

Fruits of innovation

Across the globe, customers are using the technologies developed by ABB. The following short reports illustrate the some of the technologies presented in this issue of ABB Review at work.

ABB builds a control masterpiece in Brazil

Alunorte in Brazil operates one of the biggest alumina refineries in the world. ABB control products and systems have been helping the company reach its production goals since its start-up in 1995.

When the latest expansion is completed in 2006, Alunorte will be the biggest alumina refinery in the world with five lines and production capacity of 4.3 million tons/year.

Stable and reliable ABB control systems have contributed significantly to increasing production and results at Alunorte during its ten years of operation.

“If the DCS can give you good data, you can change the data into information. If you have the power of information, you can change everything, but you need the right tool to make the change,” says Jorge Aldi, Alunorte’s process and system development manager at Alunorte. Alunorte drives for improvement, and ABB is one of the most important tools for the increase of capacity production.”

Alunorte uses the ABB Advant control system for all lines at the refinery, enhanced by ABB’s System 800xA Extended Automation.

The control system utilizes fieldbus communications (both Profibus and Foundation Fieldbus), as well as ABB’s Optimize^{IT} Real-Time Production Intelligence (Real-TPI) product.

This gives operators all the information available in the system to make

educated decisions and to take actions to prevent production losses and shut-downs, while maintaining product quality.

The expansion with ABB’s System 800xA allows Alunorte’s refinery to operate and produce up to 99 percent of the time (excluding scheduled maintenance), slashing downtime to just one percent.



Bringing competitive automation to the heart of Asia

ABB opened a new operations center in India in 2005 to service key areas of its process automation business, including engineering services, global sourcing, project collaboration, and R&D.

ABB in India is one of the fastest-growing operations in ABB, and one of the most dynamic companies in India. The new operations center in Bangalore shares essential business activities, resources and expertise across geographic boundaries within



ABB, enhancing the company’s presence in the Indian market, and giving ABB in India a greater global role.

The center employs the significant intellectual capital, technical skills

and competitive cost structure in India for the benefit of ABB operations and customers around the world.

ABB has built up a strong presence in India over many years, which now includes eight manufacturing units, a

countrywide marketing and service presence, about 450 channel partners, a global R&D center and roughly 3,500 employees.

The operations center is expected to employ 500 people by 2008, all trained to meet the defined needs of countries that purchase services. It

will channel emerging country outsourcing through a single, streamlined point of contact ensuring the best quality, performance and cost.

An international team will help facilitate exchange of technology with other ABB units, and help foster best practices.

Several pilot projects in partnership with countries such as the U.K. are already running successfully, and additional requests from other countries are coming in.

Precision robots build Big Bang accelerator



A laser-welding system using two ABB IRB 140 robots is helping to build the world's largest particle physics accelerator – the Large

Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) in Switzerland.

“This is probably the most precise and demanding application of a standard robot ever devised,” said Chris Moore, managing director of U.K.-based Garandale Systems, who designed the assembly system in collaboration with Ferranti Photonics. “Positional accuracy and repeatability are key to the success of the project.”

On completion in 2007, the LHC will consist of two 27-kilometer tubular rings in a large tunnel 100 meters underground, and be used to recreate conditions in the universe just after the Big Bang.

Each ring is comprised of tube assemblies 15 to 18 meters long, consisting

of three tubes and components like sliding rings and tube supports. Each assembly requires about 40,000 laser spot-welds that must be completed in less than an hour and to very high tolerances.

Welding specifications are extremely demanding. On one detail alone the assembly requires 0.3mm diameter spot-welds every 1 mm in axial length. Welds are only 30 microns in diameter and must be centered to within 10–15 microns to be effective.

The IRB 140 has one of the fastest cycle times of any articulated robot. Only 810mm high but with six working axes and a handling capacity of 5 kg, it is one of the smallest, fastest, and most powerful robots on the market.

ABB helps Domtar stretch its equipment dollar

In business since 1848, Domtar, Inc. is one of the oldest paper manufacturers in the world, and currently North America's third largest producer of uncoated free sheet paper, used in printers and copiers, business forms and envelopes, text and trade books, and as stationery.

When Domtar was told the drives powering their paper machines were obsolete and needed replacing, the company turned to ABB.

By integrating ABB parts and services, the paper maker avoided costly emer-

gency repairs and a massive investment in a new drive system.

ABB updated the drives instead of replacing them, extending their lifetime by more than seven years. Result: a cost savings of 50 percent, and lower production losses with reliable ABB drive modules.

“ABB's ability to ensure preventive maintenance instead of costly emergency repairs saved us lost paper production,” says Christian Brie, Domtar project manager.

Domtar uses Allen-Bradley/Stromberg Bulletin 1352 drives with its paper machines. Based on a lifecycle management model, ABB determined the drives would not be obsolete until 2015.

ABB engineers found the firing pulse on a pulse amplifier board (PAC) on

one drive had deteriorated so badly that a catastrophic failure was imminent.

They installed an updated ABB module and got the firing pulse back within specification, averting an expensive equipment failure.

That led Domtar to purchase SAMIS-TAR preventive maintenance update kits from ABB for all the A-B/S 1352 drives on their paper machines, ensuring additional years of trouble-free use from the existing drives.



ABB combs out tangles in L'Oréal production lines

Productivity in the Belgium plant of the world's number-one cosmetics company rose by ten percent after L'Oréal installed ABB's Optimize^{IT} Real Time Production Intelligence (Real-TPI) software.

Real-TPI software is a factory information system that raises productivity by finding ways to increase production efficiency and eliminate stoppages.

L'Oréal put Real-TPI to work on a high-speed hair coloration kit packag-

ing line at its Libramont facility, which makes retail hair care products like sprays and dyeing kits.

There was a rapid and significant increase in productivity, so L'Oréal installed Real-TPI on a second high-speed packaging line, where productivity again quickly improved.

Real-TPI allows L'Oréal to bring its lines up to nominal speed much faster because the software identifies, prioritizes and displays bottlenecks and emerging problems as and when they appear. This has substantially reduced the number and length of stoppages.

Over several years, L'Oréal installed Real-TPI software in four more high-speed packaging lines, collecting valuable and extensive data about the plant's production.

With this intelligence, managers are able to focus on top performance losers, while operators and maintenance staff are able to study underperformance and correct potential problems.



Keeps machinery humming at world's biggest oil refinery

ABB expertise is helping the state-owned Venezuelan oil giant *Petróleos de Venezuela, S.A. (PDVSA)* to keep equipment in peak condition and maintenance costs down.



PDVSA is one of the biggest oil, gas, refining and petrochemical companies in the world, with proven oil reserves of 78 billion barrels, and 148 trillion cubic feet of natural gas.

To help keep these essential resources flowing, ABB signed an agreement with PDVSA to improve the reliability of electrical motors and pumps in the company's Complejo Refinador Paraguaná (CRP), which at 940,000 barrels a day is considered the biggest oil refinery in the world.

Improving the reliability of CRP's pumps and motors is a key element of the refinery's business improvement strategy. ABB Performance Services can help with asset management services that hinge on measurable, sustainable performance results for process and discrete industry customers.

ABB consultants first evaluated the selection, operation and maintenance practices of motors and pumps at the site, including industry performance benchmarking and best practice management.

Then with a PDVSA team, ABB identified improvement opportunities and developed a reliability program to increase the effectiveness of equipment and lower maintenance costs in a sustainable way.

ABB's Equipment Performance Management Service guarantees performance of a specific class of assets, such as motors, drives, pumps, and analyzers, by providing all maintenance and support required to meet operating targets.

Ensuring reliable power at Russian diamond mine

ABB switchgear and transformers are ensuring a reliable power supply at

the giant ALROSA diamond mine in the polar circle of eastern Siberia, where the winters are up to nine months long and outside temperatures may drop to -70°C.

For ABB, the ALROSA contract is more than a chance to demonstrate durable products and services –

it's a gem of a contract demanding the best ABB can offer in terms of quality, delivery, and given the extreme climate, the packing and transportation of its products.

The total order from Russia's biggest diamond producer, ALROSA Co. is for 120 panels of 12-kilovolt UniGear ZS1 that will operate indoors at tempera-

tures of at least -5°C in two of its diamond processing factories.

ABB Power Systems in Russia delivered 80 switchgear panels in July 2005, completing the first phase of the contract, marking a significant milestone for ABB's new local focused switchgear factory in Moscow.

The factory sealed a deal with ALROSA because of its ability to deliver locally-produced, cutting-

edge products, whatever the logistical challenges.

The factory is the first to produce locally ABB's UniGear ZS1 switchgear for the Russian market. Set up in late 2004, the factory has its own assembly, engineering, project management and service capability. As part of the same project, ABB is supplying its RESIBLOC dry distribution transformers. The RESIBLOC is the only dry transformer technology currently used

in conditions where temperatures can fall as low as -60°C .



FACTS technology boosts steel productivity worldwide

ABB's FACTS technology is helping steelmakers increase production to meet the boom in global demand for steel. In 2005 orders more than doubled from steel mills around the world.

The orders are for Static Var Compensators (SVCs) for steel mills in eight countries – China, Iran, Italy, Mexico, Russia, Spain, Taiwan, Turkey – and are part of an investment drive by steel producers to increase melt capacity and improve power supply to meet the surge in demand for steel.

Static var compensation is a comparatively straightforward way to boost steel production because it does not require additional investment in other components in the steelmaking process. The SVCs that ABB designs for this application stabilize power



supply and improve production capacity.

The orders are for existing and green-field installations and range from 90 megavolt ampere (MVA) to a record-breaking 310 MVA for a green-field mill in Turkey. This will be the largest SVC installation in a steel application ever, and considerably more powerful than the previous world record of some 250 MVA.

ABB has delivered more than 200 SVC installations to the steel industry worldwide. It has a pioneering tradition in the field as the innovator of both SVC and SVC Light[®], the latter a unique technology that creates a smooth and stable voltage in the melting process and reduces flicker and harmonics to levels impossible to reach with conventional SVCs.

High-end technology to connect Europe's power grids

ABB's cutting edge power transmission technology is helping to link European power grids. Two high-profile links, given the go-ahead in the past year, highlight the benefits of ABB's High Voltage Direct Current (HVDC) and HVDC Light[®] transmission systems.

Unique to ABB, will be deployed in a new link connecting the power grids of Finland and Estonia.

The so-called Estlink project, formally launched in Spring 2005, is the first European Union interconnection with one of its new member states since EU enlargement in mid-2004.

ABB will supply a 350-megawatt HVDC Light[®] cable link beneath the Gulf of Finland to connect the Finnish and Estonian grids, as well as converter stations at both ends of the link. About two-thirds of the cable will be underwater and one-third underground.

HVDC offers maximum security of supply and minimal environmental impact. The approximately 100-kilometer line will be oilfree and emit no magnetic field.



A second project, the 580 km-long HVDC transmission link connecting the power grids of Norway and The Netherlands, further highlights the benefits of ABB's high-end technology.

The link, the longest underwater high-voltage cable in the world, will lead to power trading between the two

countries and increase the reliability of electricity supply.

The project – a benchmark for further cross-border interconnections in Europe – is also set to achieve a number of European sustainability objectives, including the large-scale integration of renewable energy sources, a

massive reduction in CO₂ emissions, and exceptionally low transmission losses.

Setting up the largest transformer bank in India's new super grid

India's ambitious plans to increase the country's power supply, and improve transmission and distribution, have led to two major contracts for ABB's power transformers in recent months.

Under one of the orders, ABB is to set up the country's largest-ever transformer bank. ABB is supplying the 765 kV auto-transformers and reactors to Power Grid Corporation

of India Limited, underlining the company's position as the world leader in manufacturing high-end 765 kV transformers.

The transformers and reactors will be installed at Seoni substation in the central state of Madhya Pradesh in order to transmit power from the new 3,000 MW Sipat power plant being set

up in the neighboring state of Chattisgarh.

ABB received another, similar order early in 2005 from the National Thermal Power Corporation for transformers for the Sipat plant. It was India's first major 765 kV equipment order for extra high-voltage transformers and reactors.



India's transmission system currently operates mainly at 400 kV levels. It is in the process of developing a "super grid", involving extra-high voltage capabilities at 765 kV, in order to strengthen the power network, increase grid reliability and help meet growing power demand.

Improving efficiency and saving energy

ABB's leading-edge power management and control systems have helped hundreds of power plant operators around the globe to improve their operating efficiency and reduce energy use as well as emissions. The same critical level of power is generated but less fossil fuel is used.

A recent major order in South Africa will help the state-owned utility Eskom to refurbish and increase the efficiency of a coal-fired power plant at Standerton in the east of the country, and extend its life span.

ABB is providing one common state-of-the-art instrumentation and control system which will replace obsolete control systems used at the plant's six power generation units. All six turbines will also be modernized with ABB's Turbotrol turbine control system and a retrofit of the hydraulic protection system.

The ABB control system will provide a common solution for turbine control and protection, unit control and boiler protection for all six turbines and three boilers. ABB will also equip all six-power generation units with an advanced unit control solution to improve grid stability.

The instrumentation will lead to greater measurement accuracy, increased stability and higher dynamics in transmission behavior.

Improvements in operating efficiency will also provide environmental benefits. ABB's products and solutions for power generation help reduce harmful emissions by improving power plant combustion and identifying potential performance improvements.



Improving London Underground's power supply

ABB technologies are helping to power one of the world's most complex subway train networks – the London Underground, which encompasses 270 stations and more than 400km of track and is used by some 900 million passengers a year.

ABB has installed five Static Var Compensators and ten stand-alone harmonic filters in critical points of the London Underground 22kV distribution grid. The project has been carried out by ABB working within the EdF Energy Powerlink private finance initiative consortium.

As a result London Underground is able to draw its entire annual one billion megawatt hour power requirement from the U.K. national grid.

A second power station has been refurbished and provides emergency power in the event of a grid failure, allowing time for the main power system to be reconfigured.

The ABB equipment is optimized to smooth load fluctuations and reduce harmonic disturbance on London Underground's two power distribution networks, at 22kV and 11kV, which provide power to 158 delivery points. The size of the London Underground, combined with the nature of the train loads, with large numbers accelerating and braking at any one time, made the project one of the most complex reactive power compensation studies ever undertaken by ABB.

The power supply system is continuously managed by control room staff who ensure that power is available for the safe and reliable operation of traction, signalling, lighting, station services, tunnel ventilation and escalators.

ABB has also carried out the design, installation and commissioning of a new single, centralised SCADA (Supervisory Control and Data Acquisition) system to provide overall control of the power distribution network.



Fast trains in China powered by ABB

ABB motors and traction transformers will power 20 new high-speed trains that will connect the booming cities of Guangzhou, Shenzhen and Zhuhai in the Pearl River Delta, one of the most important hubs of China's economic growth.

Bombardier Transportation, the world's largest train manufacturer, chose customized, 275-kilowatt train motors from ABB to power the high-speed trains that will soon crisscross this region at speeds of up to 200 kilometers an hour.

ABB is also supplying 25kV traction transformers – its first big order for traction transformers in China.

The trains will link cities and manufacturing centers on both sides of the Pearl River to a single, high-speed railway stretching from Hong Kong to Shenzhen in the east, through Guangzhou and west to Zhongshan and Zhuhai.

China is the biggest mass transit market in the world, with 37 cities that



currently have populations of more than one million people. The government is investing billions of dollars to modernize the country's rail network, including high-speed rail links between major population centers like Beijing, Shanghai and Guangzhou.

ABB has a long-term agreement with Bombardier Transportation to supply motors, traction transformers, power semiconductors and other power and automation products.

ABB has a proven capability in designing, manufacturing and delivering traction transformers which meet the space, weight and installation constraints of trains. The transformers also have very low life cycle costs, as well as guaranteed reliability and efficiency.