costs of software engineering in midstream solutions are always rising. Siemens helps counter this trend with its TIA Portal, an integrated engineering framework for every automation task.

The TIA Portal includes vast libraries of automation code used in a wide variety of exacting industries, including aerospace and automotive. The TIA Portal is the key to all the performance offered by TIA as it optimizes all operating, machinery, and process sequences. Used in conjunction with the latest generation hardware, it will ensure that you get the most out of your system.

■ Rugged reliability, serviceability, and long-term product support:

Midstream automation solutions must be exceptionally reliable to ensure fail-safe operation and prevent costly downtime.

Serviceability is critical, too, as solutions located outside control rooms are usually in remote places – and, for pipelines, typically buried or underwater. That's why technician service calls can cost much more than a truck roll, especially if system downtime is involved.

Siemens TIA solid-state components are engineered, tested, and ruggedly built for maximum reliability, enhanced with built-in capabilities for preventive and predictive maintenance.

If a problem persists, remote diagnostics can help determine its cause before a technician is dispatched. Once on-site, technicians' jobs are much easier and repairs are much faster with replacement components that are self-configuring and easy to replace.

In addition, with our financial strength and long term product support, you can trust Siemens to back your solutions with service and parts for decades to come, so you can continue to build an ever greater return on your invested capital or that of your customers.

Protect your intellectual property and off-load lifecycle risk

If protecting the intellectual property of your in-house or proprietary systems and solutions is important to you, consider migrating them to our line of industrial PCs and powerful PLCs, like the new SIMATIC S7-1500.

Not only do these platforms offer the performance you need in rugged packages and compact form factors, but they also offer special protection to ensure the integrity and security of your intellectual property. Or, consider using them for new "green board" designs.

Either way, you'll be off-loading the hardware lifecycle risks to us. And you'll gain access to the powerful and proven software engineering tools and code libraries of the TIA Portal.

As one of the world's largest electronics manufacturers, Siemens invests billions each year in the most advanced Application-Specific Integrated Circuit (ASIC) designs for automation and controls – so you can stay focused on enhancing your application or solution, knowing its underlying technology is always up to date.

Four applications that show how Siemens automation and control solutions can support midstream transport of oil, natural gas, and NGLs

Pipeline Leak Detection and Intelligent Pigging

Computational Pipeline Monitoring (CPM) is a key tool for leak detection. It uses field data, such as pressures, flows, and temperatures to create a real-time, hydraulic profile of the product in transit. That profile is then compared to other field references to detect any anomalies that might indicate a leak. So-called "smart" pigs are intelligent inspection devices that run through pipelines to analyze, record, and report their internal conditions.

Key features

- Scalable SCADA, from small to complex systems
- Integrated TIA Portal engineering framework
- Operating system/platform independence
- Advanced wireless networking
- Rugged reliability
- Hazardous certifications
- Safety-integrated, up to SIL 3

Key benefits

- Addresses specialized scalability and customization needs
- Reduces engineering time and costs
- Interoperates with legacy and multivendor systems
- Increases reliability and safety
- Reduces compliance risks
- Improves serviceability

Key components

- SIMATIC S7-1200 or S7-1500 PLCs
- SIMATIC ET200 distributed I/O
- SIMATIC WinCC Open Architecture SCADA
- SCALANCE X Ethernet switch
- SCALANCE M875 3G cellular modem
- SCALANCE W788 WLAN access points (802.11n)



Control Rooms and Monitoring

With pipeline lengths of up to thousands of miles – mostly underground – control rooms must keep careful watch on what's moving through them as well as all the valves, pumps, and compression stations along the way. Supervisory Control and Data Acquisition (SCADA) systems collect field data, such as pressures, flows, and temperatures, and then enter it into Computational Pipeline Monitoring (CPM) software used to create real-time, hydraulic profiles of what's in transit. The profiles are continually compared to other benchmark references to detect any anomalies, which may indicate a leak and prompt further investigation.

Key features

- High-performance industrial PC automation/monitoring for advanced statistical computing, visualization, and control
- Discrete real-time and historical data analytics
- Highly integrated self-diagnostics
- Flexible status and alarm systems
- Centralized onsite and remote-users management
- Brilliant, high-resolution HMI displays

Key benefits

- Lowers cost of ownership with higher productivity, flexibility, and investment security
- Increases visibility, ensuring more reliable, safer operations

Key components

- Advanced WinCC SCADA Open Architecture (OA) software
- SIMATIC Industrial PCs
- SIMATIC HMI Comfort Panel displays
- SCALANCE X Ethernet networking switches



Pump and Compression Stations

Often fully automated, these facilities are located, designed, and engineered to requirements defined mostly by desired pipeline operating pressures and grade changes. Inside are pumps, motors, power sources, and instrumentation, all connected to SCADA systems for remote control and monitoring. Sometimes these stations serve as PIG launching and recovery sites. They may also be located where material ownership or custody is transferred.

Key features

- Compact form factors
- Scalable performance
- Extremely modular
- Easy to use
- Built-in Ethernet communications
- Rugged reliability

Key benefits

- Saves valuable space
- Provides flexible expansion options
- Interoperates with legacy and multivendor systems
- Reduces engineering time and costs
- Cuts time-to-deployment
- Provides greatest price to performance ratio in the compact controller class (documented savings of 15-60 percent)
- Improves reliability and safety

Key components

- SIMATIC S7-1200 or S7-1500 PLCs
- SIMATIC ET200 distributed I/O
- SIMATIC HMI panels and thin clients
- SCALANCE X Ethernet switch
- SCALANCE W788 WLAN access points (802.11n)



Storage Tanks and Tank Farms

Tanks can offload hydrocarbons in transit to allow maintenance and repairs of midstream infrastructure. They also are configured in large tank farms at pipeline terminals, as well as adjacent to processing plants to hold end products for market distribution. Tank-level visibility is important to manage inventories and optimize capacity utilization.

Key features

- Scalable SCADA, from small to complex systems
- Integrated TIA Portal engineering framework
- Advanced wireless networking
- Rugged reliability
- Hazardous certifications
- Safety-integrated, up to SIL 3

Key benefits

- Increases tank-level visibility
- Increases reliability and safety
- Reduces compliance risks

Key components

- SIMATIC S7-1200 or S7-1500 PLCs
- SIMATIC ET200 distributed I/O
- SIMATIC WinCC Open Architecture SCADA
- SCALANCE X Ethernet switch
- SCALANCE M875 3G cellular modem
- SCALANCE W788 WLAN access points (802.11n)



Gain the experience, expertise, portfolio, and support you need

Use Siemens Totally Integrated Automation to improve your midstream efficiency, reliability, and safety

Siemens Totally Integrated Automation (TIA) solutions portfolio can help provide your midstream transport solutions and operations with:

- **Increased availability.** Cut the risk of costly downtime. Predictive maintenance and remote system diagnostics will enable a much more cost-effective and proactive approach to overall reliability. Built-in ruggedness ensures greater reliability. If service technicians are needed, remote diagnostics can provide them with troubleshooting insights and needed parts in advance, so they can resolve issues much faster.
- **Improved visibility.** Gather, consolidate, and analyze real-time data from every point of your mechanical operations and process flows as well as from the sensing fabric itself, along the full length of your midstream infrastructure. This visibility will support better, faster, and more informed decisions, too.
- **Better safety and security.** Improve the safety of your pipelines with Siemens TIA components that have built-in, fail-safe protective features. Many are certified to the highest safety levels defined in IEC EN 61508, the global international safety standard. Also, their hardened industrial security will help protect against cyber-attacks.
- **Simplified compliance.** Collect and compile the data for the detailed reporting federal, state, and local regulations require much faster and more easily. Not only will you save time, but you'll also reduce non-compliance risks of penalties or, worse, shutdowns.

Siemens' approach to help you address your issues first starts with learning your transport challenges, learning your business, and learning what keeps you awake at night. We then help you turn these challenges into opportunities to fuel greater efficiency, reliability, and safety across all your operations.

Siemens counts among its customers all the industry majors as well as the top oil services firms worldwide. In fact, with some, we have strategic global partnerships. At the same time, hundreds of smaller oil and gas producers are among our best customers, too.

Our experience and expertise is yours to use

Point is, we have decades of experience – experience that's yours to use – in providing solutions to all sorts of issues that the oil and gas industry faces. In the most remote places. And in the harshest conditions.

From the towering waves of the North Sea and deep waters off Brazil, to the steaming jungles of Africa and Latin America. From the blistering deserts of West Texas and Saudi Arabia, to the sub-zero tundra and boreal of Alaska and Canada. Wherever you go, you'll find Siemens there.

With that experience, comes expertise in our people and some of the world's best and brightest engineers and technicians. Their experience and expertise includes designing and engineering automation and controls for the world's most sophisticated and complex industrial applications. This includes critical infrastructure like nuclear plants, high-speed transportation, health care and, yes, oil and gas.

Expert support when and where you need it

The value of our experience and expertise is demonstrated through the technical support we provide for all of our Siemens TIA solutions throughout the lifecycle of our engagement with you. After all, we know that when you have a problem that threatens or disrupts hydrocarbon transport, minutes matter.

You can count on expert support whenever and wherever you need it. From the pre-sale, through solution design, engineering, deployment, and thereafter. From your day-one commissioning, to system diagnostics 10 years from now. Highly trained technicians are available via toll-free phone support 24/7/365.

For issues requiring onsite assistance, Siemens' authorized distributors and certified solution partners can send skilled service technicians in your area. These technicians have the training, knowledge, and parts needed to troubleshoot and solve the most vexing problems quickly and effectively.

Simplify, simplify, simplify

In dealing with the kinds of complexities we have, we've learned one important lesson: Simpler is better. That's the core philosophy you'll find underlying our Siemens Totally Integrated Automation (TIA) portfolio of plug-and-play automation and control solutions.

Our comprehensive and well-coordinated collection spans process and motor controls, analytics, instrumentation, networking, I/O, and HMIs.

You'll also find simplicity to be at the heart of our Siemens TIA Portal. It's a fully integrated, highly intuitive, and easy-to-learn engineering framework that can cut automation and commissioning time by as much as 30 percent or more by centralizing all your systems engineering.

For example, it has vast libraries of drag-and-drop software code to make software development much faster and replicable. To serve the needs of the oil and gas industry, we created American Petroleum Institute (API) and American Gas Association (AGA) function blocks.



Siemens TIA portfolio

Here are just a few highlights from the many hundreds of products in our Siemens TIA portfolio that you can deploy in your onshore production facilities:

■ SIMATIC Comfort Panel HMI



Innovative features

- Global hazardous location certifications in 4" to 12" models
- 80,000-hour LED backlight provides more than 9 years of continuous operation
- Daylight-readable, 16:9 widescreen with 16 million colors provides photo-realistic graphics
- Both data and system SD cards provide easy replacement of failed systems in the field without a computer need
- High-performance processor with Visual Basic for Applications (VBA) scripting allows for advanced HMI application development in 4" to 22" panels
- Maximum data security during a power failure

What this means for you

- Reduced energy costs due to lower current consumption and longer lifespan
- Inexpensive preservation of all data without using an additional battery
- Operational efficiency through innovative commissioning, operating, and maintenance features

■ WinCC SCADA & Open Architecture



Innovative features

- Complete SCADA solutions for wide range of requirements
- Support for latest Object Linking and Embedding for Process Control (OPC) Foundation standards for third-party interfaces
- Remote monitoring over a variety of wireless and wired networks
- Hot standby redundancy and Disaster Recovery System
- Platform Independent – installable on Windows, Linux and Solaris OS
- TÜV SIL 3 Certification for critical applications
- Long term support and streamline upgrade and migration support

What this means for you

- Reduced system costs and complexity while providing scalable solutions
- Highest levels of system reliability and availability
- High versatility and portability along with scalability
- Can be deployed for mission critical projects
- Global availability and data transparency
- Investment protection and reduced TCO

■ SIMATIC S7-1200 PLC



Innovative features

- Powerful processor and software features provide big PLC performance in a cost-effective microcontroller
- 64-bit processing and Structured Control Language (SCL) provide a framework for advanced calculations needed for pump control
- Numerous communication options provide flexibility for both local and remote connectivity

What this means for you

- Increases operational flexibility control systems using proprietary PLCs
- SIL 3 level of safety in compact size

■ SCALANCE X Ethernet Switches



Innovative features

- Rugged design with the features and certifications needed for oil and gas applications
- Scalable managed and unmanaged switches available in different port configurations
- Memory card aids in field replacement of managed devices
- Built-in diagnostics, web server, and capabilities to integrate managed switches into control applications

What this means for you

- Maximizes uptime and provides scalable solutions for your most demanding applications
- Future proof through highest operational performance
- Connecting IT and Control network according to their requirements
- Reduction in total maintenance and change costs
- Investment protection and reduced TCO

■ SIMATIC S7-1500 PLC



Innovative features

- Large memory (storage and data management)
- Secure 128-bit encryption for tamper-proof operation and greater cyber security
- System and IO diagnostics pinpoint issues quickly from built-in screen, web server, or HMI panel
- Advanced interface and open communications, including PROFIBUS and PROFINET
- Available flow calculation blocks designed to API 21 standard
- SIL 3 safety optional for safe system shutdown

What this means for you

- Offers more deployment flexibility with scalability for systems – large and small
- Reduces engineering and commissioning time and costs via simplified design
- Provides multiple levels of application security
- Provides future proof infrastructure capability for data driven architecture