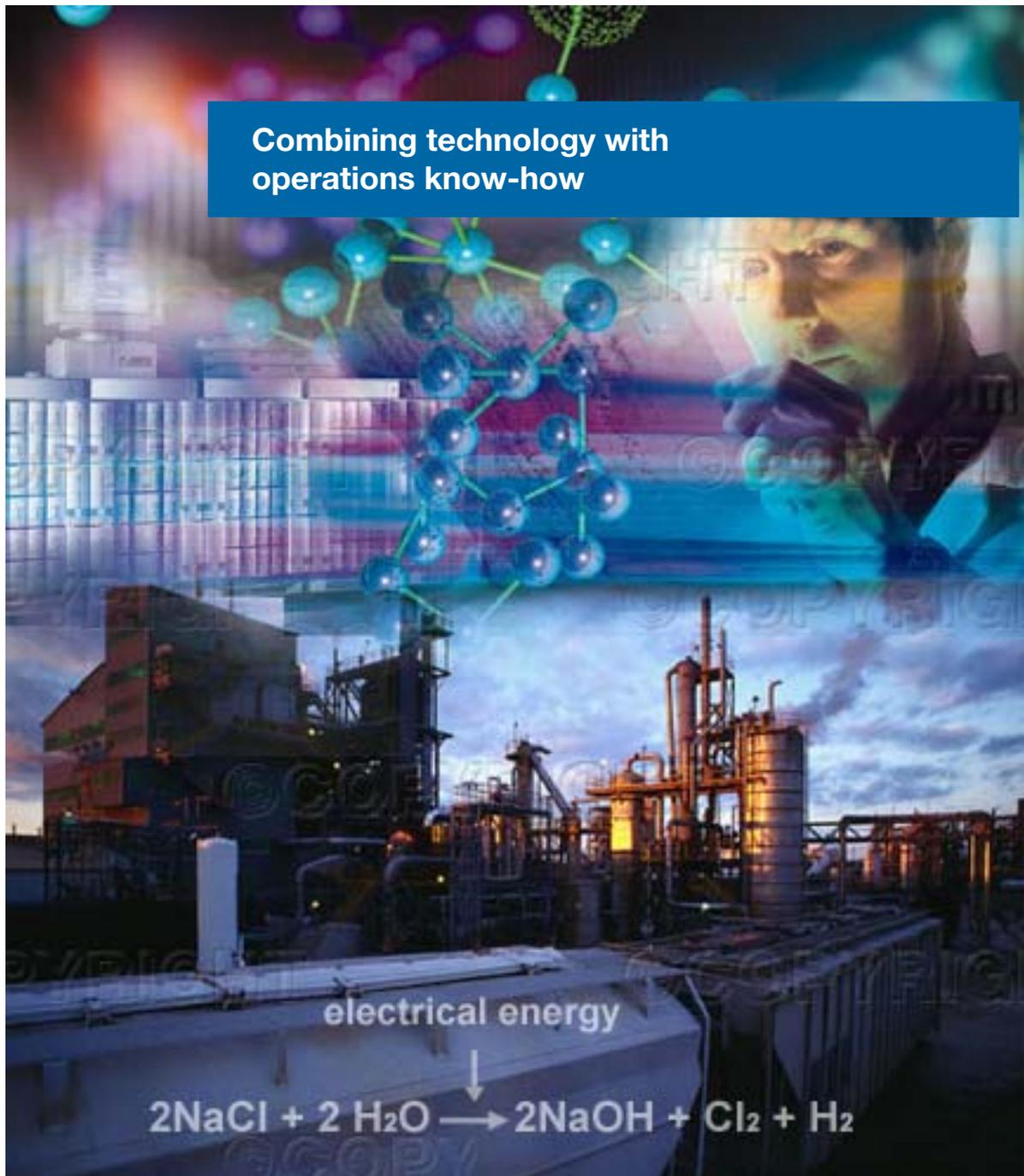


Industrial^{IT} for the Chlor-alkali Industry

Creating value through integrated solutions

Combining technology with
operations know-how





Overview

ABB's Industrial^{IT} solutions for the chlor-alkali industry are more valuable than the sum of our Products and Services.

ABB is the world's largest supplier of automation systems, power products, advanced solutions and services to the chemical industry. With Industrial^{IT}, ABB has combined state-of-the-art technologies to develop an integrated suite that meets the needs of modern chemical facilities today and in the future.

In the past you have probably thought of us as an electrical company, a controls company or an automation company. We are all of these and more!

ABB has an extensive knowledge base for the chlor-alkali industry - **chlorine/caustic soda production plants, chlorine derivatives and intermediate plants, vinyl chloride monomer and PVC plants**. We have highly qualified and experienced consultants and engineers, many of whom are specialists in the chlor-alkali industry with backgrounds in operations. They are well-equipped to deliver practical and realistic Industrial^{IT} solutions based on global best practices.

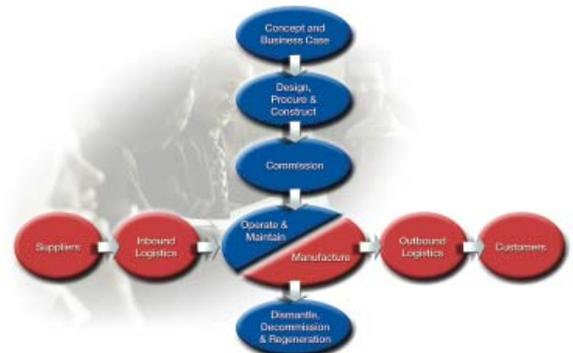
A major addition to ABB's knowledge in the chlor-alkali industry came in January 2001, with the acquisition of Eutech Engineering Solutions Ltd., the international engineering consultancy subsidiary of the ICI Group¹. This acquisition has allowed us to strengthen our position in the chlor-alkali industry by combining the practical engineering knowledge of an operating company with the technology of the ABB group.

Are you planning an investment in chlor-alkali assets? ABB can help you to move from the initial business idea through the early stages of project development to the appointment and management of an EPC contractor and the successful integration of the new investment into your business.

Do you have existing assets? ABB can help you improve operations by, for example, reducing energy consumption, increasing water recycling, reducing emissions and raising plant performance and availability—some of the key business drivers in the industry.

ABB emphasizes a “one team approach” to provide integrated solutions and exploit best practices. Whether we're procuring a single valve or developing designs for an entire plant, we believe in teamwork across the enterprise. Benefits are provided through the team's access to ABB's extensive range of products, services, technologies and know-how in the chlor-alkali industry.

ABB offers support in two business activity cycles:



- Product and capital asset cycle
- Supply chain and operating cycle

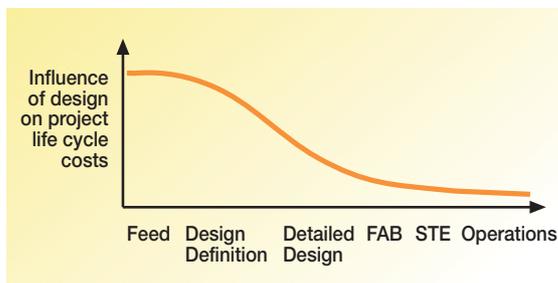
ABB has the unique advantage of being able to operate in both of these cycles, integrating them and optimizing their interaction.

¹The ICI Group was a leading multi-national Chlor-alkali producer with headquarters in the UK

Modern power and automation systems are important to success in the chlor-alkali industry. The lifetime costs of power and automation systems far exceed their initial capital costs. Therefore, it is essential that power and automation systems be regarded as strategic elements in any new investment.

All major capital projects are subject to cost and schedule risks. However, decisions taken during the design stages of a new investment have a major impact on lifecycle costs. The ability to influence investment costs is greatest in the early phase of a project.

ABB's experience indicates that as an integral power and automation partner we can help to mitigate the risks and reduce both capital and lifecycle costs. The key to risk mitigation and cost reduction is the early involvement of ABB, allowing us to leverage our expertise for your benefit.



Savings are established by:

- Leveraging ABB's knowledge base in the chlor-alkali industry
- Maintaining continuity through successive stages of a project
- Sharing information electronically and integrating it with CAE systems
- Transferring risk for delivery
- Standardizing products, services and work processes
- Reducing organizational interfaces
- Simplifying the supply chain
- Integrating products and services more closely



Through more intimate customer relationships and in-depth understanding of business objectives, ABB helps to refine operational processes and create sustained performance improvement by:

- Exploiting state-of-the-art technology
- Improving business and supply chain performance
- Improving variable cost performance
- Optimizing the asset base
- Improving the contribution of operations to business
- Ensuring compliance with licensing and regulatory agencies

ABB's powerful blend of knowledge, skills and resources is a spur to innovation. To help us create leading edge solutions, we have links with major universities and research programs and maintain our own ABB corporate research center.

For the chlor-alkali industry, ABB has embarked upon a program to develop new applications of our technologies and enhance our comprehensive range of standard products. These new developments are aimed specifically at delivering operational benefits to producers in the industry.



Advanced Technologies, Systems and Services

ABB supplies the total needs of the chlor-alkali industry for both batch and continuous processes. We offer global solutions customized to fit every situation while providing full lifecycle support. The Industrial^{IT} suite of scalable solutions is perfectly matched to today's dynamic enterprises and focuses on keeping reliability and performance at the highest level.

ABB collaborates with chlor-alkali customers to understand their needs, provide information to sustain their industry leadership and develop solutions that exploit new automation frontiers for controlling their plants.

A key feature of ABB's automation technologies and services is ABB's Industrial^{IT} Aspect Objects[™]. This feature integrates information from a variety of applications (including computer-aided engineering systems used by engineering contractors) and makes it available in real-time to any authorized user regardless of their location. Plant data and plant components are presented as configurable software objects. Each object carries a range of related information that makes the object instantly recognizable to plant-wide information networks. With ABB Aspect Objects, plant information is deployed rapidly and uniformly, so that personnel throughout your enterprise view your business through the same real-time "window." Better information means faster decision-making and more control over assets.

For the chlor-alkali industry, ABB offers a suite of products encompassing power, measurement, analysis, control, automation and management solutions and integrates them into a single architecture, Industrial^{IT}. Our products are designed for aggressive environments and meet the full range of industry standards and protection requirements.

Because world-class performance and reliability are key requisites of the chlor-alkali industry, ABB products are specifically designed for a long mean time between failure.

ABB is committed to full lifecycle service, aimed at creating and sustaining value. Through our chlor-alkali unit, we reach out to a global network of experts, who continually deliver the best available technology and support throughout the life of your assets.

Optimization Solutions and Advanced Applications

The solutions and services developed by ABB's chlor-alkali unit form an integral part of the Industrial^{IT} suite. They are designed to address the needs of the industry by offering:

- Improved performance
- More eco-efficient production
- Reduced waste
- Sustainable operations

ABB solutions for the chlor-alkali industry include:

Chlorine Electro-Chemical Process Optimization

A process optimizer that balances the current efficiency across cells to optimize performance and to identify and diagnose faults.

The software can be operated with any DCS platform. It exploits all the capabilities of your current information processing systems to interpret data and determine performance variability in oxygen, hydrogen and chlorine.

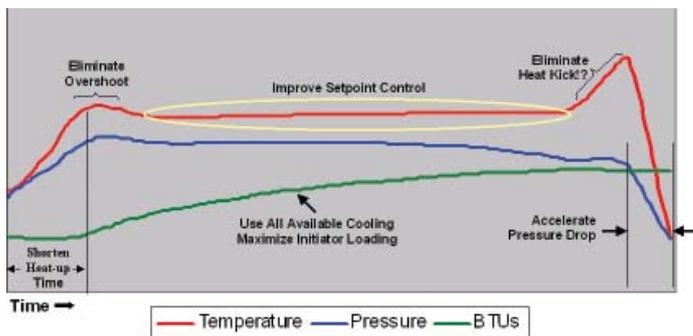
The main objectives are to improve overall cell performance, maximize production and improve product quality and membrane life.

PVC Reaction Process Optimization

This optimizer model has been developed as an off-line tool for process investigation and as an on-line tool for operating and controlling PVC batch reactors.

As an off-line tool, the model is calibrated with historical data and enables "what if" scenarios to be carried out, to identify opportunities for improvements in product quality, productivity and cost reduction. The model can be tuned to optimize for different criteria (for example, maximum output, minimum cost and product quality).

As an on-line tool the model can be used to support batch optimization and characterization. The model supports on-line real-time parameterization to predict, control and optimize such items as initiator charge and reactor temperature profile. As a result, reaction times are optimized, plant throughput increases and coarse out-of-specification batches are detected earlier.



PVC Quality Optimization

A derivative of the reaction process optimizer, this quality optimizer focuses on PVC product consistency. Target values and ranges are defined for all of the key polymer properties; the objective of the optimization is to constrain the properties within these limits.

Process Plant Simulation

Process plant simulators that can be used for training and validating operators, and for developing and testing new operating strategies. We've provided more operator training simulators to the chemical industry than any other company.

ABB simulators can interface to the plant control system and use real data to populate the models. The simulators are configurable for different processes, both batch and continuous: for example, chlorine diaphragm and membrane cell processes, VCM and PVC processes.

Predictive Asset Management

Using existing sensor data and known fault conditions, our predictive asset management tools determine the operating conditions of manufacturing assets without the use of dedicated asset monitoring equipment. This approach is particularly beneficial in areas of the plant where operating conditions make it difficult to take specific measurements. With this technique, we're able to predict and avoid accelerated asset failure regimes and thereby reduce planned and unplanned maintenance.

Advanced Applications

World-class technology from both our own R&D and our software partners. We combine expertise in advanced applications and expertise in the chlor-alkali industry to deliver tangible results to your plant. ABB professionals are available world-wide to design and commission real-time integrated applications for your site, using best-in-class tools.

Technology-based Solutions

Tapping into the power, automation and process technologies of Industrial^{IT}, ABB brings about major improvements in the performance of your businesses. Our technology builds upon years of industry experience, state-of-the-art software applications and expertise in plant operational design, process engineering and licensing.

Whether you require specialized reporting, connectivity to business systems, composition control or a customized planning and scheduling system, our Advanced Applications Engineering group will find the solution.

ABB provides Technology, Products, Applications, and

Close the Gap between Plan and Reality with ABB's Industrial^{IT} base
With Industrial^{IT} you are fully Web-enabled, Collaborative and

ABB Power Products balance your operational, reliability and safety performance while reducing operating costs.

ABB Motors and variable speed drives are designed to operate in aggressive, corrosive environments with very high reliability and low maintenance.

ABB Rectifier systems are ideally suited to Chlorine manufacturing operations. They exploit latest technology and are designed for high efficiency, reliability, long life and low maintenance.

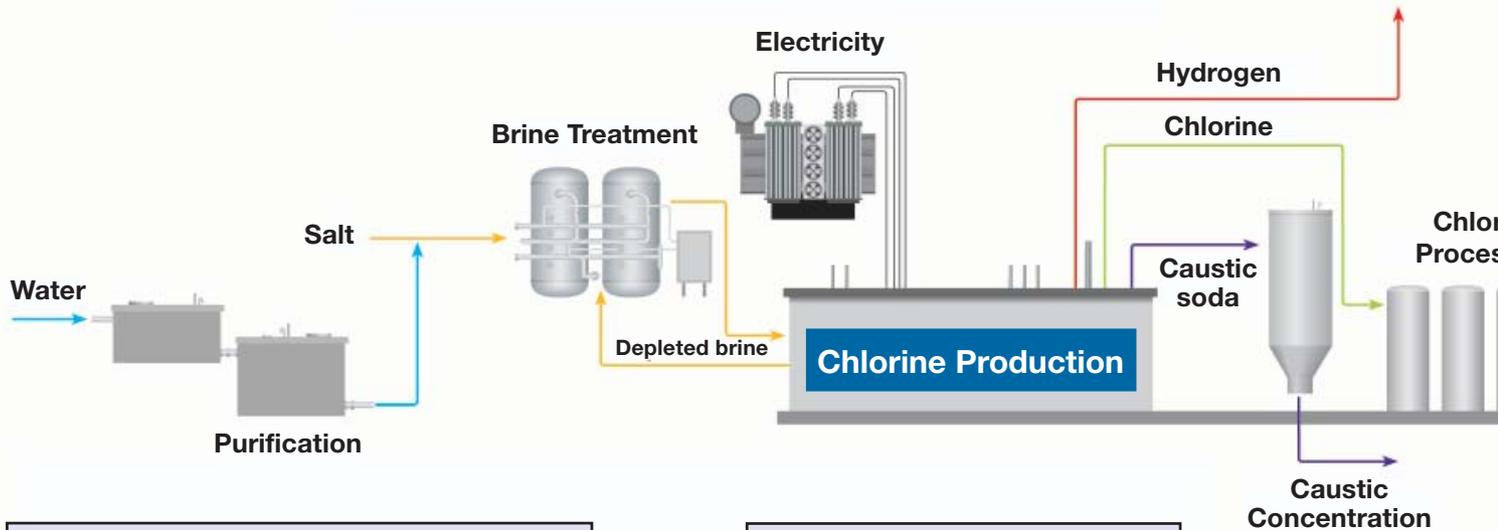
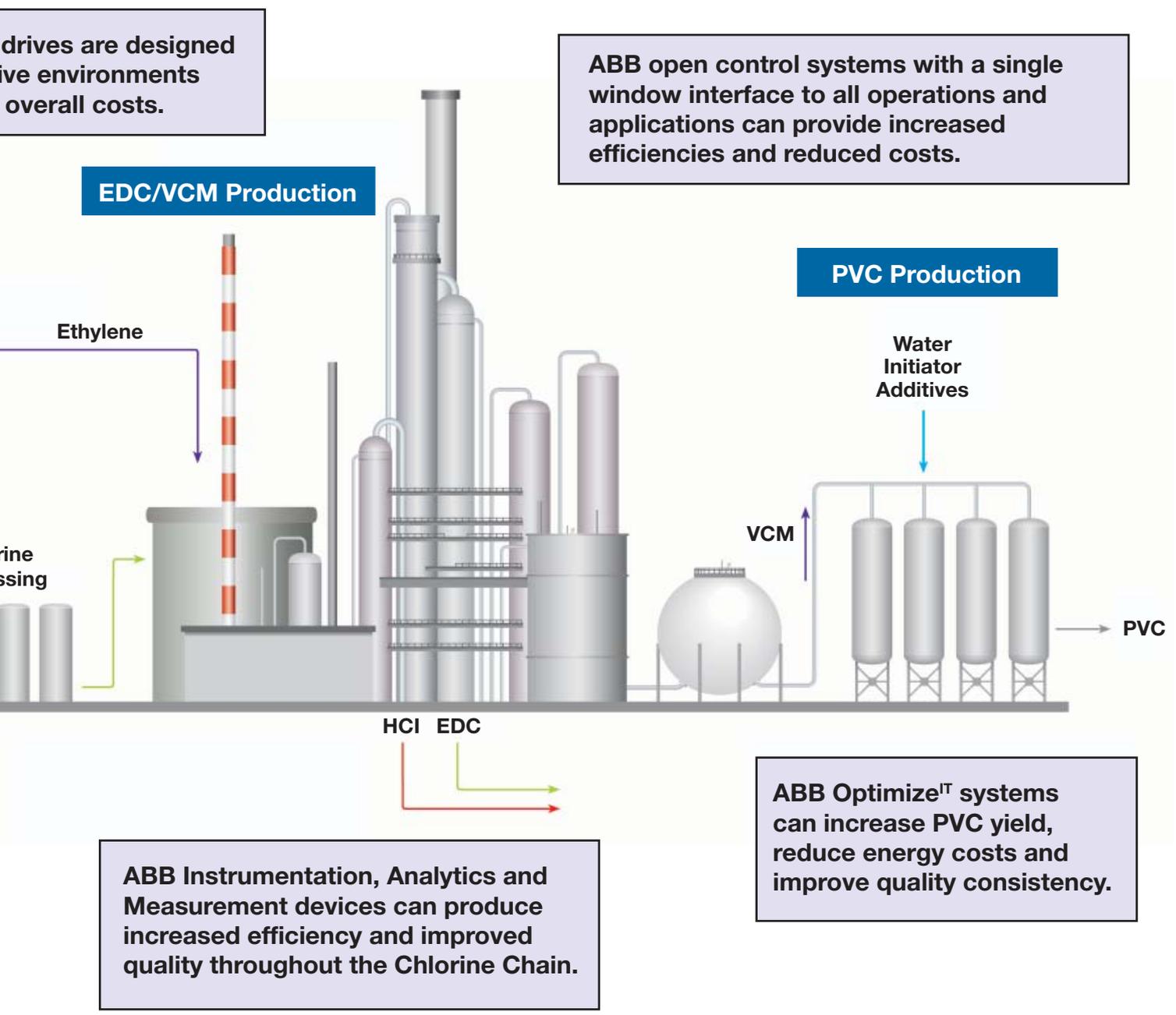


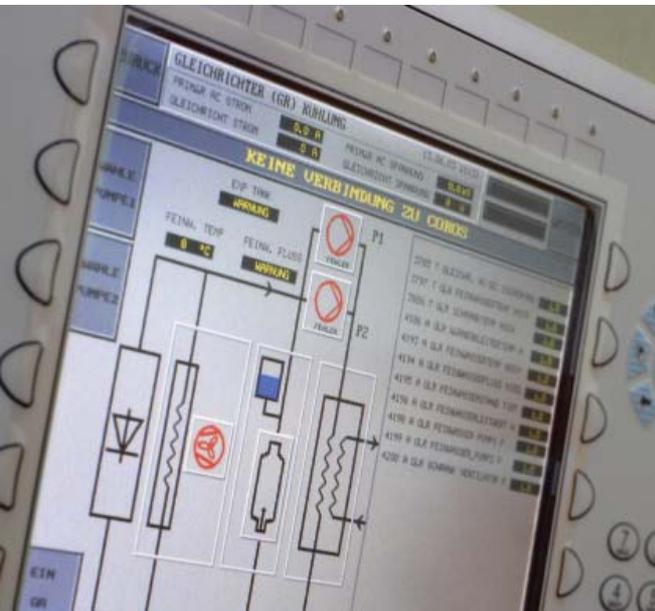
ABB consultants can provide support in the development and maintenance of water systems to optimize usage and treatment.

ABB Optimize^{IT} systems can help to monitor cell efficiency and optimize energy consumption.

Services for the Chlor-alkali industry.

Used Solutions to increase your Profit.
and Operative in Real-Time across all Levels and Systems.





Rectifier Systems

ABB is the market leader in rectifier systems for chlor-alkali industry. ABB's Industrial^{IT} rectifier systems feature high reliability, long life and low maintenance, ensuring a high return on investment.

Each system's scalable modular design allows for a high level of standardization along with the flexibility to adapt to your specific needs.

Application specific control features include:

- Constant current control
- Power factor regulation
- Ampere-hours regulation
- Active compensation of DC current over swing due to tap changing
- Trending

Motors and Drives

ABB is the market leader in high and low voltage motors, with a complete range of standard designs up to 11 kV. The motors feature high efficiency, high reliability and long bearing life. Low voltage motors work with variable speed drives and with low levels of noise.

ABB has a complete range of high, medium and low voltage drives from 0.15 kW to 18 mW, incorporating variable speed and flux optimization for energy efficiency. Built with reduced harmonics and the minimum number of components, these drives perform with higher reliability and lower overall costs.



Analytical Solutions

Innovation and experience are combined in ABB's analytical products to offer our customers exceptional functionality, reliability and accuracy in the harshest environments while maintaining a clear display of the process. We recognize that first-class analytical results are essential for understanding your process and for identifying ways to reduce costs while improving product quality.

ABB offers an unprecedented range of process analyzers including over 75 analyzers specifically designed for the rigorous demands of the chlor-alkali industry, such as infrared and near infrared photometers, ultraviolet photometers, paramagnetic and thermo-magnetic analyzers, thermal conductivity analyzers and mass spectrometers.

We have a premier record in combining our products with third-party products to supply turnkey solutions for the chlor-alkali industry. Our Systems Integration Units enable us to engineer and supply sample handling systems and enclosures specifically designed for demanding chlor-alkali duties.



Power Products

Composite Plant Solutions

ABB supplies Industrial^{IT} products and services on a turnkey basis. Large projects require supply coordination and total integration of products and services. Our equipment and electrification solutions have proven very successful in new plant projects worldwide. These solutions include:

- Transformers
- Capacitors
- Switchgear and motor control centers
- Remote services
- Power optimization
- Plant design

Industrial^{IT} solutions, systems and equipment efficiently transmit, distribute and control electricity. With our extensive hardware, our expertise in network management, control, protection and monitoring, and our consulting and diagnostic capabilities, we can optimize your asset utilization and contribute to the profitable operation of your business.

Power Systems

ABB is able to help you develop your power systems through computerized modeling. We use your real maintenance history to carry out a structured analysis. This analysis pinpoints the asset development strategy that enables you to balance performance, cost and risk.

High power rectifiers and drives are necessary for chlorine production but can introduce harmonics into power distribution systems. ABB can help you optimize your power distributions systems and co-ordinate solutions, including ABB capacitors and harmonic filters for controlling harmonics.

ABB is the market leader for distribution transformers with over thirty production facilities around the world. Based on proven technology, we offer a complete product range up to 72.5 kV (oil type, dry type and special applications).

ABB's Industrial^{IT} switchgear covers the full range of requirements for chlor-alkali producers. The fixed pattern design has fewer components, to improve reliability, minimize maintenance and lower overall costs. The equipment is fully arc protected for enhanced safety.

The equipment incorporates multi-function, software-configurable, protection relays. The relays feature real-time self-monitoring for disturbance recording and power quality measurements.

Our specialists work with you to identify and provide solutions for your electrical system over its entire life-cycle.





Consultancy Services

The engineers and consultants in our ABB Process Solutions group have unprecedented know-how in the chlor-alkali industry gained through their operational heritage with ICI.

Drawing upon this unique heritage and wealth of experience in the chlor-alkali industry, we develop, improve and maintain the performance of manufacturing operations and associated infrastructure.

Some of the services that we offer include:

- Asset management
- Business process optimization
- Energy and utilities
- Environmental services and IPPC
- Manufacturing process optimization
- Operational plant support
- Safety management

ABB consultants are helping chlor-alkali producers throughout the world to deliver tangible benefits in the following areas:

Capacity increases. Carry out discovery studies, make recommendations and implement changes to process design.

Quality improvements. Study existing quality standards with recommendations on measures to improve absolute values, quality and consistency.

Cost reduction. Study costs and make recommendations for their reduction. Typically, this would include energy and raw material costs.

Environmental or safety improvements. Make recommendations and design modifications to improve performance.

Problem solving. Identify the causes of process problems, and recommend solutions, for example, to extend asset life, reduce downtime and improve efficiency.



Here are three examples of services provided by ABB consultants for the chlor-alkali industries;

Water Technology

Water quality, brine purification and the control of impurities are critical features in the efficient operation of a membrane cell chlorine plant. Therefore, these areas of the process have much tighter specifications for demineralised water.

ABB's water technologists are very experienced in developing systems for the chlor-alkali industry and providing life-cycle services to maintain the systems.

Risk Based Inspection

ABB can help you develop a robust, cost-effective inspection program that maximizes production time, minimizes downtime, maintains a safe operational regime and offers added value. Risk-based inspection is a powerful technique.

ABB's methodology is based on partnership with the customer to understand what can go wrong and what the consequences are. We make sure that inspections identify damage before it escalates.

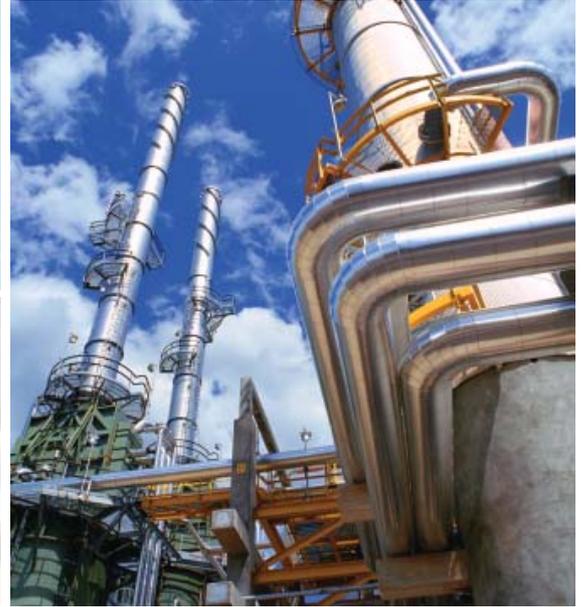
In today's environment, regulatory compliance is essential, and inspection work must be integrated into the maintenance routine. It can no longer be treated as a separate issue. Inspections must concentrate on areas where the risks associated with failure are greatest, using techniques that are appropriate to the risk.

This risk-based methodology can be applied to all types of equipment to determine the most appropriate inspection strategy. Typical approaches include:

- Non invasive techniques minimizing vessel entries
- Techniques to lengthen the intervals between inspections
- Focused inspection, to concentrate on key areas
- Equipment looked at on a system basis

combining to:

- Reduce the total cost of inspection
- Increase availability
- Improve reliability
- Fewer, shorter, more manageable plant overhauls



Benchmarking

ABB uses a rapid, quantitative approach to assess the performance of assets and related processes and to identify opportunities for improvement.

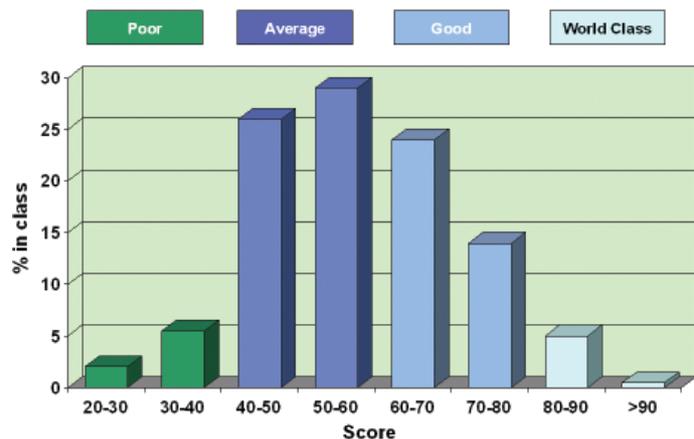
Our approach to benchmarking is to evaluate current performance and improvement opportunities.

We provide a quantitative appraisal that compares your asset performance against external measures, evaluates the performance gap and highlights areas for improvement.

We show you the impact of performance gaps on your most important financial and business indicators. This analysis provides the information that's essential for go/no-go decisions, without incurring large costs.

The benchmark study defines the size of the strategic opportunity and clearly shows you where the money is.

Overall Manufacturing Performance Distribution



Industrial^{IT} Solutions from ABB



Industrial^{IT} solutions from ABB blend the industry's broadest portfolio of compatible knowledge components with a proven architecture for real-time enterprise automation and information.

Visit us at:

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You can find ABB in more than 100 countries.

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For more information on
ABB Industrial^{IT} solutions
for the chlor-alkali industry,
please contact your local sales representative

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