



Oil, Gas and Petrochemical

Solutions for efficient, reliable and safe  
operations  
Serving the midstream oil and gas  
industry

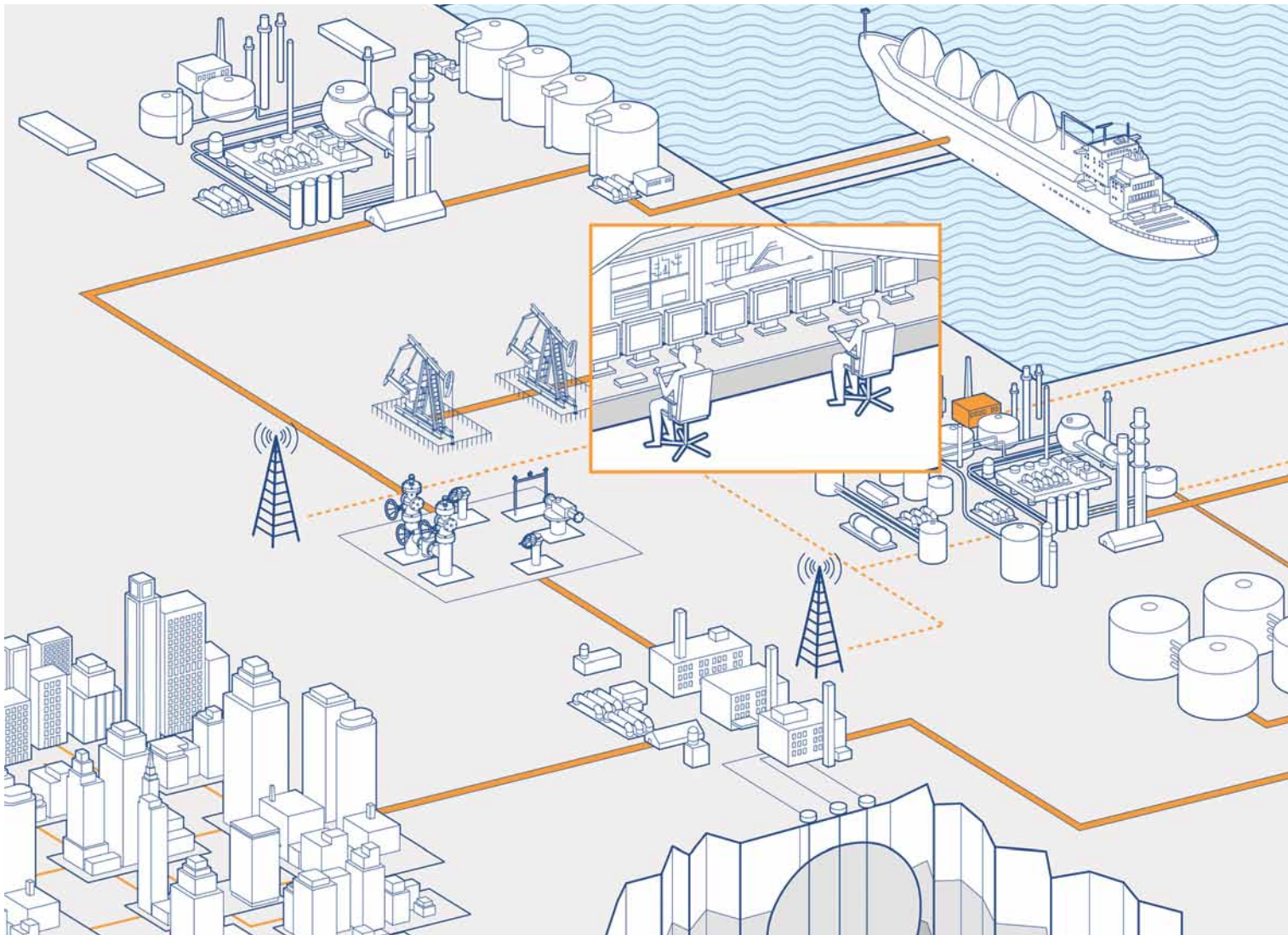
Power and productivity  
for a better world™



# We are committed to providing you with efficient, reliable and safe operations

ABB is a proven, world-leading supplier to the oil and gas industry, with over 50 years of experience and thousands of successfully completed projects worldwide. We can provide you with the integrated products, systems and services you need to keep your operations safe, productive and profitable.

Our global presence in major oil and gas centers ensures you access to expertise and support at the local level.

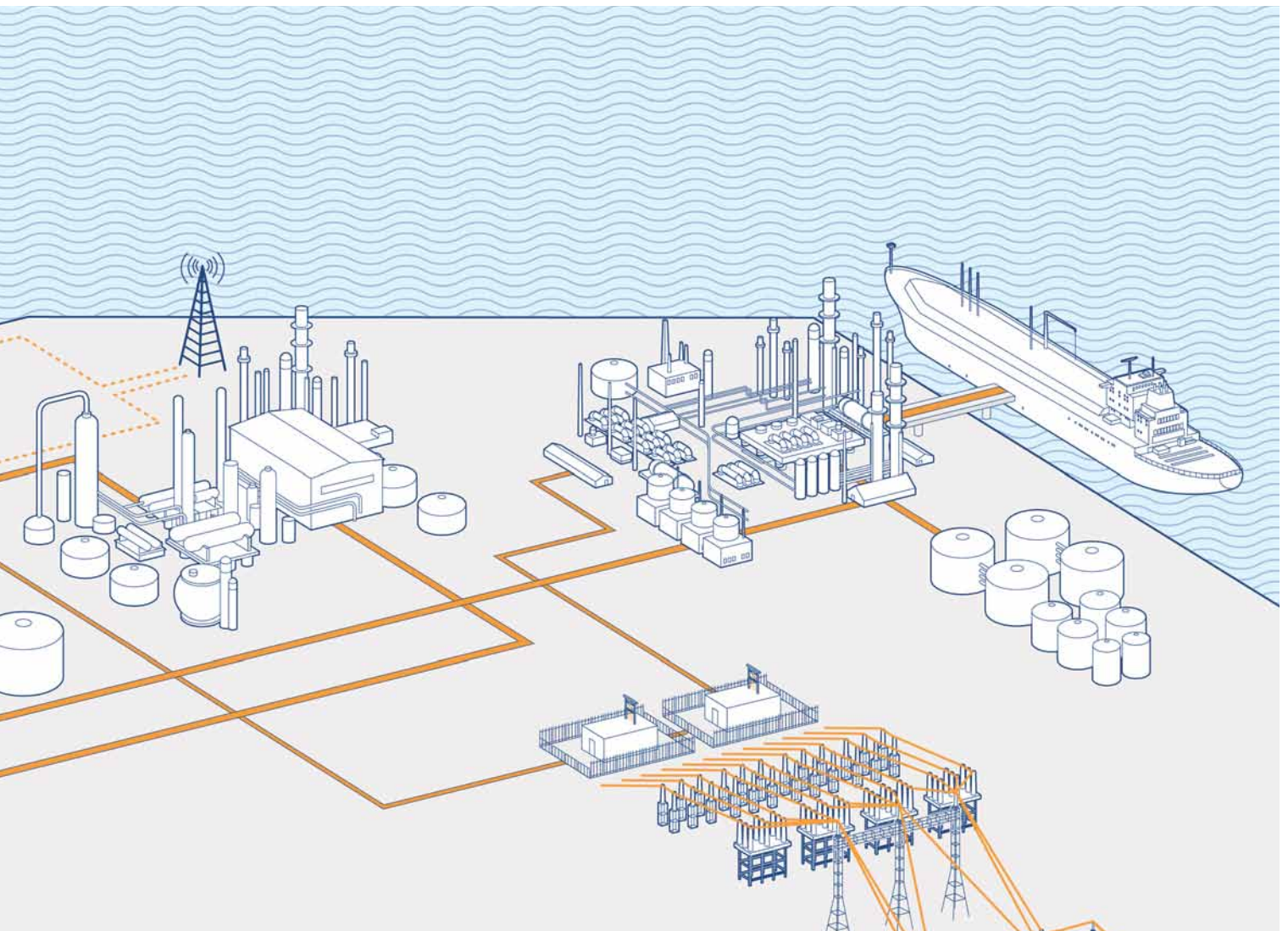




# ABB for midstream

Our midstream market approach integrates our portfolio with core competence in automation, electrification and as EPC contractor. We offer you the best of both proprietary and third-party products and applications for the entire supply chain from well head to product rollout, throughout your project's life cycle.

Our solutions improve monitoring and management of hydrocarbon transportation through pipelines, tankers and terminals, ensuring reliable operations, functional safety, system availability and compliance with environmental requirements.



# Creating value for our customers

## Solutions that improve energy efficiency and industrial productivity

ABB contributes to energy efficiency improvements in two key ways. First, our energy management experts analyze how energy is used and identify wastes as well as specific areas for improvement. Second, we provide equipment, systems and solutions that reduce energy consumption and loss, improve productivity and manage equipment and processes more efficiently.

We offer modern control solutions, automation products and electrical equipment. Key technologies include controls, enterprise software, instrumentation, low-voltage products, drives and motors. This is important for midstream businesses where there are major energy consumers such as gas compressors, oil pumps along pipelines, and reinjection processes.

ABB provides solutions for increasing efficiency of the midstream chain, thanks to our complete offering of electrical variable speed drive systems (VSDS). Energy savings, accurate process control and reduced payback time make VSDS the optimal choice for new pump/compressor installations, for revamping of existing direct-on-line electric motors and replacing gas turbines used in compressor applications.

30%

energy savings

Case studies and real applications show that energy savings may exceed 30 percent and investment payback time may be less than three years.

## ABB integrated solutions

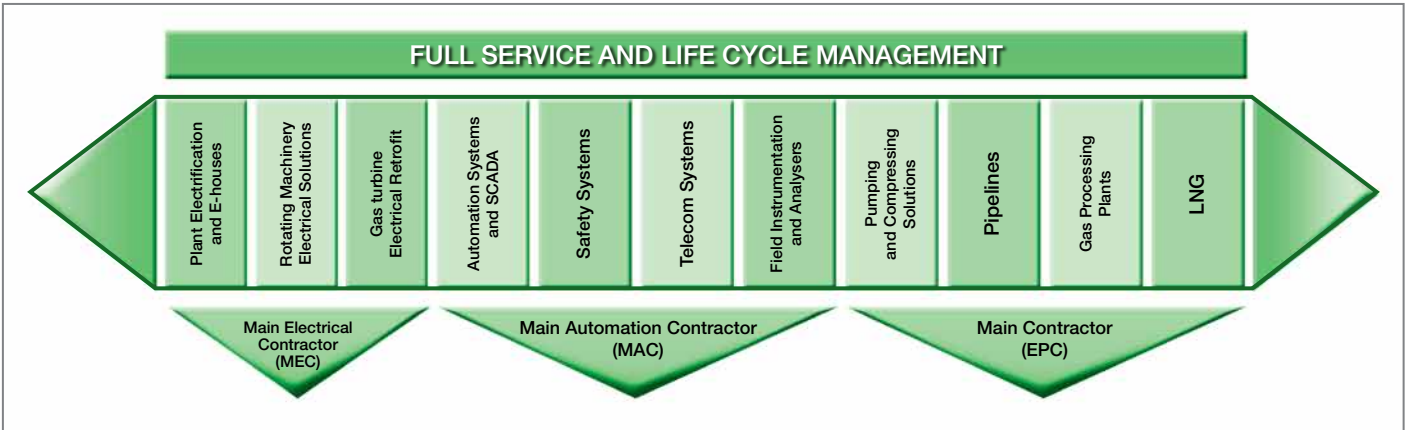
ABB combines design and system engineering expertise with extensive fabrication knowledge to provide you with integrated, fully-optimized solutions.

Main Automation/Electrical Contractor (MAC/MEC) contracts are becoming the preferred strategy for customers in the oil and gas industry because they satisfy the exacting technical and execution requirements of automation systems for complex industrial facilities.

We have considerable experience as MAC/MEC for global projects, and we can take total responsibility for management

of automation/electrical/instrumentation selection, manufacture, installation, commissioning and after-sales support.

When ABB is named MAC/MEC early in a project, we analyze engineering requirements and optimize the scope definition, which reduces CAPEX and OPEX costs, shortens the project timeline and reduces the number of engineering tasks and change requests required. These capacities, combined with our extensive experience as engineering, procurement and construction contractor (EPC), make ABB a superbly qualified business partner for midstream plants.



# A wide array of applications and solutions

## ABB's offering for midstream

	Pipelines	Terminals/ Storage	Compressing/ Pumping	LNG Liquefaction	LNG Regasification	Gas Processing	GTL/ modular GTL
Automation	■	■	■	■	■	■	■
SCADA/RTU	■						
Instrumentation	■	■	■	■	■	■	■
Rotating machinery electrical systems and testing	■		■	■		■	■
Plant electrification	■	■	■	■	■	■	■
EPC	■	■	■		■	■	■
Service	■	■	■	■	■	■	■
Telecommunications	■	■	■	■	■	■	■

### Pipelines

Our pipeline scope of supply covers everything from automation to EPC, including pipeline stations, instrumentation, telecom and project-specific applications.

As MAC/MEC, ABB can coordinate the supply chain for pipelines that cross countries, replacing numerous contractors with a single EPC. In short, we ensure a standardized approach for complete project execution.

ABB solutions for oil and gas pipeline automation include monitoring and management of block valve stations, pump stations, tank farms in liquid applications and compressing, reducing and metering stations in gas applications.

We also have core competence in Supervisory Control and Data Acquisition (SCADA) Systems. Open architectures of SCADA Systems are critical for transferring huge quantities of data dealing with extended areas and telecom problems, and contain several instruments with multiple protocol standards, asset management and project-specific applications.

A reliable, real-time, object-oriented relational database that is Structured Query Language (SQL) compliant guarantees data integrity. The data replication engine bridges scalable architectures, from peer-to-peer to hierarchical multi-layered systems, providing multiple paths for data communication. This significantly increases the availability of the system, drastically reducing downtime.

Online disaster recovery is available, and includes:

- Complete binary copy of the real time relational database and logs files
- Up to triple redundancy
- Scheduling of data and configuration replica

Pipeline automation based on SCADA System interfaces perfectly with ABB controllers and Remote Terminal Units (RTUs), which provide local process automation and power management at gathering, compressor and pumping stations, and comply with high integrity (up to SIL 3), fieldbus and open process control systems.

# A wide array of applications and solutions

## Terminals/Storage

Terminal and storage management should interact seamlessly with hydrocarbon production and transportation. Specifically, midstream requires primary distribution of crude and gas to oil and gas tankers, refineries and gas plants, feeding secondary gas distribution.

As MAC/MEC for terminal and storage facilities, we can cover the entire plant life cycle of terminal and storage facilities, including in the scope of supply:

- Instrumentation
- Plant electrification, drives and motors
- Process automation and power management through a single System 800xA
- Service

Additionally, Terminal Management Automation Control (T-MAC) is an ABB standardized solution and its functionality covers:

- Product receipt
- Product storage
- Product dispatch
- Safety
- Utilities and auxiliaries

The T-MAC scalable architecture and system framework is modeled for complete management of:

- Field device connectivity
- Terminal equipment (metering/tank gauging systems, electronic presets, access control, driver interface terminals, weight scales).

T-MAC interoperability is based on Open Process Control (OPC) and can support enterprise resource planning (ERP) based on integrated platforms (SAP, Oracle, IBM).

Automation and electrification for gas storage can be leveraged on our extended portfolio that, apart from automation systems, includes rotating electrical machinery solutions.

Thanks to our EPC capabilities, ABB can directly supply terminal and storage plants, leveraging competencies that are endorsed by references worldwide.

## Compressing/Pumping

ABB covers all activities related to the core application of oil and gas transportation. In fact, for pipeline compressor/pumping stations, we offer solutions suitable to your individual needs: compressors or pumps coupled to gas turbines, electrical motors with variable speed drives or diesel/gas engines. We have executed more than 50 EPC projects on a lump sum turnkey basis in various areas of the world. With a keen eye on protection of the environment and territory, we have successfully completed projects in the most hostile conditions: from the deserts of Africa to the tropical regions of Thailand and the cold climates of Eastern Europe.

Inside or outside EPC scope of supply, ABB can provide compressor/pumping station control based on System 800xA, our scalable technology platform and architecture. The 800xA provides a common set of engineering, operation and maintenance tools to meet all plant automation needs. Electrical solutions for power distribution, energy management, and motors/drives for electrically-driven pumping/compressors strings are fully integrated with this technology platform.







### Liquefied natural gas (LNG)

ABB designs and builds solutions for the every aspect of the LNG value chain:

- Gas production
- Liquefaction plant
- Shipping
- Regasification terminal
- Pipelines delivery

In particular, we provide a wide range of solutions that integrate process engineering and electrical/automation capabilities:

- Automation and Power Management System (PMS) for plants
- SCADA systems for gas pipelines
- Plant electrification
- Rotating machine electrical solutions and control for compressors of liquefaction plant cooling systems
- Engineering, procurement and construction of regasification terminals and connected pipelines

### Gas processing

ABB designs automation systems for all types of gas plants, from wellhead to treatment centers, such as:

- Gathering systems
- Tri-phase separation (oil, gas, water)
- Gas treatment and fractionation
- Gas lift/gas injection/water injection units
- Gas to liquid and modular gas to liquid conversion

ABB offers automation, EPC and plant electrification for the complete plant. We also provide integrated solutions for rotating machine electrical systems (motors and drives) as well as control of complete string motor/compressor-motor/pumps. Our test facilities are available for gas/water injection applications.

# Major recent references: midstream



## Control system for Baku–Tbilisi–Ceyhan crude oil pipeline

Client / Country: BP / Azerbaijan, Georgia, Turkey

Scope of work: integrated control and safety system including terminal management and field instrumentation

The second longest oil pipeline in the Trans-Caucasus region



## SCADA system for Hassi R'Mel–Arzew Pipeline

Client / Country: Sonatrach / Algeria

Scope of work: pipeline automation, including revamping of SCADA system

The longest Algerian natural gas pipeline



## Telemetry for gas and condensate network

Client / Country: Kuwait Oil Company / Kuwait

Scope of work: fully integrated pipeline automation including SCADA, leak detection, management information system, telecommunication and instrumentation

The ABB SCADA System enables KOC to control its entire production assets including 2,000 km of pipelines, 21 gathering centers and the world's second largest oilfield, Burgan



## Snøhvit (Hammerfest LNG)

Client / Country: StatoilHydro, Linde / Norway, Germany

Scope of work: automation, electrification, instrumentation and low voltage motors and drives

Snøhvit is the first major offshore development on the Norwegian continental shelf with no surface installations



## Queensland Curtis grass roots LNG plant

Client / Country: Bechtel, BG / Australia

Scope of work: integrated control, safety system, configuration support and site installation support services

The plant will produce 12 million tonnes/annum which corresponds to the energy required to power the metropolitan area of Brisbane for 15 years



## ADCO SAS Gas Lift Compressors

Client / Country: ADCO / United Arab Emirates

Scope of work: electrical trains/drives and motors for gas processing plant

The VSIDS full-load tests performed at ABB facilities showed an outstanding result: the efficiency of the ASDS was 95.76 percent





### Barzan Residue Gas Compressors

Client / Country: Qatar Gas, Exxon Mobil / Qatar

Scope of work: electrical trains / motors plus one drive and transformer, switch over distribution, process control automation 800xA

The most reliable and innovative starter/helper for LNG in the world based on voltage source inverter VSDS



### PDO Kauther Compressors Station

Client / Country: Petroleum Development Oman (PDO) / Oman

Scope of work: electrical trains/drives and motors for hydrocarbon transportation

Extreme environmental conditions were overcome with high speed drives and water cooler chillers designed for an ambient temperature of 60° C



### El Merk Project – Lot 3&4 – Off-site facilities

Client / Country: Groupement Berkine (Anadarko/Sonatrach) / Algeria

Scope of work: engineering, procurement, construction, commissioning and startup of field gathering stations, gas distribution manifolds and flowlines

The GIS system allowed our client to reduce overall project execution by one year with a production gain of 150,000 barrels of oil per day



### New Crude Oil Transit Line (TL-4)

Client / Country: Kuwait Oil Company / Kuwait

Scope of work: engineering, procurement, construction, installation and commissioning of a new pipeline and associated ancillaries including automation system

ABB is building a 123 km, 30-inch diameter transit line that will transport up to 665,000 barrels of oil per day



### Gas Compressor Station on GPDF pipeline

Client / Country: Sonatrach / Algeria

Scope of work: engineering, procurement, construction, commissioning and startup

Boosting gas transportation on one of two gas pipelines linking North Africa to Europe



### Automation and vertical integration at CLH loading terminals

Client / Country: CLH / Spain

Scope of work: automation and control of loading terminals tank farms and oil pipeline station

ABB delivered complete control of one of the widest European pipeline network

# Advanced automation, control and instrumentation solutions

## SCADA system / Remote Terminal Unit (RTU)

SCADA (Supervisory Control and Data Acquisition) System is the key concept used to address supervisory control and data acquisition, and highlights ABB's excellence as a solution system integrator. With SCADA, we integrate all components of which basic software is a small but crucial "piece of the puzzle":

- Field
- Communication
- Control center

The core of ABB SCADA is built on a reliable, high performance, real time relational database management system that is unique in the market.

Referential integrity and active queries enhance retrieval speed and integrity of data updates. Our database management system combines standard SQL technology and open connectivity to external corporate databases, improving compatibility and performance.

Reliability and data consistency are enforced through severe referential integrity. Live data, databases and HMI configuration are broadcast in real time through a dedicated replication engine in two modes:

- Hierarchical (local, regional and corporate levels)
- Peer-to-peer (offsite backup control center for immediate disaster recovery)

Replication functionality allows automatic configuration to be:

- Centralized (remote non-intrusive)
- De-centralized (local to server)
- Both

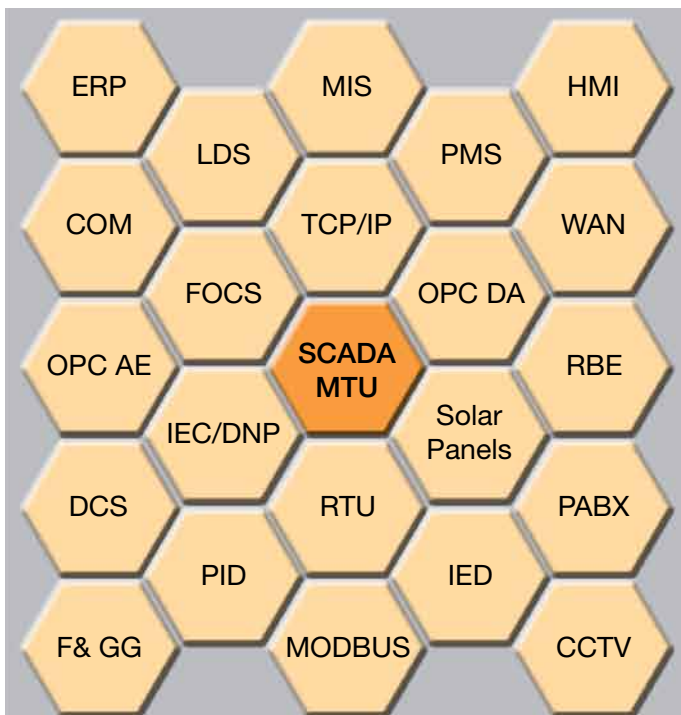
Gas and liquid pipeline applications are usually the consistent part in ABB scope of supply according to project modeling and simulation of operations.

Production Data History (PDH) is an enhanced historical database designed to easily accommodate accurate reporting and audit trail requirements of the pipelines application sector.

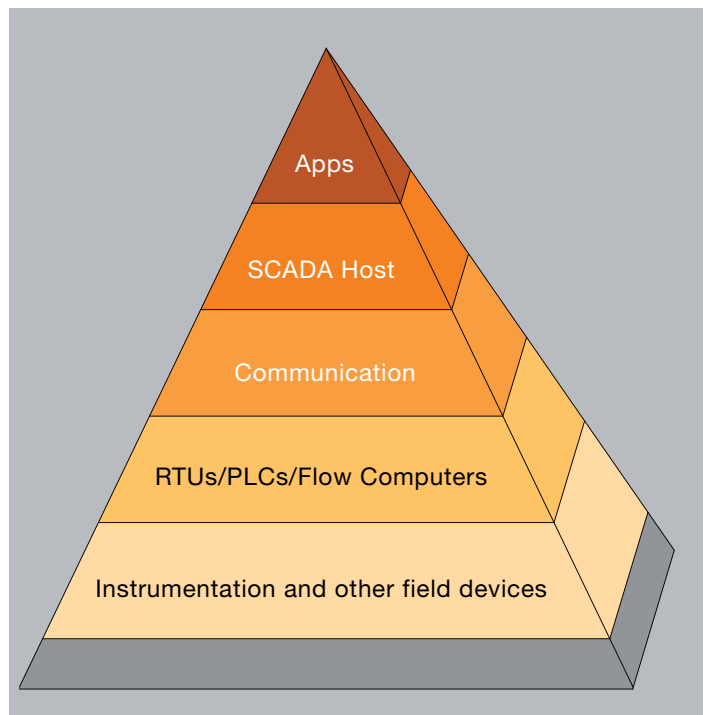
SCADA System integrates Remote Terminal Units (RTUs), hybrid controllers, and flow computers that provide local control, monitoring and specific dedicated functionalities, such as emergency shutdown, fire and gas and asset management. Data streams are based on recognized standard protocols (i.e., IEC870-5-101÷104, DNP3), but several third-party proprietary protocols are also available.

Our SCADA solutions integrate applications for pipeline management such as fatigue management, alarm management, change management, operational experience integration, training simulation and compliance validation into a single system.

SCADA: the integration hub



Integrated levels of SCADA System



### Management information system (MIS)

ABB has the availability of leading software solutions for near real time applications in oil and gas industry including asset management, mobile work force management, trading and risk management, operations management and solutions for planning and forecasting oil and gas needs.

These applications are totally interfaced with our automation solutions for real time applications such as SCADA Systems. On a basic level, Management Information System (MIS) is a set of applications that facilitates communication between the production/operations level and enterprise resource planning (ERP).

Information is exchanged in two ways: from production to management, to aid decisions that match manufacturing with business needs, and from management to process automation facilities in order to keep production running smoothly and according to demand.

The technical staff of a facility needs information from operations in real time, while management's production decisions depend on trading model timing. MIS handles both. MIS is a web-based information management system for all types of real-time processes – an ideal solution for integrating process data into one central system when there are multiple control rooms and geographically distributed production sites contributing data.

When applied to oil and gas, MIS is an archiving and web-based reporting system, handling such diverse data streams as:

- Process values
- Events
- Messages
- Batching
- Lab analysis

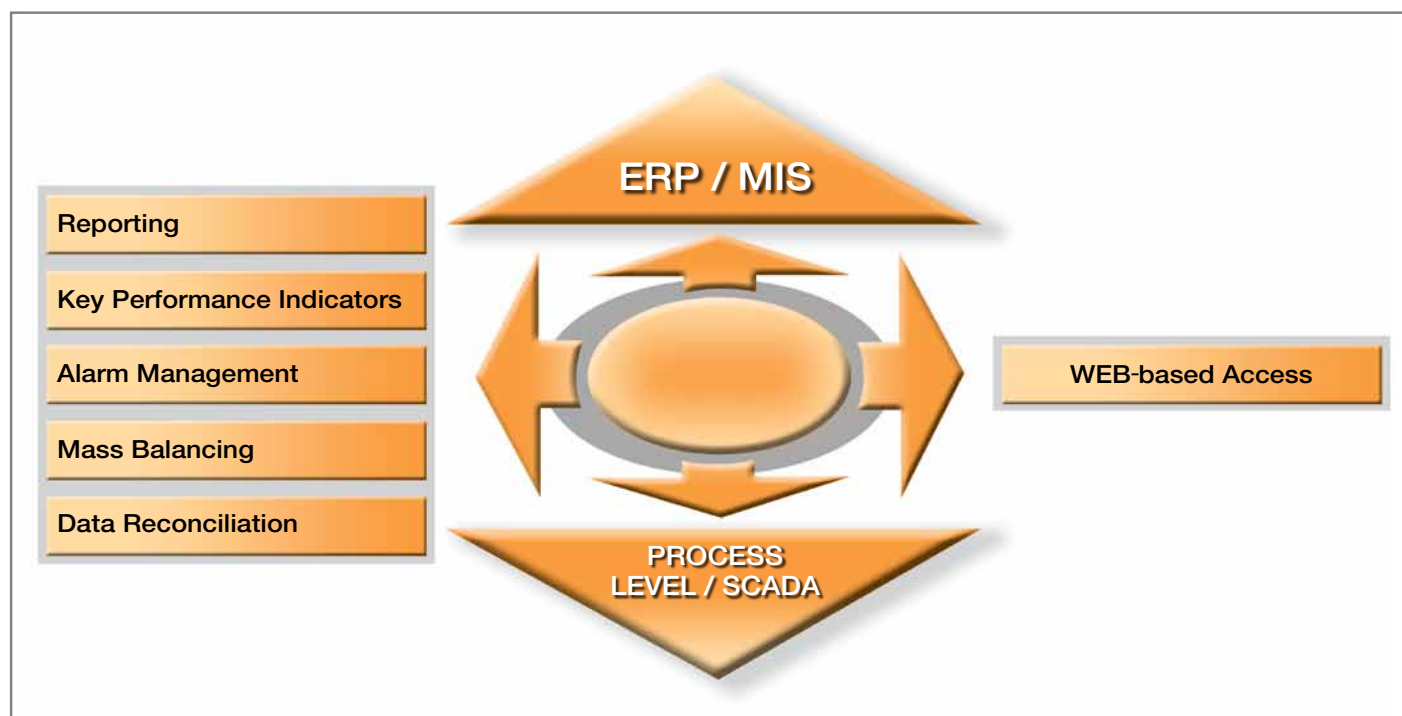
MIS can also generate reports and make them available worldwide through intranet or internet connections.

MIS architecture is based on a central software module (Base Node) that interconnects heterogeneous systems, exchanging time series data and events. Functionalities covered are: automatic data synchronization among nodes, data recovery in case of communication loss and redundancy. Transfer of data is based on web services, with results available worldwide, independent from platforms, interfaces and locations.

Several MIS modules specifically designed for oil and gas applications are available:

- Reporting
- Key Performance Indicators
- Alarm management
- Mass balancing
- Data reconciliation
- Gas plant management specialized module for compressor stations

Management information system: interfunctional architecture





# Advanced automation, control and instrumentation solutions

## Distributed Control System (DCS)

As a global automation leader, ABB delivers integrated solutions for control and plant optimization, as well as industry-specific application knowledge and services that help oil and gas customers worldwide meet critical business needs along the entire hydrocarbon transportation chain. We provide a unique control system for concentrated installation and distributed network typical of pipeline transport applications. With System 800xA, our customers create an integrated enterprise where PLCs, control systems, F&G, ESD, maintenance systems and ERPs all collaborate in one seamless environment. We offer you the foundation for truly integrated process operation.

In particular, ABB developed unique solutions to fit the latest ergonomic evolutions in control room and consoles design, operator effectiveness and extended operation workspace (EOW) as well as optimized CAPEX and OPEX. To clearly identify the roles and responsibilities of personnel ABB studied and created automation solutions that allowed proper channeling of information to assigned operators.

## Geographic information system (GIS)

GIS is a geospatial-based infrastructure management system that enables all field infrastructure and production assets to be designed, constructed, maintained and managed at the highest level of efficiency and precision. It provides accurate evidence and an up-to-date view of the project in real time. GIS integrated data come from many different sources and performs pre-sized calculations of the quantity of materials needed for construction.

This solution supports the Pipeline Open Database Standard (PODS™), an independent database modeling initiative, applicable to gas and liquid gathering, transmission and distribution pipeline systems. The PODS data model is implemented as a relational database in Oracle or Microsoft SQL servers and can also provide tight integration with GIS software platforms.

By implementing GIS and PODS, ABB is able to implement the most widely used pipeline data model in the oil and gas industry.



## Terminal Automation

In the field of Terminal Automation Systems (TAS), we have developed our own solution, T-MAC, that has a wide application in marine and inland terminals management. Our product is able to handle the typical unit operations of a terminal such as receipt, storage and dispatch of the complete product portfolio. Since these terminals receive products to/ from different sources such as pipelines, rail lines and ship offloading facilities, our system is designed to integrate different operations, systems and functions such as tank gauging, inventory management, SCADA, safety, regulatory and transactional business – placing ABB in a leading position as global solution provider of extended automation systems for product transportation and storage.

## Instrumentation

We supply an unparalleled selection of measurement solutions for midstream oil and gas customers, including a wide range of measurement instrumentation. Our innovative products deliver cost-effective solutions that feature world-class performance, and we can integrate the products into state-of-the-art solutions by using our experienced, in-house engineering team.

Our instrumentation portfolio consists of products for:

- Flow measurement
- Temperature measurement
- Pressure measurement
- Analytical measurement
- Level measurement
- Valve automation

Our measurement portfolio is used by the world's leading oil companies and features products with a wide range of certifications.



# A world leading supplier of electrical systems solutions

## Rotating machinery electrical system and gas turbine retrofit

ABB provides integrated electrical solutions for rotating machinery, such as compressor and pumps. Our offerings include a wide range of motors, drives and transformers, seamlessly integrated to provide unique solutions. Our drive and driven equipment integrated control system provides a single control for complete string, motor-drive-rotating machinery, including advanced control functionalities.

We also provide retrofit service to replace existing old and inefficient gas turbines with electrical trains to drive compressors and pumps. The scope includes complete site activities, such as removal of gas turbines, installation of new units and adaption of auxiliary units, as well as supply and installation of relevant equipment, such as control systems, power distribution equipment and power grid ties.

## Test facilities for electric motors and drives

In close cooperation with CESI (the Italian research center for electrical application) ABB has developed new test facilities over an area of 4,000 square meters. The facilities, located in Milan, Italy, include two inertial test beds designed for back-to-back and full-load testing of variable speed drive systems

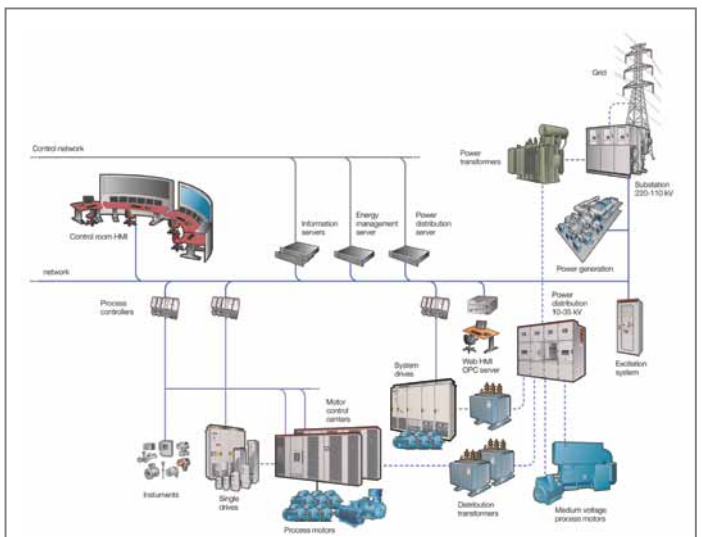
(VSDS) with a maximum rated power of 45 MW (and higher on request).

The new facilities enable us to deliver tested equipment that meets the stringent requirements of the oil and gas and other industries where full-load testing of electrical equipment is required.

- 4,000 square meter facility with No. 2 inertial platforms of 240 square meters each
- No. 2 test bays
- Back to Back tests (for regenerative VSDS, No. 2 needed) up to 45MW shaft power or more, on a case-by-case basis.
- Full-load combined test with dedicated load machine up to 30MW

## Plant electrification

Our current product and solutions offering covers all plant electrification (from HV substation to LV users), coordinating all competencies including electrical management system (EMS) and SCADA. We develop competitive solutions from project definition to installation including commissioning and customer training. Additionally, our product/service portfolio includes pre-fabricated – containerized power stations (diesel and gas turbine), HV modular substations and services for energy efficiency assessment.





# EPC knowledge and service competencies supporting midstream

## Engineering, Procurement and Construction (EPC)

ABB has broad international experience in the design, engineering, procurement and construction of oil and gas plants, with a core competence in the midstream field. We have executed more than 50 midstream projects in various regions of the world.

Mainly, we execute EPC projects on a lump-sum, turnkey basis, covering all activities related to the core application of oil and gas transportation.

We provide full-scale EPC plants, complete with services, products, systems and solutions throughout the oil and gas supply chain, commissioning and startup processes.

## Service

ABB is one of the world's largest automation companies, and we have an extensive and global installed base of control systems. We provide world-class support to ensure maximum performance of our customers' equipment investment by increasing plant reliability and efficiency. To our customers, our highly skilled personnel and consolidated experience are synonymous with trust.

ABB offers a life-cycle management model that maximizes the value of the equipment by ensuring long-term availability of the product, spare parts, and product support and expertise. ABB can keep several generations of systems running in parallel through full integration. This allows for step-by-step evolution to new generations of technology over an extended period of CAPEX investment.

Our complete portfolio of services and service products, integrated with advanced controls software solutions, can help to maximize your investment by:

- Increasing investment profitability
- Improving resources productivity and management
- Continuously improving equipment reliability
- Enhancing energy efficiency
- Guaranteeing high security standards and environmental compliance

The rapid evolution of automation and information technology in the oil and gas industry requires a high level of expertise and the resources to manage, maintain, and ensure security and optimization of facilities and processes at all times. ABB is dedicated to meeting these challenges and continuously improving our products and services to best meet our customers' needs.



# Contact us

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