



Automation

Enhancing productivity and energy efficiency of oil refineries, terminals and downstream complexes

ABB in the oil refining and downstream industries

Responsibility

ABB is a truly global organization with global resources. With a firm focus on health, safety, security and the environment, we strive to provide the process industries with technology and services that have a positive effect on the world in which we live. With significant application knowledge developed over many years we can improve your productivity and reduce the environmental impact.

Risk management

ABB provides a wide portfolio of products and services for oil refineries/heavy oil conversion and associated downstream processes either directly to the end user or via engineering contractors. In many cases ABB will act as the main automation contractor (MAC) or main electrical contractor (MEC), taking responsibility for the integration of the composite solution to reduce client risks, project delivery time and to optimize the operational benefit of the installed system.

Enhanced return on capital

ABB's services and products enhance your project from first concept to decommissioning. We operate locally while drawing support from ABB resources around the globe. A partnership with ABB provides world class expertise and continuity. As the project develops from one phase to the next, we are able to capture lost profit opportunities that would otherwise be missed.

Operational profitability

ABB's technologies provide fully integrated power, automation and safety solutions with open interconnectivity to business systems. We offer a single system solution safely providing integrated automation, electrical, power management and telecom aspects that also supports all major fieldbus technologies.

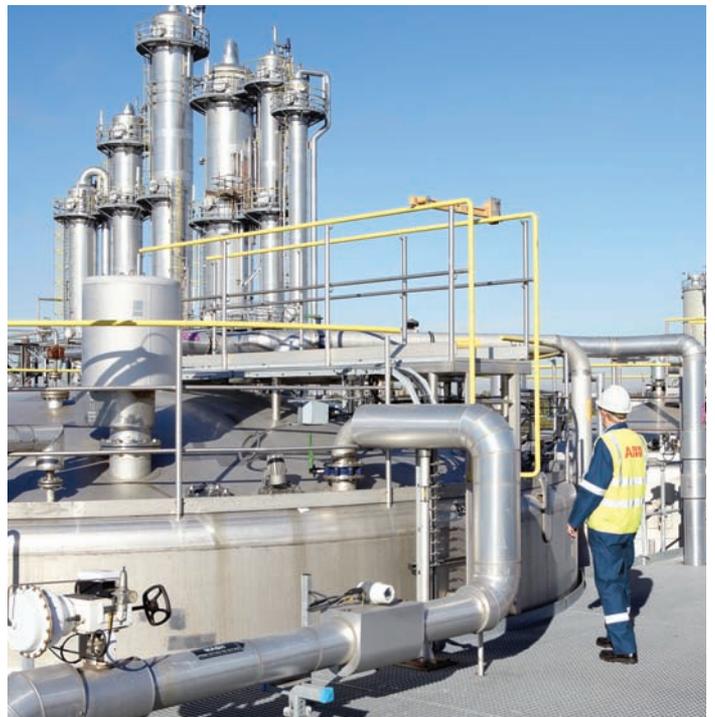


ABB in the oil refining and downstream industries

Environmental and energy efficiency

ABB's refining customers are environmentally responsible companies in a very challenging industry. As they seek to develop and bring to market their product offerings they must avoid degrading the environment and creating pollution through their actions. The implementation of the Kyoto Protocol and the start of carbon trading in the European Union in 2005 are setting new parameters as well: carbon emissions now have a financial value.

ABB's products, systems and solutions are designed to have the lowest possible environmental impact. ABB's service offerings can help customers use these and third party offerings to be more environmentally responsible and also improve their financial performance through lower emissions.

As one of the world's leading engineering companies, ABB helps its customers to use electrical power effectively and to increase industrial productivity in a sustainable way. ABB has an unparalleled range of technology, expertise and solutions within a portfolio that has been deployed within the process industries, supporting energy efficiency within electrical systems.

Health, safety and security

Continuous pressures to reduce costs and improve profitability are balanced by a company's social responsibility to protect their people, property, environment and the surrounding community from harm.



ABB offers safety services that can identify hazardous conditions and provide a risk reduction strategy and a complete plan for improved safety. ABB safety services include project management, consultancy and implementation, spanning the complete asset and safety lifecycles. ABB's safety and process applications can be executed within the same system environment and even the same controller. This offers safe instant interaction between applications, preserving the integrity of the safety applications. This architecture eliminates the duality of system operations and their associated lifecycle costs and leads to optimized project engineering, training, operations, maintenance and spare parts.

ABB has more than 30 years of experience in designing, implementing and maintaining fault tolerant, certified programmable safety systems for the refining industry. ABB provides safety solutions that are easily scalable from a few loops to complete safety systems.

Security is enhanced when safety and process applications are executed within the same controller. Combined systems can freely exchange signals and data without the need for external complexity such as interface hardware, software and mirroring of data. Reduced complexity provides fewer seams and points of penetration. ABB provides additional security integrity through use of embedded firewalls and extensive diagnostics that eliminate common-cause failures of control and safety systems.

Reducing your costs and risks

- Utilization of ABB as an MAC/MEC reduces CAPEX costs by around 20 percent
- ABB's advanced process control reduces OPEX costs by 3 percent to 9 percent
- ABB's Total Plant Reliability™ improvements return 3 to 1 on investment
- Integrated process automation and electrical control / power management systems (PMS) reduce energy usage by up to 10 percent - ARC
- Extended operator workplace (EOW) provides an ergonomic HMI for the process, plant assets and automation, electrical and telecoms aspects, thereby improving productivity
- TÜV certified implementation and training services in functional safety management eases regulatory approval

People and systems

Supporting the complete manufacturing process

Safety, risk management, operational excellence and sustainability are important to ABB and its customers. The ABB portfolio of products and engineering expertise can lower risk, reduce cost and help you maintain a competitive edge.

ABB is a leading supplier of instrumentation, analytical devices, automation, electrical and safety systems to oil refineries from jetty management through process units to oil movement and storage, blending and distribution. From single products, supplied direct or via channel partners, to complete composite solutions demanding excellence in project management and deep process application knowledge, ABB can tailor the delivery scope to meet your requirements. In some cases you may choose to use ABB's consultancy services to supplement your own staff. Alternatively you may choose to have ABB act as the main automation/electrical contractor (MAC/MEC). ABB has considerable experience in the MAC/MEC role for global projects and



can take total responsibility for the management of the automation and electrical design, selection, manufacture, installation, commissioning and post-commissioning support. By assigning ABB as the MAC/MEC early in a project ABB determines engineering requirements, optimizes the scope definition and therefore reduces CAPEX and OPEX costs.

Where there are multiple contractors (EPCs) supplying different process units, ABB will perform the interface management function to ensure a consistent, compatible solution. This eliminates the need for the client or project management contractor to coordinate and pass this information between many different parties.

In order to help oil refineries achieve a competitive edge, ABB now offers extended automation. This incorporates, in a fully redundant integrated platform, safety management, process and electrical control, and asset management to provide all your plant personnel with up-to-date information relative to their job role.

Combined with total life cycle services and evolution policy, our integrated solutions and consultant services improve your return on capital employed – making ABB an ideal partner throughout the lifetime of your refinery for optimization of the assets.



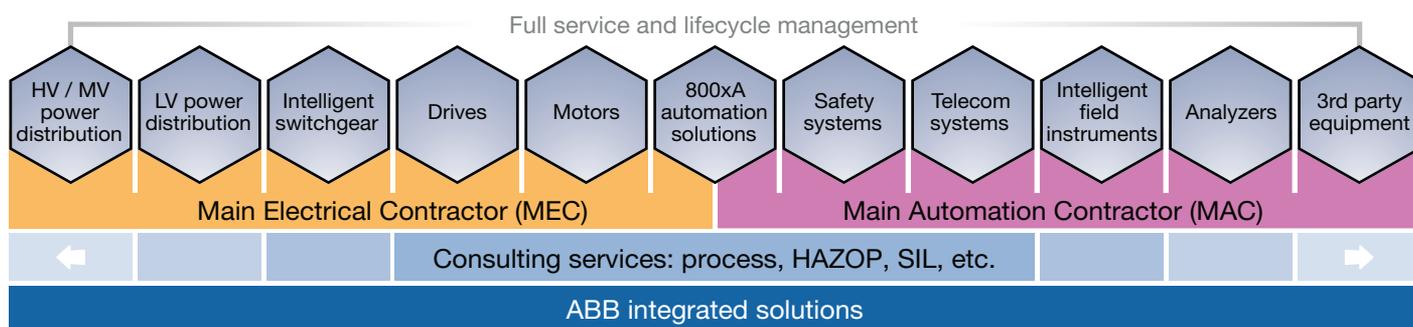
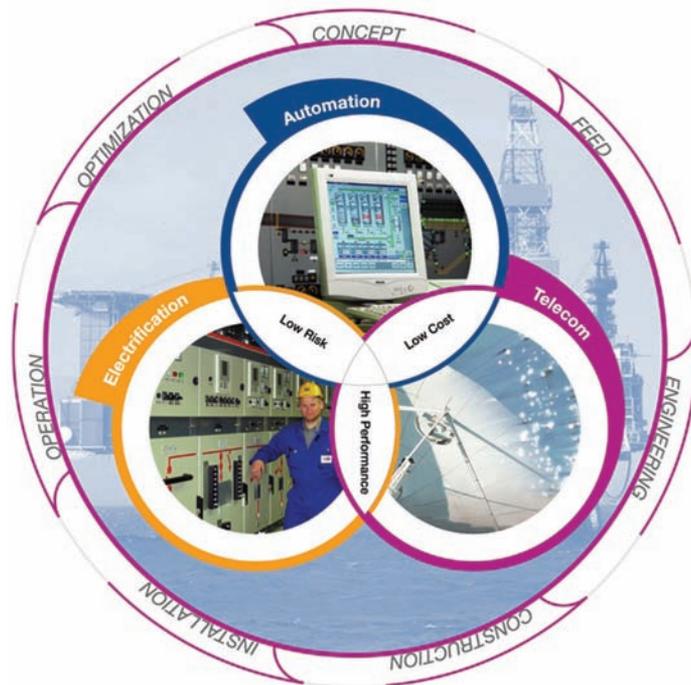
A multiscope life cycle supplier

As a leader in automation and power technologies with global engineering capability and a wide portfolio of products and services, ABB meets the special demands of the process industries. By involving ABB at the concept and feed stages of a project, we can assist you in identifying best in class solutions that leverage the use of newer technologies and reusable components.

We recognize that automation systems are key to your company's long term viability and therefore support the use of framework agreements to cover a wide scope of product supply and associated services. These can cover multiple sites and form the basis for a corporate alliance agreement.

We deliver multiscope projects with the objective of meeting your goal to reduce total installed cost and total cost of ownership. On refineries with multiple EPC involvement, ABB works with the end user to create a common Functional Design Specification (cFDS) for the supply of ABB and non-ABB scope to provide commonality, reduce risk and costs by reuse of proven solutions.

Throughout the life cycle of your facilities, we are well positioned to support your changing requirements giving you the flexibility to match your needs with our capabilities, from routine maintenance and remote monitoring to performance services.



Multiscope competence

From minor upgrades to new grass root refineries

ABB's professional project management, global presence and strict compliance with international industry standards, ensure timely, high quality deliveries throughout all project phases, from concept to operation – with a firm focus on health, safety, security and environment.

We execute projects around the globe, with local content and support to ensure knowledge transfer. The combination of global execution and local involvement improves productivity in even the most remote locations.

ABB contributes to lasting improvements across the project's life cycle by bringing special expertise to the integrated engineering team, including multi-discipline experience and indepth product and system integration knowledge.

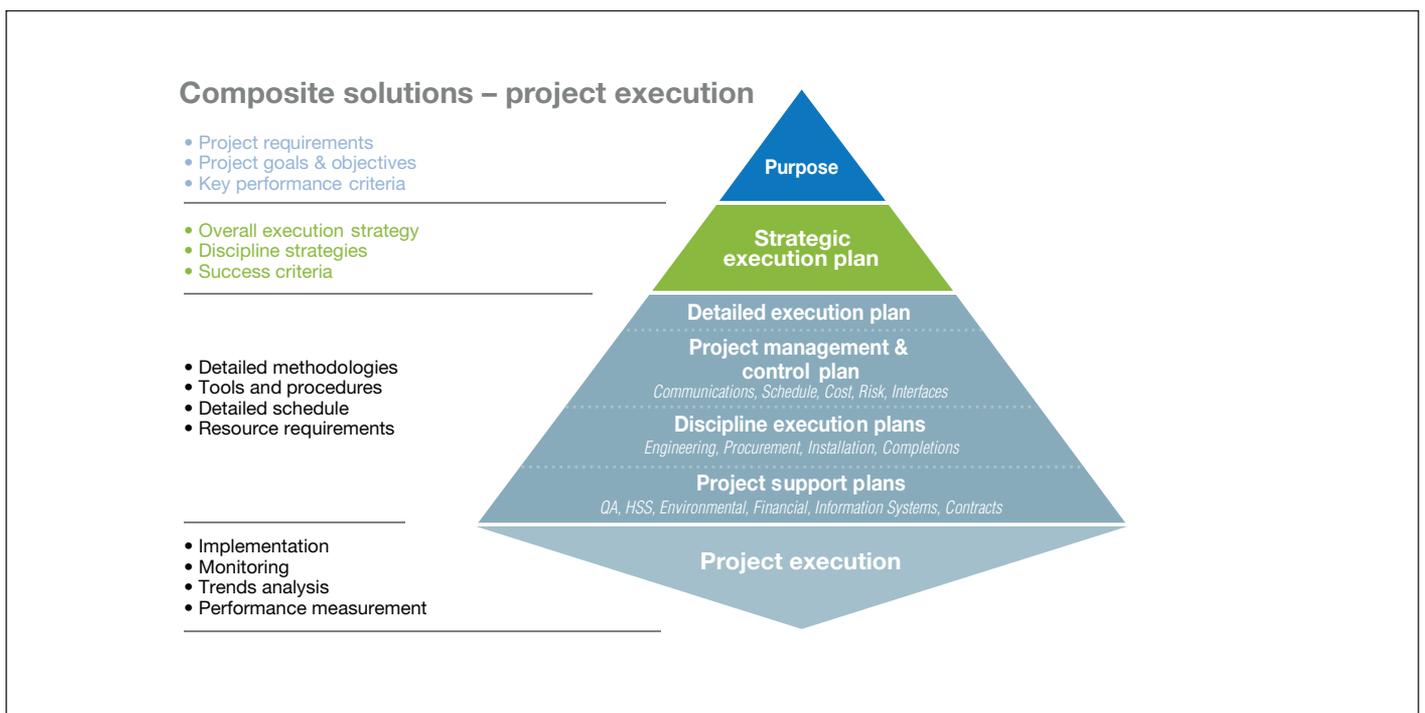
Our focus on system migration paths allows us to upgrade existing installations to state-of-the-art solutions without production stops. ABB has specific services and evolution products to allow upgrades and hot cut changeover of existing systems, be they ABB or non-ABB.

ABB's analytical technology, advanced process control services, overall equipment effectiveness (OEE) calculation tools, and inferential modelling, build solutions to increase revenue and lower operational costs.

Once installed, ABB engineers will look to support you in process optimization, best use of assets, maintenance of the safety SIL rating plus routine servicing of the ABB and non-ABB equipment.

Risk management

- ABB manage large projects effectively – we provide large-scale capabilities in terms of administration, engineering, documentation, testing and handling logistics of multi-discipline packages.
- ABB's consultancy and engineering services have decades of experience in process, automation and safety systems to reduce costs and maintain regulatory compliance.
- The use of type-tested products from ABB and third-parties, along with control libraries, reduces risk, eliminates potential project delays and improves operator visibility of assets.
- As a MAC/MEC, ABB takes responsibility for the interfacing of its and third party equipment, reducing risks during pre-commissioning.



Automation

A complete scalable portfolio

Scope of supply

- Process control systems
- Safety systems
- Analyzers and process analytical technology
- Instrumentation
- Advanced process control and optimization solutions
- Terminal management
- Oil movements and blending
- Information management systems
- Production intelligence
- PLC / compact control products
- Fieldbus and wireless technologies
- Operator training systems
- Dynamic simulations
- Asset management solutions
- Cyber security

Application 1

ABB, as the advanced process control vendor, provides, worldwide, a suite of the latest technology products and solutions to optimize the performance and maximize the refinery profitability. For a Far Eastern refinery, ABB's predict and control, state space multivariable controller, combined with ABB's inferential modelling platform, was used to tightly control the process units. This resulted in an increase of 3 percent to 9 percent profitability.

Application 2

ABB as the MAC provided the turnkey single point responsibility to install and commission the complete gasoline blending system for a European refinery. The scope included the FTNIR analyzer, analyzer models, offline and online optimization, instruments, valves, blend header, composite sampler, prototype fuel tanks, additive systems, etc. The captured benefit was several million dollars per annum return.

Application 3

The ABB process fourier transform infrared (FTIR) analyzer for HF (hydrofluoric acid) alkylation refinery process unit operation, jointly developed with ConocoPhillips, helps petroleum refineries to operate their HF alkylation units more efficiently and safely, while making a significant contribution to operational and environmental risk mitigation.



Integrated automation

Extending refinery boundaries

Today, ABB's Extended Automation System 800xA is the leading automation system in process industries, going far beyond the features offered by other programmable logic controllers (PLCs) or distributed control systems (DCSs).

The System 800xA includes asset management and TÜV certified Safety Instrumented System (SIS) capabilities, MES reporting, full audit trail facilities to track operator actions and changes and OEE calculation tools to support root cause analysis of production performance. The system supports all five IEC61131 programming languages, Fieldbus and HART compliant field devices. Overall production reporting, product traceability and compliance reporting is achieved for the user by having integrated information management facilities.

Electrical scope integration using IEC61850 and Profinet protocols reduces risk to start-up and improves operational costs and asset management.

In the role of main process analytical contractor (MPAC), ABB provides analytical solutions from design engineering and specification at feed stage through to the supply of complete analytical systems including sampling systems, analyzers, housings and analysis/modelling software. Having the widest range of analyzers, ABB provides better visibility and quality control.

To enhance our automation offering ABB has developed a complete range of standard and industry-specific instrumentation and control libraries for plant device and equipment control providing superior operator visibility.

Advanced process control and inferential modelling from process experts can be applied either as part of a new system installation or later once production has been established and constraints have been identified in the existing assets.

ABB, with its partner company Industrial Defender, can provide cyber security systems extending from the process automation through the corporate IT infrastructure.



Asset information - operational gains

- Complete instrumentation, automation and electrical portfolio meeting the needs of the process industries – we manufacture, engineer and install safe, reliable and secure solutions.
- Asset information that's effectively organized – System 800xA technology acquires, analyzes and aggregates automation and asset information. Asset management solutions are built-in, not added as an option.
- Improved return – we offer management decision support, process and instrumentation/automation expertise.
- System 800xA provides flexibility for device management with a comprehensive library of field devices, supporting multiple fieldbuses with inherent device diagnostics.
- Integrated automation, electrical and telecoms user environment.

Electrification

Meeting refinery industry standards

Scope of supply

- LV/MV/HV electric power systems
- Combined heat and power plants
- Electric power distribution systems
- Power management systems
- Electric control systems
- Electric motors
- Variable-speed drives

Application 1

Looking to reduce risk and improve project implementation, this polymer producer selected ABB as their main electrical contractor (MEC) for their new chlorine plant. The supply included electrical equipment - 90 MVA transformer, 132kV/22kV switchgear, 50 MVA filter, 132kV switchgear, 6kV switchgear, an electrical protection and control system - and infrastructure work including cabling, installation, piping, mechanical and civil modifications. Taking on full responsibility for design, analysis, engineering, procurement, project management, installation and commissioning of the complete system, ABB was able to complete the project two months ahead of schedule.

Application 2

For a major complex, ABB supplied the complete control system for their combined heat and power plant that included both electrical power and steam load shedding. This allows the plant to manage their energy utilization effectively across the site, and avoid blackouts.

Application 3

The customer wanted to reduce fuel consumption and pollution. ABB delivered a power management system (PMS) for optimized power generation and distribution. The supplied PMS power distribution system optimizes production based on available power capacity. To ensure environmentally friendly, state-of-the-art power management, ABB was involved from the feed phase to commissioning.



Single source supply

Total integrated electrical solutions

ABB is one of the largest manufacturers of electro-technical products and systems. Our high-efficiency low voltage, medium voltage and high voltage products meet the standards of the refining industry.

ABB has been at the forefront in developing electro-technical solutions that comply with new requirements for energy efficiency, control and safety. Featuring high reliability and performance, our electrical products are suitable for the full range of process plant applications. By the use of IT industry standard communication protocols, ABB reduces risk, project implementation time and operational propagation delays thereby improving the time to market and production throughput.

Historically, electrical control systems, power management systems and load-shedding systems are handled separately. System 800xA Extended Automation combines these three functions into a single integrated system with significant cost savings and operational benefits.

Customers who use ABB for their electrical scope requirements experience improved system performance and significant cost savings. ABB is recognized as the leading supplier of AC motors, DC motors and variable-speed drives. For large project deliveries with a broad scope, and as

a member of the integrated engineering team, ABB can optimize work flows, resources, and costs to accommodate the principal works schedule.

Increased quality, reduced power demand, improved electrical protection, integration efficiency and support for multiscope projects - ABB's involvement in your project means lower risk, tighter project schedules and improved return on capital employed.

High efficiency - high rewards

- Complete integrated electrical project solutions – ABB manufactures, engineers and installs reliable, safe and secure solutions.
- Proven, state-of-the art electrical building blocks, both operational reliability and open inter-connectivity, are provided for automation and integration with ABB and third-party devices.
- Increased electrical efficiency – enable cost savings and health, safety, security and environmental benefits.
- Recognized benefits of a single engineered automation and electrical solution.
- Reduced motor failures by up to 40 percent - ARC



Process expertise

Scope of supply

- Conceptual project design
- Feed support
- Generation of the user requirement specification
- Safety assessment
- Process and alarm philosophy
- Abnormal situation management
- Inspection services
- Integrity management
- Life of plant planning

Application 1

At an ethylene plant, ABB engineers implemented furnace controls and advanced process controls integrated to on-line analyzers to improve their profitability by seven percent. The success of the project required an understanding of

the clients particular process, their operating strategy and management strategy. The process understanding led to a knowledge of true constraints and true bottlenecks and the requirements of the APC application to push the plant to these real constraints.

Application 2

ABB's reliability services performed an 18 month, multi-site improvement process, which focused on management leadership, lagging / leading success measures, risk-based scheduling, operations and maintenance partnerships, root cause failure analysis, operations empowerment and preventive maintenance practices. By implementing ABB's recommendations, this company enjoyed annual savings of close to \$1 million in reliability costs and increased production of nearly \$3 million.



Life cycle excellence

From concept to plant optimization

Operational costs are lowered when ABB is involved from the start of the project. We are dedicated to finding solutions that satisfy your technical requirements, financial objectives and production goals. Your risks are reduced when you take advantage of ABB's experience and expertise across multiple disciplines.

From the start of a project our full range of technical, project management and design expertise comes into play. When combined with our operational knowledge of the industry this makes a big contribution in helping you to define the right scope for your needs.

Our process safety skills are valuable in either an operational or project environment. These skills are enhanced by services and solutions ranging from the installation of fully instrumented safety systems to IEC 61508/11, to the leadership of hazard studies. Our comprehensive global functional safety management system provides end-to-end SIL assured solutions, through TÜV certified products, engineers and project implementation processes. Our process industry experience leads to fit-for-purpose, cost effective and pragmatic solutions that improve safety and meet regulatory requirements. ABB also provides training in functional safety management (FSM) to assist you in meeting regulatory requirements.

In operation, the System 800xA control system with its aspect/object technology allows the storage and direct access to a wide range of information such as specific operator guidance and maintenance instructions. Along with the built-in asset management software, linked computerized maintenance management systems can reduce unplanned slowdowns or shutdowns by 40 percent and reduce maintenance labor by 63 percent during planned shutdowns.

We help process plant operators to comply with legislation and stakeholder expectations with regard to asset integrity. Our industry recognized expertise in integrity management provides an independent view of asset integrity and the supporting management systems and practices.

We guarantee efficient and effective hot cut changeover modifications in existing installations, having a specific engineering resource dedicated to hot changeover of ABB and non-ABB systems. Support for on-line changes and upgrades for multistream plants and those processes that never have a total plant shutdown are also catered for by the System 800xA system.



Productivity and profitability Through technology and services

Operational excellence is achieved when continuous improvement strategies are matched with real-time feedback and analysis tools to maximize production and reduce operational costs. ABB services, used throughout the operations phase, deliver operational excellence. ABB can audit your plant and advise you of potential improvements to increase production rate and reduce quality variability.

Timely and reliable production information is vital in order to analyze and improve productivity. ABB's production information system offers an open architecture for data collection from ABB and third-party systems, and delivers customized reports.

Integrated solutions provide asset management of the refinery and downstream processes, optimization by advanced process control and the use of ABB's expertise and consultative services to reduce OPEX. Operational benefits are also enhanced by the use of targeted training and the use of the appropriate training simulators.

ABB reliability services provide solutions that improve safety, compliance and profitability. The World Class Reliability (WCR®) benchmark is a product of 40 years of development. The benchmark process identifies best practices and compares an organization's performance level with other companies and industries. Qualitative and quantitative analysis are conducted of both reliability and maintenance practices, resulting in:

- Identification of performance gaps in the nine criteria of WCR
- Development of strategic and tactical plans to close the performance gaps
- Creation of a business case that documents the financial impact of addressing areas of opportunity

Following WCR, Total Plant Reliability® is addressed through a multi-staged improvement program. This comprises of focused empowerment of site personnel, asset management, maintenance prevention and balanced scorecard methodology. TPR provides a path to permanent reliability improvement that can easily result in a 3 to 1 return on investment.

Operational profitability

- Process knowledge and cross-discipline competence give us the power to enhance your asset recovery.
- Our multi-discipline, multiscope solutions increase production and product quality at a reduced operational cost.
- Support services for ABB and third-party equipment.
- System tools to identify loss production and root cause analysis.
- Training including IT technology aspects such as security.



Global services

ABB has standardized processes, procedures and tools throughout our worldwide service network so you always receive consistent, high-quality service and parts – whenever and wherever needed.

ABB offers specialized performance improvement services, such as overall equipment effectiveness (OEE) analysis, that are designed to enhance process operations. To ensure optimal equipment effectiveness, ABB's OEE analysis may be supplemented with an implementation plan and implementation services. Performance improvement services cover just one of the many service areas offered.

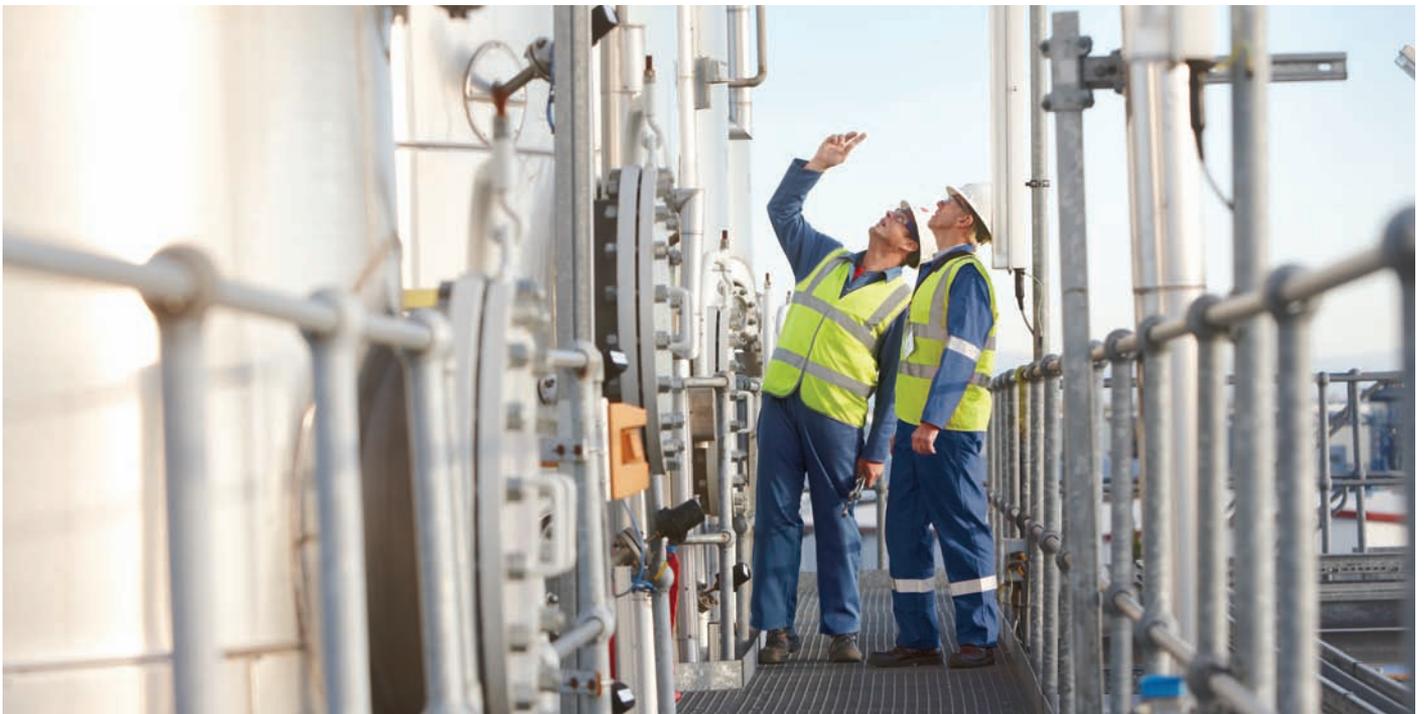
On-site, ABB services range from installation support to full project management. Adding ABB support and remote services allows you to minimize operational costs and increase productivity and revenues.

ABB's local and global service organization tailors the scope of the post installation support to suit client needs from on-demand support, spares availability through to full healthcare contracts whereby ABB maintains the complete automation and electrical assets.

For aging refinery installations, ABB offers migration and retrofit analysis. Our professional migration strategies and implementation result in low-risk improvements to the OEE. As a leading supplier to the process industries, ABB offers step-up programs and software maintenance programs that reduce downtime and maintenance costs, including hot cut changeover expertise.

ABB's well-trained staff are able to increase production and uptime. ABB offers a wide spectrum of training courses, including, product, operations, safety culture and safety assessment. The courses can be held on site, at ABB facilities or electronically via our eLearning products.

Where users wish to outsource their maintenance requirements, ABB FullService® will provide the asset management and maintenance of the installed automation, electrical and telecoms assets including the provision of personnel during normal operations and planned shutdown requirements.



Future development

ABB's future direction has always been influenced by the needs and challenges of our customers. Increased information flow and more stringent environmental requirements will certainly influence our future developments in the oil refinery and downstream sector.

The growth of data source devices will create new challenges in areas such as alarm systems and operator interfaces. A major challenge with data source devices will be to avoid "data overflow" while taking advantage of the information flow to increase the degree of automation, optimization, remote control, remote support and diagnostics. ABB will continue to be the leading automation, electrical and analytical vendor and set the standards for integrated operations.

Such developments include the use of wireless and Ethernet technologies, process analytical technology (PAT) and the use of the ABB extended operator workplace to provide better integrated visibility of the entire process plant and increase productivity.

As the needs of the oil refining and downstream industries evolve, ABB will meet these challenges with scalable products utilizing common building blocks and standardized software library solutions.

ABB employs hundreds of engineers and scientists in its corporate research laboratories and in addition has co-development activities with 50 universities.

As a leading technology provider, ABB is actively involved in industry forums to contribute to and monitor trends in industry, markets and technology. This, along with direct input from our customers and consultants, shapes our development of new products and solutions for the oil refining and downstream industries.



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