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The customer magazine
of ABB in India,
Middle East & Africa

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Mahmoud Shaban
Country Manager - Saudi Arabia
Sub-Region Manager -
Arabian Peninsula
Region Division Manager,
Power Systems - MEA

Dear friends,

In the Arabian Peninsula governments have turned to mass transit solutions. Saudi Arabia, Kuwait, Bahrain, Jordan, Syria and Iraq are all weighing up the possibilities of implementing mass transit solutions to ease traffic congestion and provide their citizens with an alternative to their cars. Similarly the GCC railway will change the region's logistics network once and for all.

These are once in a lifetime projects. The need for transportation investments is pressing, as is the desire to ensure that these investments are long-lasting. This is where ABB has a role to play. Our experience in the transportation sector is long and varied. We have worked with the railway industry for decades. Similarly, our marine experience is also one that we are proud of.

ABB has begun to work with contractors and developers on projects

in countries such as Saudi Arabia and the UAE. Our electrification and control system products will be part of one of the first transit solutions in Riyadh, at King Saud University. Similarly, we have played a part in building the Dubai Metro.

We all envision a region where multiple transit options are available to all. ABB can and will play a role in making that vision become a reality. ABB will be investing in its railway and transportation teams locally, with the aim of passing our knowledge and know-how to you. I hope you enjoy this issue.

Yours sincerely,

Mahmoud Shaban



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Powering Saudi Arabia's largest university



380 kilovolt gas insulated substation to facilitate power reliability

ABB solution will provide reliable power to Najran University, Saudi Arabia's biggest educational institution.

A substation will be supplied to Najran University, Saudi Arabia's biggest educational institution, to help ensure reliable power supplies for the campus.

ABB will be responsible for the design, supply, installation and commissioning of a 380 kV (kilovolt) substation capable of distributing power at 132 kV and 13.8 kV. The turnkey order includes civil works and auxiliary systems as well as key equipment such as gas-insulated switchgear (GIS), transformers, protection equipment and substation automation.

This substation will help meet the growing demand for electricity and support the expansion of Najran University. ABB's compact GIS technology will ensure reliability and at the same time minimize the substation footprint.

Najran University is located in the city of Najran in the south of Saudi Arabia. The university, which was founded in 2006, is the country's largest by area and covers 18 million square meters. The university complex will house two campuses for males and females and will encompass 15 and 10 colleges for males and females respectively with an overall capacity of 45 thousand students.

The university will also house administrative buildings, a medical city, a research center, sports facilities and housing accommodation for faculty and staff members as well as students. Future investments will include a five-star hotel, commercial centers and private schools.

Improving grid reliability in Saudi Arabia

Saudi Electricity Company, Saudi Arabia's national power transmission and distribution operator will be provided with six substations to boost power capacity and improve grid reliability.

ABB will design, supply, install and commission the 110/13.8 kilovolt (kV) substations, which are scheduled for completion in 2012. The scope includes delivery of other major equipment including gas-insulated switchgear, medium-voltage products, transformers as well as network protection and low-voltage auxiliary systems. Each of the substations will be equipped with the latest IEC 61850 compliant automation, control and protection solutions.

IEC 61850 is an international communications standard that ensures interoperability and open communications between substation devices and other grid installations.

Substations are key installations in the power grid. They transform voltage levels and facilitate the efficient trans-



110/20 kV Harman transformer substation

mission and distribution of electricity. They include equipment that protects and controls the flow of electrical power. ABB is the world's leading supplier of air- and gas-insulated substations, with

more than 10,000 installations worldwide covering a range of voltage levels up to 1,100 kV.

First Smart Campus workshop in Saudi Arabia

ABB in Saudi Arabia's KNX team showcased intelligent solutions for buildings and campuses in the first intelligent industries workshop organized by the Ministry of Higher education recently. The aim of the event was for technology vendors to discuss with universities both the concepts as well as practical applications for today's campuses.

The booth was visited by management from universities nationwide who were interested in ABB solutions. ABB was invited to visit the universities and give presentations on the solutions for smart campuses.

ABB's smart building solutions are based on the simple, yet proven KNX technology which is now accepted as the world's first open standard for the control of all types of intelligent buildings - industrial, commercial or residential.



ABB booth at Smart campus workshop

With ABB's KNX systems, the buildings we occupy are easier to manage and control, resulting in increased flexibility, security, economic efficiency and convenience.

For more information: www.abb.com/knx

Showcasing ABB solutions at KFUPM

ABB automation solutions consisting of 800xA direct control system were displayed at the control systems and electrical engineering department of the King Fahd University for Petroleum and Minerals (KFUPM) by Process automation division's Oil & Gas and Petrochemicals business. Several hundred students attended the exhibition which saw participation by the Saudi Basic Industries Corporation, one of the world's leading manufacturers of chemicals, fertilizers, plastics and metals. KFUPM was established on September 23, 1963 by a Saudi royal decree as the College of Petroleum and Minerals providing high-level education about petroleum and minerals. It was elevated to university status in 1975. Among Saudi universities, it is highest regarded for excellence in its science and engineering programs.

For more information: www.abb.com/controlsystems

Iron ore pellet plant commissioned in Bahrain

Integrated process control and electrical system provides enhanced process control, monitoring and energy efficiency



Helping efficient manufacture of iron pellets

The new pellet production line no.2 at Gulf Industrial Investment Company (GIIC), Bahrain has been commissioned by ABB.

Production at GIIC's pellet plant no. 2 is rated at six million tons of iron ore pellets per year; after commissioning, its production capacity doubled to more than eleven million tons per year.

ABB's scope of supply comprised engineering, manufacturing and delivery of intelligent low voltage (LV) motor control centers, an emergency power generator, medium voltage (MV) power factor correction, MV and LV motors and variable speed drives, integrated with a System 800xA process control system, field instrumentation and a collaborative production management system (Knowledge Manager and maintenance management system). The delivery also included infrastructure systems, fire detection, telecommunication, lighting, cabling, earthing and lightning protection.

ABB provided related engineering services to the customer including installation, supervision and commissioning of the material as well as customer training.

GIIC will benefit from enhanced process control and monitoring, as well as from increased energy efficiency, provided by the integrated process control and electrical system. Field instruments, intelligent motor control centers and variable speed drive systems are all integrated with the core 800xA control system, so the operator has a wide variety of views of the concerned process parts (aspects). The ABB Knowledge Manager system further collects and monitors process data to provide pellet plant specific reports. The system also links to the overall GIIC ERP (Enterprise Resource Planning) system, comprising a maintenance management module including spare parts control.

In mid 2007, Kobe Steel Ltd. awarded ABB with a contract to supply GIIC with

electrical equipment and control systems to support the expansion of their plant. Kobe Steel Ltd. is one of Japan's leading steelmakers and a major contractor for iron ore related processes.

Mechanical and electrical installations were concluded in spring 2009 and the first pellets were produced mid of 2009. The acceptance certificate from GIIC was awarded at the end of June 2010.

GIIC is located in the Kingdom of Bahrain and produces high quality direct reduction grade iron oxide pellets; its new annual rated capacity is eleven million tons. The project was executed within the tight schedule required by the client and the end user now benefits from a state-of-the-art plant that already produces more than the original rated capacity. The iron ore concentrate shipped to GIIC is being grinded, then mixed with additives and processed to iron ore pellets in a grate kiln.



Intelligent lighting systems

Energy efficient KNX solution for Al Khobar hotel

ABB KNX technology lighting system helps InterContinental Al Khobar achieve significant energy savings.

A lighting control system based on ABB KNX technology helps InterContinental Hotel Al Khobar achieve double-digit energy savings. The InterContinental Al Khobar, which opened in 2009, will be the first hotel in Al Khobar to implement ABB's KNX-based technology, which will allow the facility's management to control lighting throughout the six-storey building. Individual functions include automatic lighting control, timer control, and a host of custom light scenes.

ABB's lighting control system will provide the hotel with controllers for maintaining constant lighting levels through a combination of natural and artificial light. Motion and presence sensors for the automatic control of lighting and other consumer loads according to need, both

indoors and externally have been supplied. The KNX lighting control system was implemented by ABB partner Nassli.

Situated in the heart of Al Khobar and with 112 guest rooms, executive floors, and other modern amenities, the InterContinental Hotel Al Khobar is fast becoming the hotel of choice for business travelers to the Eastern Region.

"With environmental sustainability high on our agenda, we wanted to implement a lighting solution that would reduce our carbon footprint and increase our guest's comfort at the same time," said Josef Sorger, General Manager at the InterContinental Hotel Al Khobar. "To our delight ABB was able to deliver a guest-friendly solution that did both."

For more information: www.abb.com/knx

System 800xA to integrate the process and power devices



System 800xA control room

ABB's System 800xA Extended Automation controller has received KEMA certification for its IEC 61850 electrical integration interface. IEC 61850 is the global communication standard for power distribution and substation automation. System 800xA's unique ability to integrate wide variety of intelligent electronic devices provides a single platform for process and electrical systems, resulting in significant opera-

tional and energy efficiency benefits.

The IEC 61850 standard, along with other emerging technologies, has lowered the investment barrier for customers to integrate the process and power devices on their plant floors. The demand for integrated process and power automation is growing in traditional markets that are heavy energy users, such as oil and gas, power generation, pulp and paper, minerals and metals industries.

By integrating power and process systems on the common 800xA platform, customers optimize the design and performance of their electrical and automation systems and see additional benefits in reduced maintenance, engineering and overall lifecycle costs. According to leading research and advisory group, ARC, typical savings can result in a 20 per cent reduction in

CAPEX (capital expenditures) and OPEX (operating expenditures) by integrating these two, usually separate, automation infrastructures.

ABB's extended automation System 800xA has improved industrial productivity, safety, and operational profitability for customers from process industries such as oil and gas, petrochemicals, pulp and paper, cement, and mining to traditional electric and water utilities to alternative energy production such as solar, waste-to-energy and bioethanol.

KEMA is a global provider of business and technical consulting, operational support, measurement and inspection, testing and certification for the energy and utility industry.

For more information: www.abb.com/controlsystems

Collaborating with Canyon Offshore

ABB will be collaborating with Canyon Offshore for trenching services to support our subsea high-voltage cable installation projects. This partnership will further strengthen ABB's project capability in this specialized and growing market.

ABB is one of the world's leading high-voltage cable manufacturers, with extensive knowledge and experience across a range of applications including offshore wind farm connections, oil and gas platform power links and subsea interconnections.

Established in 1996 and now part of Helix Energy Solutions Group Inc, Canyon Offshore is an innovative and reliable marine contractor with specialized solutions for underwater and unmanned services in extreme environments. The company has an expanding fleet of purpose-built trenching vessels and access to a large fleet of dynamically positioned vessels capable of responding to extreme weather conditions.

For more information: www.abb.com/highvoltage

Modernization project to improve grid reliability

ABB has taken up a project to help improve grid reliability and network control. This includes upgradation of the automation and protection systems in 25 substations for the Brazilian power distribution utility, Light SA.

The project is part of an extensive modernization program being carried out by the utility in the Rio de Janeiro region to improve grid reliability as part of the preparations for the Soccer World Cup in 2014 and the Olympic Games in 2016.

ABB will install substation automation systems comprising of a range of protection and control equipment within the substations. Installations will include over 1,250 relays from the RELION® family of intelligent electronic devices (IEDs), modular relays from the COMBIFLEX® range and a MicroSCADA Pro supervisory system.

This solution will help improve reliability of power supplies and grid stability in the metropolitan area of Rio de Janeiro. The



Flexible AC transmission systems (FACTS)

system will also enable remote monitoring and control of the substations bringing efficiency and cost savings to the customer.

Light SA is Brazil's fourth largest electricity distribution company. It distributes electricity across one quarter of the state of Rio de Janeiro, serving approximately 3.9 million customers.

For more information: www.abb.com/substationautomation

Helping integrate renewable energy into the grid

ABB will supply an HVDC Light® (high-voltage direct current) converter solution to support the interconnection of the Norwegian and Danish power grids. The project is for utilities Statnett of Norway and Energinet.dk of Denmark. The 500 kV (kilovolt) link is a new record in transmission voltage using this technology.

The underwater link will boost transmission capacity and will enable both Norwegian and Danish networks to add more renewable energy to their energy mix and to use electricity more efficiently.

ABB will design, supply and commission two 700 megawatt (MW) converter stations based on the company's leading-edge HVDC Light® technology. The HVDC Light® solution will boost power capacity, enable better load balancing in both grids. It will also reduce the impact of power sys-



HVDC Light solution to boost power capacity

tem disturbances and contribute to the stability and reliability of the grids. The higher voltage level will also help minimize transmission losses.

HVDC Light® continues to be a prefer-

red choice for underground and underwater long-distance power interconnections as well as new applications, such as providing mainland power supplies to islands and offshore oil and gas platforms, city center in-feeds where space is scarce, and more recently in the integration of renewable energy generation from sources such as land based and offshore wind farms.

Controllability, compact modular design, ease of system interface and minimized environmental impact are some of the key advantages of this technology. These systems help overcome distance and grid constraints while ensuring robust performance, power quality while minimizing electrical losses.

For more information: www.abb.com/hvdc

Traction transformers for Bombardier

ABB has developed a highly compact, lightweight and powerful traction transformer for Bombardier's new locomotive. Especially designed for North America, the dual-powered locomotive ALP45DP can switch from electric to diesel mode automatically, without interrupting power supply to the coaches.

To provide North American railroad companies with the flexibility to benefit from increased electrification, Bombardier recently developed the ALP45DP (ALP - American Locomotive-Passenger) dual-powered locomotive. As it can switch automatically between two fuel modes and because of the tunnel restrictions for diesel operation, this will lead to shorter and more comfortable rides for the passengers.

For the ALP45DP, ABB designed a traction transformer that is 25 percent lighter than conventional designs with the same technical requirements, weighing around 10 tons.

Unlike other dual-powered locomotives that usually travel short distances and have only one engine, the ALP45DP is a long-distance locomotive with two high-speed engines, which means space for com-



Powering mobility for Bombardier

ponents like the traction transformer is severely reduced. The transformer can operate in three electrical systems (12 kV 25 Hz, 12.5 kV 60 Hz and 25 kV 60 Hz) and incorporates two high-power auxiliary transformers and two reactors, which distribute the power to the coaches for lighting, heating, air conditioning, toilets, passenger information systems and other

electrical requirements.

The transformer also withstands intense thermal shock caused by instantaneous acceleration when the locomotives go from zero to full throttle instantaneously. For more information: www.abb.com/transformers

Increased efficiency in wind turbine manufacturing



ABB robots painting a wind turbine

A robot-based surface finishing concept for rotor blades reduces paint shop energy consumption by up to 60 percent and paint consumption by 25 percent compared to alternative methods.

Wind turbine rotor blades are subjected to continuous levels of stress and environmental attack. Hence they require a special surface coating that has to be perfectly applied with micrometer precision at the specified thickness and smoothness. Poor finishing will lead to surface fatigue, blade degradation and reduced turbine output. The cost and logistical complexity of repairing or replacing a rotor blade, especially at sea, is huge.

To minimize these risks ABB has developed a fully automated robot-based concept that applies the coating with micrometer precision. The concept is available in either a stationary or mobile variant, to meet the needs of both large-scale and smaller scale manufacturers.

Unlike conventional paint shops, the ABB solution combines a highly compact footprint with a uniquely energy-efficient ventilation system that extracts the chemicals and recycles 95 percent of the air, thus reducing energy consumption to a minimum.

Building on the success of the concept, ABB has since developed a mobile portal-based variant that can paint even longer rotor blades of 80 meters or more in length. The portal is self-contained with all process equipment onboard, and has a remarkable productivity rate, about four times that of a manual paint shop.

For more information: www.abb.com/robotics

Revitalizing the grid in northern Scandinavia

ABB FACTS (Flexible AC Transmission Systems) technology is helping to strengthen power transmission capacity and security in northern Finland and Sweden. ABB has installed two turnkey series capacitors for the Finnish transmission operator, Fingrid Oy, to increase the capacity and security of its 400 kilovolt (kV) power transmission system.

Series capacitors are part of ABB's family of FACTS technologies and are an important part of a larger grid investment package in northern Finland, which is designed to increase Fingrid's transmission capacity to neighboring Sweden by some 200 megawatts (MW).

Rather than building new transmission lines, Fingrid opted to increase the capacity of its existing power network with a solution that could stabilize the network and at the same time meet the increasing market demand for power transmission between northern Finland and Sweden.

The series capacitors installed feature an ABB innovation known as CapThor™ that comprises of a very fast high-power plasma switch working in parallel with a fast mechanical switch. This combination provides compact, fast-acting protection against disturbances in the grid, such as lightning strikes which could damage the series capacitor. The device is unaffected by the environment, and may be used for a wide range of voltages.

For more information: www.abb.com/facts



ABB Facts series capacitors

Ultrahigh-voltage transformers for China



An ultra high voltage transformer

To strengthen the power transmission grid of China, ABB will design, supply, install and commission 800 kilovolt (kV) ultrahigh-voltage direct current (UHVDC) transformers for a converter station for China Southern Power Grid Co. Ltd. This converter station will form part of the Nuozhadu-Guangdong transmission system.

The 800 kV UHVDC transformer is a key component of ultrahigh-voltage power links that deliver large amounts of electricity over very long distances. UHVDC technology enables more efficient use of renewable energy sources, reduces dependency on fossil fuels and helps cut carbon dioxide emissions. It is particularly suitable for large countries like China, where the centers of power consumption are often far from power sources.

China Southern Power Grid is one of two leading state-owned utilities in China responsible for building and operating the power grid in the southern part of the country.

For more information: www.abb.com/hvdc

New testing facilities for oil and gas drive systems

ABB has recently established world-class electromechanical equipment test facilities at the headquarters of CESI (Centro Elettrotecnico Sperimentale Italiano) in Milan, Italy. These facilities will be used to test the load capacity and reliability of large motors and medium voltage drives used in a range of oil and gas applications, from offshore platforms to remote production sites.

ABB worked in close cooperation with CESI to develop the test facilities, which will help to meet the increasing demand from OEMs and end-users. The new facilities enable ABB to deliver certified equipments as per the requirements of the oil and gas industry where full load testing of electrical equipment is required.

The facilities will also allow testing of new equipment such as variable speed drives and a complete lineup of adjustable speed drive systems (the medium voltage ensemble of switchgear, transformer, converter, electrical motor and filters). Full load, no load, heat run, vibration and noise tests will also be performed in accordance with International Electrotechnical Commission (IEC) standards and vendor's requirements, including the strictest standards driving the oil and gas industry.

CESI is a market leader in testing and certification of electromechanical equipment and power systems in more than 35 countries all over the world.

For more information: www.abb.com/oilandgas



ABB testing facilities at CESI

Increasing productivity and lowering energy consumption



Gearless mill drive

ABB will provide gearless mill drives and electrical systems to Corporacion Nacional del Cobre de Chile (Codelco), the world's biggest copper producer. These solutions will increase productivity and lower energy consumption for Codelco at the Mina Ministro Hales mine in northern Chile.

The scope of supply includes three drive systems, one 12 megawatt (MW) system and two 8.9 MW systems. In addition, the order includes 220 kilovolt (kV) gas insulated switchgear, and three containerized rooms to house 23kV gas insulated switchgear, auxiliary services and power transformers as well as project engineering, installation and training.

ABB pioneered the development of gearless mill drives that address the production challenges faced by mine operators. The world's first gearless mill drive was delivered by ABB in 1969 and is still in operation providing cost-effective, energy-efficient performance with proven long-term reliability.

For more information: www.abb.com/mining

Efficient solution for gold mining

An ABB solution is enabling the highly energy-intensive ore-grinding process at Australia's largest gold mine. This process is the most powerful of its kind in the world. The solution has been operating successfully since March 2010 at the Boddington Gold Mine in Australia, which was recently modernized and reopened by owners Newmont Mining Corp.

A key part of the process is the ultra-powerful ABB variable speed drive system that controls the four huge high pressure grinding rolls (HPGRs) that grind the rock into optimally sized pieces that can be fed to the ball mills for further processing into gold and copper. These HPGRs are efficiently controlled by an ABB drive system, consisting of eight units and each of the unit is made up of an ACS1000 medium-voltage drive of 2,800 kW, converter transformer and squirrel cage induction motor.

Made by Polysius, these HPGRs are the biggest in the world and can grind up to 2,100 tons of material per hour. The drive system enables the HPGRs to grind hard abrasive rock more productively, more energy efficiently and with less wear and tear on the machinery than conventional crushers and mills. ABB variable speed drive systems have the fastest torque and speed response time of any technology on the market. They continuously adjust the speed of the grinding rolls in response to micro-second fluctuations in voltage and changes in size or type of media.

For more information: www.abb.com/drives



Medium Voltage AC Drives ACS 1000

ABB names Frank Duggan to Group Executive Committee



Frank Duggan

ABB has appointed Frank Duggan to the Group Executive Committee as Head of Global Markets, a role that represents the company's market and regional organizations at the company's top management level. Duggan succeeds Michel Demaré in this position.

Demaré will focus on his role as Chief Financial Officer following a return to growth in ABB's global markets.

Duggan has been manager of ABB's India, Middle East and Africa region since 2008. India was assigned to this region in 2009. He retains this role in addition to the new position which he took over on March 1, 2011.

"Michel has done a great job in establishing a pivotal role for Global Markets as a channel through which the needs and opportunities of our

global market organizations are brought to the Group level, and in contributing to the resilience of our markets in turbulent times," said CEO Joe Hogan. "It is now the right time to transition this role to Frank Duggan. His deep understanding of the priorities of mature and emerging markets, his attitude and his passion for ABB will all be very valuable at an important time for our growth ambitions and to strengthen our customer focus."

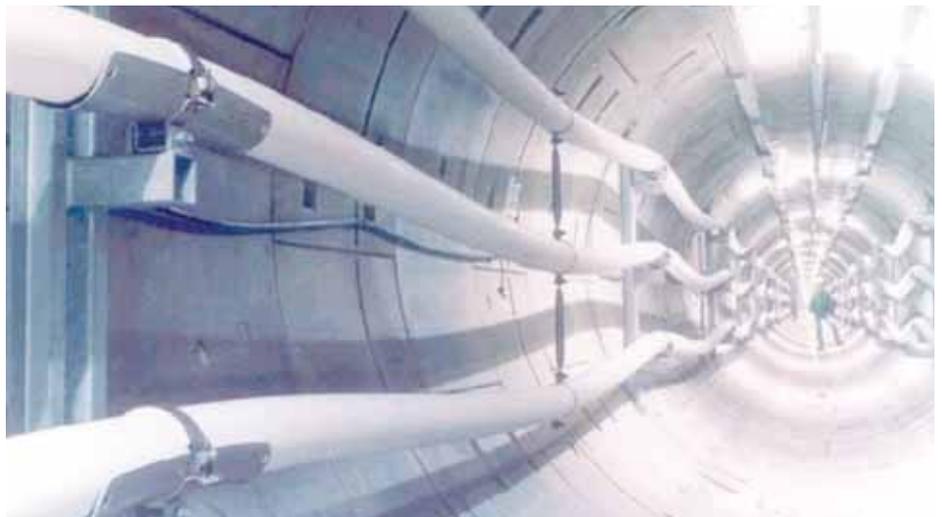
Duggan joined ABB in 1985 and has held a variety of roles including global management positions in the Process Automation division, and country management roles in Europe and Asia. Duggan will continue to be based in Dubai, and the other seven regions of the Global Markets organization will report to him.

ABB technology enables underground power production

ABB will build two underground substations for Qatar General Electricity and Water Corporation (Kahramaa), the electricity and water operator in Qatar, to help meet increasing residential and commercial demand for power in the capital city of Doha.

The substations will be practically invisible to the public and form part of the first phase of Musheireb, the key project of Dohaland, which is a subsidiary of the Qatar Foundation for education, science and community development. The project will include an underground pedestrian area, car parks as well as historic and new buildings.

ABB will design, supply, install and commission two 66 kV (kilovolt) gas-insulated switchgear (GIS) substations as well as transformers, 11 kV metal-clad air-insulated switchgear and cables. The substations will be equipped with ABB automation systems and the latest generation of protection and control products, compliant with the IEC



Safe, compact and efficient underground substation solution

61850 global substation communications standard.

Kahramaa is rapidly expanding and enhancing its power grid to meet growing demand for power in the region. Its transmission grid comprises about 200 primary high-voltage and extra-high

voltage substations as well as hundreds of kilometers of overhead lines and underground cables. The distribution network includes about 6,500 low and medium-voltage substations, supported by more than 4,500 kilometers of cables.

Helping expand potash production from the Dead Sea



Satellite image of the southern basin of the Dead Sea, with the APC salt ponds on the right and the Israeli salt ponds on the left, separated by a central canal that is also the international border between the two countries. The Dead Sea is one of the saltiest bodies of water in the world, with a salinity level of 33.7 percent, about ten times that of the average sea or ocean. Source: NASA.

Electrical, control and instrumentation package helps raise productivity and efficiency for the Arab Potash Company

Process automation systems from ABB are helping Arab Potash Company (APC) expand its extensive potash production and port facilities at the Dead and Red Seas in Jordan to become one of the most productive and efficient in the world.

ABB provided an electrical, control and instrumentation package to help boost capacity at APC's warehousing facilities at Aqaba by the Red Sea and make the storage and loading process faster and more efficient. The long conveyor system, three stackers and two reclaimers are now controlled by a System 800xA distributed control system that helps deliver a loaded product of consistent quality.

As a result of the two System 800xA automation systems at the potash refinery at Safi in the Dead Sea and Aqaba, and the ongoing modernization of existing facilities APC will have a leading-edge process automation system

that integrates all automation functions at the sites into a single engineering and operations environment enabling facilities to operate more efficiently and with considerably less cost.

APC is one of the world's major suppliers of potash, a vital plant and crop nutrient used in agricultural fertilizer all over the world. The company's vast salt ponds extend over 112 sq.km at the southern end of the Dead Sea, and its potash refinery at Safi on the banks of this hypersaline mineral-rich lake is capable of producing 2,500,000 tons.

Processing potash from saltwater is a long and complex process that takes around 12 months to complete. The highly saline water in the APC salt ponds is slowly evaporated by the heat of the sun to produce a mineral-rich slurry called carnallite, which is then processed into potash at the Safi refinery.

APC recently completed a large modernization and expansion proj-

ect at Safi to enhance the efficiency of the refining process and boost capacity by 25 percent from 2 million tons to 2.5 million tons a year. The existing hot leach and cold crystallization plants were upgraded and a second cold crystallization plant was built.

The three plants are the heart of the refinery. There, the carnallite is dewatered, crystallized, leached, dried, and screened into three grades of potash. Each stage of the refining process at the new plant is controlled and optimized by a state-of-the-art System 800xA distributed control system that monitors and manages process information from 3,500 input/output channels.

The project at Safi follows the recent modernization and expansion of APC's warehousing facilities at Aqaba by the Red Sea, where the potash is stored, ready for loading onto bulk carriers for shipment to markets all over the world.

For more information: www.abb.com/controlsystems

ABB adds sparkle to the Cullinan diamond mine

ABB in South Africa will be ensuring optimum performance of the mine winders at the Cullinan mine, owned by Petra Diamonds, a major supplier of rough diamonds to the international market. The contract is for the maintenance and the electrical inspections of the mine winders.

ABB has a dedicated team of specialists who will carry out the service maintenance and electrical inspections of the mine winders. The service contract is for four inspections and routine maintenance for the next five years.

These services are important for the upgrading and expansion of mining infrastructure and in assisting mines to use energy more efficiently.

The Cullinan mine is the third richest diamond producing mine in South Africa and also the world's main supplier of the highly valuable blue diamonds.

The recent acquisition of Coilmech,



Optimizing mining with technology and products

a mine hoist related business, is part of ABB's drive to create greater awareness of our mining technologies and product range. The acquisition extends our local

engineering and manufacturing capabilities and demonstrates ABB's commitment to local mining market.

For more information: www.abb.com/mining

Catering to the growing power needs of Bangladesh



Strengthening Bangladesh's power network

Supporting the rapid power capacity addition of Bangladesh, ABB will construct a new 230 kV substation with one and half breaker scheme. ABB will be joining hands with Power Grid Company of Bangladesh Limited (PGCB) for the extension and renovation of the substation at Fenchuganj and for the upcoming power island at Sylhet district along with the extension of

the Comilla substation. This includes the design, supply, installation, testing and commissioning of these substations.

This follows another project received by a consortium led by ABB for 132 kV grid substations at Munshiganj, Meghnaghat, Madigan and Hasnabad. This order was funded by Japan International Credit Agency (JICA) under their Asian Clean Energy Fund. The substation will help improve grid reliability and improve energy efficiency.

ABB's solution for the projects include large power transformers, high and medium voltage products, control and relay panels, substation automation system and fibre optic telecommunication system.

The rapid increase in power availability has necessitated corresponding strengthening of the national grid. PGCB is coming up with projects which have requirements for fast delivery so as to coincide with new power plants com-

ing on stream and facilitate the power offtake into the grid. The current project will evacuate approximately 300 MW of power to be generated at the upcoming Independent Power Plant (IPP) at Bibiyana. The ongoing project of Meghnaghat and Munshiganj similarly evacuates approximately 600 MW power to feed the local load, especially the industries.

ABB is also helping to improve the distribution network of Dhaka by adding approximately 800 MVA. Though the long term focus is on gas and coal based power plants to address the acute power shortage, the government has undertaken emergency measures by temporarily permitting setting up of peaking and rental power plants across the country. As a result, a capacity of close to 1,000 MW will be shortly added to the grid, followed by a similar quantum addition in the next fiscal year.

ABB technology provides monitoring solution for Oil India

The Oil and Gas (O&G) business for ABB's Process Automation division in India bagged an order for a Supervisory Control and Data Acquisition (SCADA) from Oil India limited (OIL), one of India's leading energy companies. This project is similar to the ONGC Enterprise wide SCADA project being executed by ABB.

The real benefit of the project lies in providing OIL managers real-time, on-demand access to all the technical information across the facilities around Oil India's Duliajan office in the eastern state of Assam.

The scope of deliverables in this project includes a Master Control Center (MCC) at Duliajan. The master control room will be equipped with a video wall, web servers and main SCADA servers with human machine interface (HMI) for seamless operation. Oil India Limited's facilities like oil collecting station, early production system, water injection, central tank farm, gas collecting stations and electrical substations around a 40 km radius of the central office in Duliajan will be linked by the ABB solution.

Each facility will have SCADA terminal, Foundation Fieldbus based AC800F remote terminal unit (RTU) and field instrumentation whereas the electrical substation will have a RTU with numerical relay retrofitting. The scope of instrumentation includes water cut meters, mass flow meters, pressure, differential



SCADA control room enables real-time monitoring of OIL assets

pressure and temperature transmitters.

Oil India Limited has been an ABB customer for the last 13 years and already has a pipeline SCADA system (SPIDER) from ABB installed in 1998 for transport of crude oil. This was upgraded in 2008 with Network Manager by expanding an additional 655 km product pipeline control.

Oil India Limited is the oldest oil company in India with its history tracing up to 1890 for the first oil well Drilling

at Digboi in Assam state of India. The company named as Assam Oil Company by then was converted to Oil India in

Solution will help OIL oversee its facilities from the master control room in real time

1958 by Government of India. The company produced 3.7 mtpa of crude oil last year.

For more information: www.abb.com/scada

Powering the Cairo Metro

ABB in Egypt has undertaken the complete overhauling for 150 ABB medium voltage circuit breakers and 20 kV type HB of rectifier stations for Egypt's Cairo Metro Line #1. Metro Line #1 has a capacity for 1.5 million passengers a day. The project covered 16 stations from Sayda Zenaib station to Helwan station. Most of the circuit breakers were supplied between 1982 -1988 and were in need for overhaul. The rehabilitation of circuit breakers helped increase their lifetime, reduced the possibility of emergency faults and helped in achieving stability in the power supply network.



The ABB team who performed the overhauling job

The ABB team worked during the power shutdown phase from 1 am to 5 am and their efforts were appreciated

by the Cairo Metro management.

For more information: www.abb.com/mediumvoltage

Efficient and sustainable transportation solutions

ABB is a world leading supplier of innovative and reliable technologies to train manufacturers and railway operators. This includes rolling stock, infrastructure as well as FACTS, network management and SCADA systems. ABB also provides service, maintenance and retrofit.

Power and automation offerings from ABB contribute in improving the lives of more than two billion people in the 74 countries in the Indian sub-continent, Middle East, and Africa. As the growing need for movement of people and goods has made mobility an important aspect in this region, ABB highlights its commitment to efficient and sustainable transportation solutions.

Mechanized movement of goods is a prerequisite for concentration of industry and hence modern manufacturing methods. Similarly, the existence of large cities depends on the reliable transportation

for people, and continuous supply of food and other necessities.

Growing urbanization is increasing strain on infrastructure and adding to congestion. Concerns over air quality, CO₂ emissions, limited reserves of fossil fuels, and the spatial footprint of conventional modes of transportation are calling for cleaner and more efficient solutions.

Railways are well positioned to meet these requirements. Within city areas, suburban railways and metros make an important contribution to relieving road congestion while offering a low carbon footprint, and if electrified, zero emissions at point



ABB powers the Dubai Metro

of delivery. Many booming metropolises are facing the challenge and opportunity of creating new systems from scratch.

Through its expertise in the power and automation sectors, ABB can offer many products and technologies to the railway industry. Electric railways are major consumers of electricity, and this consumption can fluctuate strongly and in short time periods. Grid management technologies ensure power is delivered reliably while maintaining the stability of the supplying grids. To transfer power from grids to railways and to support the operation of both, ABB provides substations



and components (including transformers, frequency converters, switchgear, and FACTS devices). For the trains, the offerings include traction transformers, switchgear, motors, converters, power semiconductor devices, and turbochargers for diesel locomotives.

ABB has grown its rail activities considerably in recent years, becoming a major supplier for several of the leading train manufacturers and rail operators. The technologies and equipment serve in all rail applications, ranging from high speed and suburban railways, to metros, trams, trolleybuses and freight. Service, maintenance

and retrofits all form part of the offering.

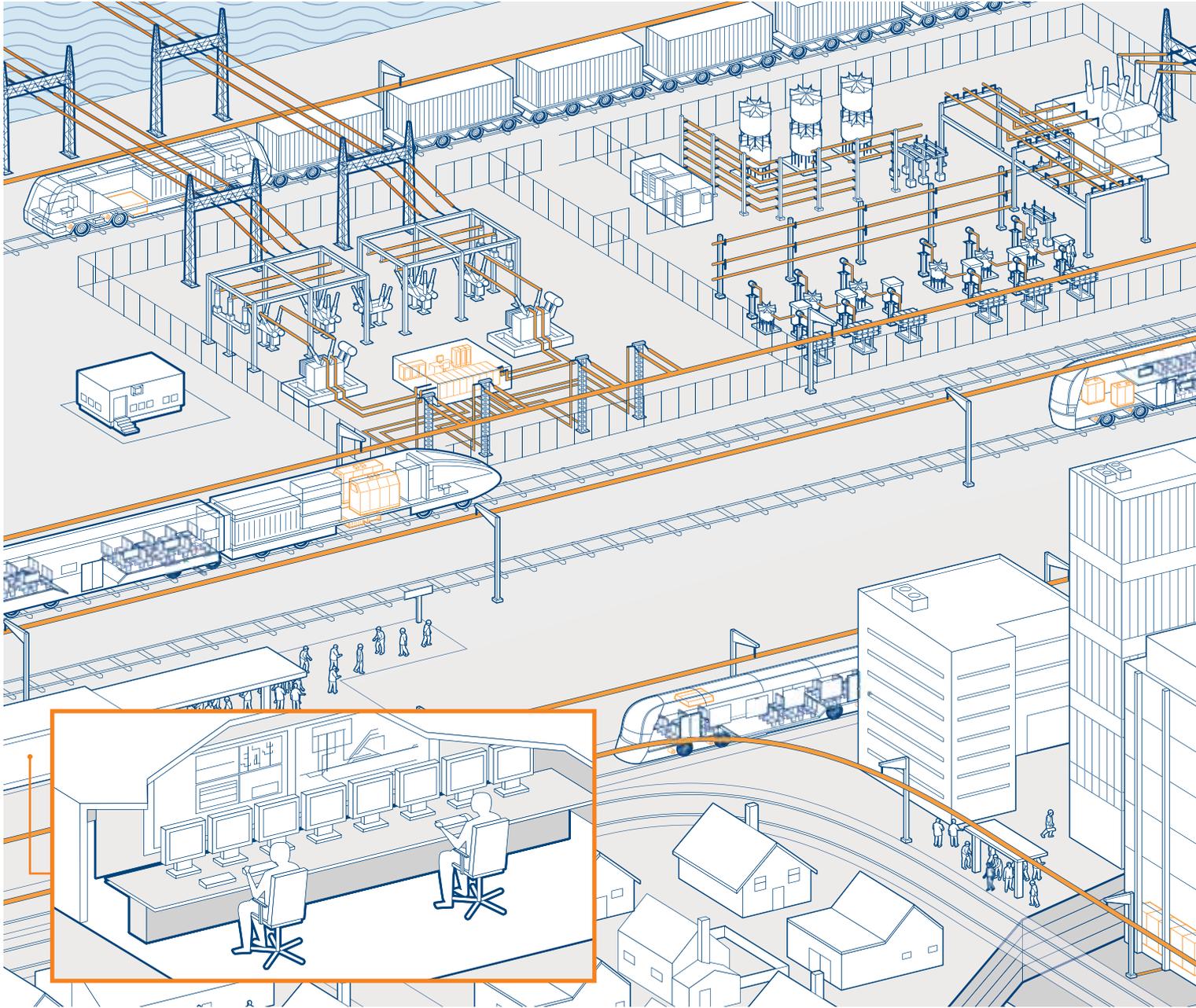
Since the beginning of the railway industry in the 19th century, ABB and its predecessor companies have been introducing new technologies, localizing products and services that improve the efficiency of an operating railway. We supply components and retrofit solutions for diesel and electrical locomotives, and power products to transmit, monitor and control power to the traction sub-stations for electrified networks.

With rapid urbanization, scope for metro rail solutions has emerged all across India, Middle East and Africa and we are

well poised to support these schemes having gained experience and a leadership position with urban transport projects in India, Saudi Arabia, South Africa, and UAE. ABB offers intelligent and reliable power supply networks for 25,000V AC overhead metro power lines in Delhi and Mumbai, as well as 750V DC metro lines in Dubai, Bangalore, and trolley bus system in Riyadh.

Our technological prowess, global presence, application knowledge coupled with local expertise provides products, systems, solutions and services for building efficient and sustainable rail networks.

Overview of ABB's railway capability



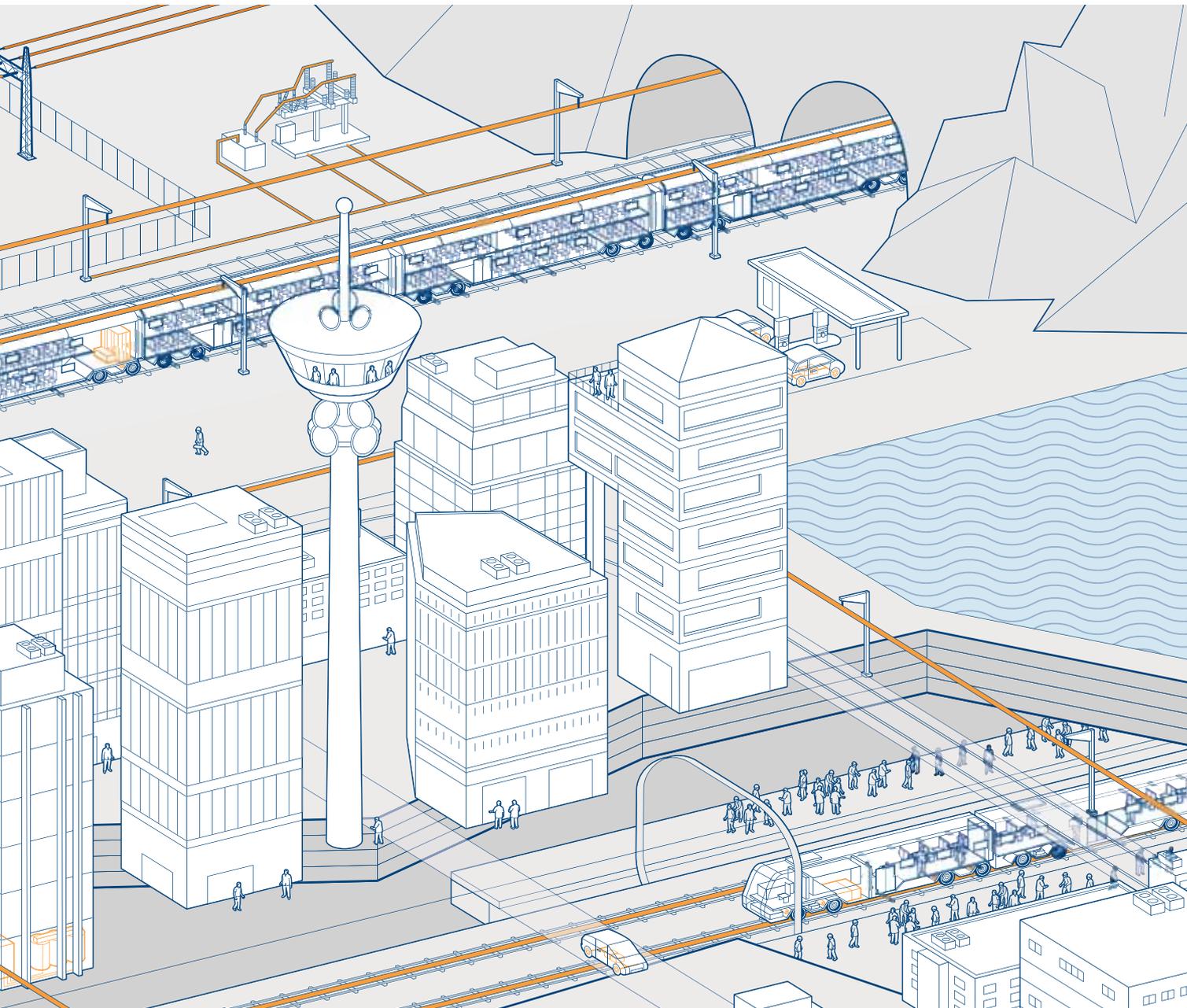
A global approach with local presence

With about 124,000 employees we are close to customers in around 100 countries. ABB has been present in India, Middle East and Africa region since 1926 when its first office opened in Cairo, Egypt, more than eighty years later ABB has major offices in all key countries in this region, employing nearly 12,000 people with manufacturing and engineering centers in Egypt, Saudi Arabia, India, South Africa, and the United Arab Emirates.

Key deliverables

- Complete substations and turnkey AC and DC rail power systems, FACTS, network management and SCADA
- Traction and trackside power and distribution transformers
- Main and auxiliary converters, battery chargers
- Traction motors and generators
- High, medium and low voltage products and systems
- Semiconductors
- Turbo chargers for diesel locomotives
- Static frequency converters
- Traction rectifiers

ABB is a world leading independent supplier of innovative and reliable technologies to train manufacturers and railway operators. This includes rolling stock and infrastructure as well as FACTS, network management solutions and SCADA systems. ABB also provides service support, including maintenance and retrofit.



Turnkey infrastructure solution and propulsion package

ABB is able to construct and install complete, turnkey trackside power supply systems for rail networks, offering a wide variety of innovative and reliable products for every aspect of rail infrastructure. Onboard trains, ABB's propulsion package includes the design, manufacture and supply of all the main traction components. This offers the best overall solution and optimisation in costs, reliability, weight, size and energy efficiency.

Efficient customer service around the globe

ABB has a global network of services for railway providing the possibility to get tailor made and lifecycle services for rolling stock and infrastructure. ABB's broad range of services consists of spare parts, maintenance, upgrades and retrofit, on and off customer site. A customized bundle of services is available based on the customer's operating needs, on demand when needed or in multi-year service level agreements.

For more information: www.abb.com/railway

Turbocharging solutions for Indian Railways

Indian Railways is the biggest customer for turbocharging in India. ABB turbochargers and turbocharger components are powering IR's diesel 750 HP to 4500 HP locomotives.



TPR61 turbocharger for railway applications



VTC high performance compact turbocharger for diesel engines

The exhaust gas of a diesel or gas engine is an useful resource, capable of producing up to fourfold gain in engine power, lowering costs and reducing fuel consumption. These exhaust gases of a diesel engine are used to drive a compressor via a turbine and force compressed air into the cylinder increasing the power output of an engine. Thanks to this relatively simple principle, turbocharging contributes nearly 75 percent of the total output of an engine.

The ultimate goals of turbocharged engine development are higher power and efficiency - two areas in which the ABB TPR turbocharger makes a vital contribution. ABB developed the powerful TPR especially for modern 4-stroke diesel engines used on heavy-duty locomotives, with features that meet the technical, environmental and cost requirements of the traction market well into the next decade. With the TPR model, ABB offers railway operators a turbocharger, that com-

bines highest performance and reliability with fuel economy and environmental compatibility.

Indian Railways (IR) operates approximately 10,000 passenger trains and transports 20 million passengers and 2 million tons of freight every day covering total rail network of 64,215 route Kms. More than 70 per cent of IR's rail network is catered to by a fleet of more than 4000 diesel locomotives. Diesel Locomotive Works (DLW), Varanasi and Diesel Loco Modernization Works (DMW), Patiala are two major manufacturing hubs for diesel locomotives in India.

ABB is the world leader in turbocharging diesel and gas engines in the 500 kw plus power range. Worldwide, more than 190,000 ABB turbochargers are in operation - on ships, in power stations and gensets, on diesel locomotives and large off - highway trucks. A global network of 110 service stations ensures close proximity to our customers and fast, top-quality service around the clock.



Energy efficient turbocharging solutions for Indian Railways

75 per cent of a diesel engine's power relies on one vital component, the turbocharger

Indian Railways is the biggest customer for turbocharging in India. The solutions offered are supply of new turbochargers to diesel locomotive production, spares for turbochargers at all zonal railways, Overhauling and workshop services for latest generation of turbochargers, rehabilitation program and design improvements keeping in view changing locomotive operational conditions for enhanced reliability and availability.

ABB turbochargers and turbocharger components are powering IR's diesel 750 HP to 4500 HP locomotives. Currently, more than 100 nos. VTR250, 700 nos. VTC 304 and 1500 nos. TPR61 model of turbochargers are operating in IR's fleet of diesel locomotives. The fleet is increasing every year with supply of approx. 300 turbochargers from ABB's Vadodara production facility. ABB turbochargers are an obvious choice because of long time between overhauls (TBO) of approximately 6 years, reduced

specific fuel consumption (SFC), high efficiency, integral turbine, uncooled gas casings, optimized single entry gas inlet casing, wide compressor map, unique patented foot fixation, high thermal efficiency to the tune of 70 per cent when coupled with compact, robust and rigid construction.

We are equally involved in future developments of diesel locomotives at Research Design and Standards Organization (RDSO) for technical upgrades. Our technical team collaborates in various projects of RDSO - emission reduction program, suitability check, turbocharger for BG 1350 HP Engine - to name a few.

ABB turbocharging is the preferred vendor for all the locomotives aimed for export because of wide spread service network across the region including 5 in India, two in South Africa and one each in Bangladesh, Sri Lanka, Senegal, Tanzania, UAE and others.

For more information: www.abb.com/turbocharging

Helping move the first automated metro in the Middle East

Reliable, high quality power is key to keeping the Dubai Metro running smoothly. ABB's Substation Control and Monitoring Systems (SCMS) and low-voltage products are working together to deliver reliable power to red line stations of Dubai Metro - a driverless metro network that is pegged as the world's longest fully automated metro system to be completed in one phase.

The metro network is 75 kilometers long and will carry 23,000 passengers per hour, per direction. The service has started with 12 trains on the tracks, which will go up to 44 once remaining stations are operational next year.

As part of a long-term frame agreement with Dubai Electricity and Water Authority (DEWA), ABB has designed and installed Substation Control and Monitoring Systems (SCMS) for three 132/33 kV gas insulated switchgear substations for Dubai Metro. The first two installed substations are currently supplying power to all red line stations, whilst the third substation - installed in March 2009 - will supply power to the entire Green line once it is operational in 2012.

ABB's SCMS technology is designed to increase energy efficiency and grid reliability for the entire electrical network by using a powerful set of tools to monitor and manage power quality. The substations also feature fault recorders and tariff metering systems to carefully monitor performance and ensure smooth operation.

Meanwhile, ABB's main distribution panels are responsible for the primary power distribution to the low-voltage network, which feeds the power distribution, lighting and HVAC (heating, ventilation, air-conditioning) systems within each metro station. The primary cabinets and motor control centers are designed using the ABB branded ArTu-K switchgear system.

Modernizing electric locomotives

ABB is partnering with Indian Railways to modernize traction converter technology deployed on IR's fleet of 3500 electric locomotives.

Trains drawn by electric traction on Indian Railways (IR) 20,000 Rail Kilo Meter (RKM) electrified network currently carry over 65% of freight traffic and over 50% passenger traffic. ABB is partnering with IR to modernize the traction converter technology deployed on IR's fleet of 3500 electric locomotives. With strong experience of manufacturing IGBT (Insulated Gate Bipolar Transistor) based converters for railway applications globally, ABB is helping Indian Railways modernize its fleet.

AC electric locomotives draw power from single-phase 25 kV Over Head Line (OHL), and converts it to a lower voltage for vehicle propulsion and for on board auxiliary power supply. The stringent physical demands on these converters include ambient temperature of 70 degrees celsius at start-up, voltage variation range ranging from 16.5 kV to 31 kV and vibration severity of 4 g.

Traction converters for fitment in IR's existing fleet of locomotives, have to be customized for shape, size, mounting dimensions and orientation of the product inside the limited space of the machine room. Further, since the locomotive drivers are accustomed to a particular way of operating, the converters have to be designed with software features, protection and interface details in order to maintain a standard look and feel.

The 6000 HP propulsion converter takes single phase 25 kV supply from the OHL, to a PWM controlled three phase voltage required by the six traction motors, which provide traction power to the vehicle.

IR's three phase 6000 HP AC locomotives, employed thyristor based propulsion converters. However due to demand of higher reliability and efficiency, IR has launched a program to upgrade the propulsion converters to modern IGBT technology.

ABB's BORDLINE® CC series water cooled propulsion converter based on low-loss HiPak™ IGBTs was selected



180kVA auxiliary converter

by IR for this upgrade for the following reasons:

- Improvement in overall power converter efficiency due to lower semiconductor losses.
- Enhanced tractive effort performance and availability due to use of axle control and new generation control system.
- Improvement in the quality of motor current waveform leading to reduced motor losses, torque ripple and better ride quality.
- Use of water cooling and components which comply with new OHSAS standards make the equipment more environment friendly and safe.

The 180 kVA auxiliary converter, takes single phase 25 kV supply received by the locomotive, and converts it to 415 V three phase, for power required by machine room auxiliaries on board the locomotive.

In conventional IR locomotives, rotary ARNO converters were used to generate 3-phase supply (3x415Vac, 50 Hz). In addition to high maintenance requirements of such rotating machines, ARNO converters have major drawbacks like poor voltage regulation, low input power factor, low conversion efficiency, presence of lower order harmonics at output

and no diagnostic facilities.

The power part of ABB's converters are equipped with Power Electronic Building Blocks (PEBB). PEBB is the new paradigm for designing high reliability static power conversion systems and is a power electronics packaging concept that replaces complex power electronics circuits with a modular, intelligent, reconfigurable and reliable power processing platform. These PEBB modules together with their hardware managers provide an optimum solution for the high-speed control requirements of demanding traction power conversion systems.

ABB is actively training IR personnel in the new IGBT technology. We offer on-site product training to the drivers and maintenance staff at locomotive-sheds across India coupled with training programs in IR's electrical training college in Nashik.

For more information: www.abb.com/powerelectronics

Powering South Africa's Gautrain



Gautrain is a variant of Bombardier's hugely successful Electrostar, all 1,600 cars of which are powered by ABB traction transformers and motors

ABB traction technologies powers South Africa's new high-speed railway, the Gautrain, linking Johannesburg, Pretoria and the country's largest airport.

Traction technologies from ABB are powering South Africa's new high-speed railway, the Gautrain, linking Johannesburg, Pretoria and OR Tambo International Airport, the country's largest airport.

The 80-kilometer Gautrain Rapid Rail Link brings high-speed commuter communications to Gauteng province, the smallest of the country's nine provinces, but the most important economically and the most densely populated.

ABB is playing a vital role in the project by providing advanced traction solutions that will power the entire 80-km line and the 24 electric trainsets that will operate at speeds of up to 160 km/h.

The power to the line solution comprises one main feeder substation, which steps down power from the grid to the correct voltage, and five auto-transformer paralleling substations located at intervals along the track.

The entire ABB solution is designed with exceptionally high levels of reliabil-

ity, redundancy and safety to ensure 99.99 percent availability. The equipment also has to withstand exposure to pollutants, high levels of seismic and lightning activity, and operate within a large temperature range and at high altitude.

Each of the 24 four-car electric trainsets is powered by an ABB traction transformer and a traction motor manufactured by ABB for train provider Bombardier Transportation. The Gautrain is a variant of Bombardier's award-winning Electrostar train, which is widely used in the United Kingdom and powered by ABB traction transformers and traction motors.

ABB has modified the transformer design to meet specific requirements of the Gautrain for high acceleration, low noise emissions and adaptability to the African climate. Chief among these modifications is a huge increase in power of around 40 percent to boost the train's acceleration.

Rolling stock traction solutions for optimized performance



Optimised electrical propulsion package to achieve superior performance

High integrated traction packages for all rolling stock

ABB is a global player and one of the very few independent suppliers of traction packages. This unique positioning and strong local presence in all major rail markets helps ABB to provide optimum solutions for vehicle manufacturers and train operators.

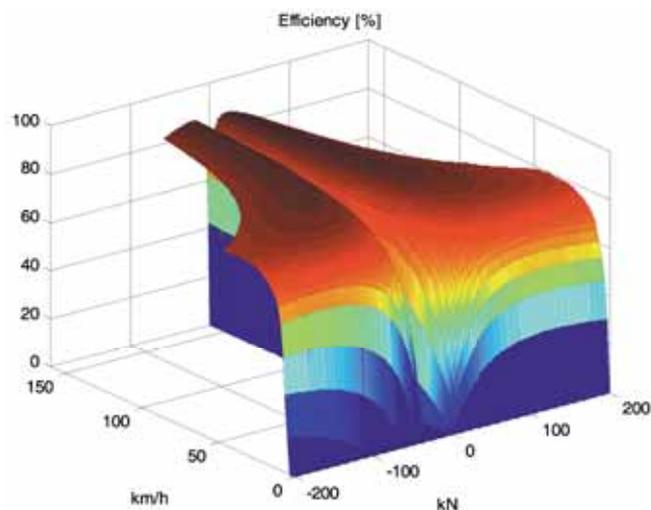
Key advantages and customer's benefits are :

- one single interface to the supplier
- total energy efficiency
- low life-cycle cost
- optimized dimensioning of components
- fast commissioning and homologation

Full service portfolio for rail customers

A typical customer's installed base may have been built up over a period of 40 years or more, and will reflect the different prevailing technologies during that period. ABB has hence developed a service portfolio to help customers face this challenge. Thanks to its vast knowledge base, ABB can provide service for rolling stock regardless of type or age. Work performed can range from routine diagnosis and maintenance to retrofitting, re-engineering and overhauls.

As a long term partner, ABB has a proven track record of service packages with railway customers in which ABB commits to improve the equipment performance and reduce the operating life cycle costs.



Design simulation for operating conditions



Service provided close to the customer

Infrastructure turnkey solutions for more capacity and power stability



Turnkey power supply solution tailored to customer's requirement

Turnkey railway infrastructure solutions

ABB offers a comprehensive range of AC traction substations for both 16.7 Hz and 50 Hz applications comprising single- or two-phase feeder substations and switching posts, autotransformer stations and substation automation (local control and protection). For DC traction substations, ABB is also an experienced partner taking care of system integration such as rectifier substations up to 3000 V DC.

Network management and SCADA systems

SCADA (supervisory control and data acquisition) automation systems enable remote monitoring, control and operation of traction power as well as data acquisition for traction substations. ABB SCADA system is the customer's choice for mainline and urban transport systems worldwide, due to its proven reliability and flexibility.



SCADA control room for a metro rail power system

FACTS solutions for improved power quality

Trains taking power from the grid must be able to rely on the supply to be stable. Similarly, power quality in the grid must not be impaired, despite harmonic generation and unbalance between the phases of the load. Time as well as money can be saved by implementing FACTS in existing systems rather than investing in new transmission or sub-transmission lines, and/or building new substations and feeding points.

Adequate power quality can also be achieved with in-feed at lower voltages as it may be sufficient to feed a railway system at 132 kV rather than at 220 kV or even 400 kV, which enables a lower investment cost and in shorter time. FACTS for railways comprises SVC, SVC Light[®] and Dynamic Energy Storage.



Outdoor substation module for mainline railway

Strengthening the power network in Kuwait

Kuwait's first 300/400 kV substation in Sulaibiya district has been commissioned on 24, February 2011. It is the first of the three substations which are being built to strengthen the country's power and transmission network. The three substations, in Sulaibiya, Fintas, and Jabriya, all rated 300/400 kV and are linked to the substation of the Gulf Cooperation Council Interconnection Authority (GCCIA)'s substation in Kuwait.

The three substations being built by ABB will transmit an additional 1500 megawatts (MW) of power from the Subiya power station presently under construction. Once complete, the three substations will increase the country's transmission voltage from 300 kV to 400 kV. The Sulaibiya substation will be able to serve more than fifty thousand households via distribution substations.

The completion date for Sulaibiya as well as the substations at Fintas and Jabriya is also significant. All of the substations are set to be energized before the summer months, and prior to Kuwait's peak season for electricity usage.

The country has faced power shortages over recent summers due to the increased load on the grid caused by air-conditioning. The substations at Sulaibiya, Fintas, and Jabriya, combined with the additional power available to the country over the GCC Interconnection Grid (another ABB project - see page 29) will ensure that Kuwait will face far fewer blackouts in future.

The Sulaibiya substation was inaugurated by His Excellency the Minister for Electricity and Water, Dr. Bader Al-Sherean on 24, February 2011 in commemoration of Kuwait's 50th anniversary of independence and 20th anniversary of liberation following the Gulf War.



400 KV gas insulated switchgear room at Sulaibiya substation

The substation itself is one of the largest ever to have been built in Kuwait. The total space taken up could easily cover five full-length football fields. This is one of the largest substations in the Gulf and Middle East region.

The major electrical equipment for the Sulaibiya site was imported from Switzerland and Germany. In total 24 bays of 400 kV Gas insulated switchgear with 72 Circuit breakers plus 13 bays of 300 kV Gas insulated switchgear with 39 circuit breakers were installed at the site. In addition, ABB also supplied the network protection and control equipment currently installed at the site.



The substation includes four power transformers with a capacity of 750 MVA. In total, ABB has imported twelve, 703,000 kilogram transformers to Kuwait. The transformers, which measure 14.5m lengthwise by 17m width wise and are 10.4m tall, are possibly the largest ever installed in the Middle East. The weight of a single transformer used at Sulaibiya is equal to the weight of 450 passenger cars or the weight of two fully loaded Boeing 747 airplanes. The transformers, which are a story all in their own right, had to be transported at a speed of five kilometres an hour through Kuwait's streets at night to avoid traffic congestion.

ABB expertise in substations

Substations are key installations in the power grid that facilitate the efficient transmission and distribution of electricity. They include equipment that protects and controls the flow of electrical power. ABB has been designing and building substations for more than 100 years. In that time ABB has supplied some 5,500 air insulated and gas insulated substations for all voltage levels and all climates, from the densest downtown locations to the harshest environments on earth. ABB engineers, manufactures and delivers complete installations, and the company has dedicated substation capabilities in around 100 countries.

In March 2009 ABB was awarded the contract, worth \$450 million, to build the three substations. According to Rainer Brauksiepe, Local Division Manager for Power Systems of ABB in Germany, the scope of this project was unrivalled in a country the size of Kuwait. "In a record time of two years, an international team of engineers and construction workers from Kuwait, Germany, Switzerland and other countries executed the building and installed and commissioned the electrical equipment at Sulaibiya. At various times during the project up to six hundred people were busy on this site. We did not have a single serious injury during this project," he said.

For all those working on the project, the highlight was the inauguration of the substation by His Excellency the Minister for Electricity and Water Dr Bader Al-Sherean. "ABB has been able to complete Sulaibiya to the specifications of Kuwait's Ministry of Electricity and Water. This would have been remarkable had we been working on only one substation," said Richard Ledgard, country manager for ABB in Kuwait. "The fact is that we've been working on two other substations which are just as large as Sulaibiya at the same time. We've proved beyond a doubt that we can deliver to the highest standards despite the challenges."



The Kuwaiti minister for Electricity and Water Dr Bader Al-Sherean being presented a memento at the opening of the Sulaibiya substation



His Excellency the Minister for Electricity and Water for Kuwait Dr Bader Al-Sherean inaugurating the Sulaibiya substation

ABB in Kuwait



ABB Kuwait has been involved in some of the country's largest projects. ABB Kuwait's support has been key to the successful completion of the GCC interconnection grid project as well as the first 400 kV substations in the country, at Sulaibiya, Fintas, and Jabriya. Less than half a year back ABB made history in Kuwait again following the signing for the building of the Mina Abdullah water pumping plant. The plant will pump about 1.5 million cubic meters of water a day from two desalination plants, more than doubling the country's fresh water supply. This increase in capacity will support the needs of the country as it looks to develop the economy over the coming decades.

Improving reliability for the GCC interconnection grid



The GCC Interconnection grid consists of over 900 kilometers of double circuit 400 kV backbone of overhead line links from Kuwait, through Saudi Arabia with taps to Bahrain via Submarine cable, and Qatar. The grid is currently being extended to the U.A.E and Oman.

Seven main 400 kV substations were also built to link the four countries of Phase 1 of the Project, between Kuwait, Saudi Arabia, Bahrain and Qatar.

As the Interconnection grid connects the three 50 Hz systems of Bahrain, Kuwait and Qatar with Saudi Arabia's 60Hz system, one of the biggest HVDC back-to-back convertor stations in the world was built with a full capacity of

1800MW through three convertors. This links the grid to the main Saudi Arabian 60 Hz grid.

ABB won the contract for the six, 400 kV substations, which were built in Kuwait, Saudi Arabia, Bahrain and Qatar. The total value of the contract was US\$222 million making it one of the largest substation orders ever awarded to ABB. ABB was tasked with the design and manufacturing of the equipment, system engineering, installation, commissioning and civil works.

The first interconnection energization step took place in Kuwait power system on the 17, February 2009. Kuwait's Al-Zour substation was energized by the GCC Interconnec-

tion Authority.

According to the GCC Interconnection Authority which manages the grid, the GCC interconnection will provide economical, operational and technological benefits to the six countries that make up the union.

The economic benefits include improved security of supply and improved economic efficiency thanks to the interchange of energy between the national grids. Security of electricity supply is one of the major spinoffs, particularly in summer when demand for electricity can exceed supply. The Interconnection grid can provide countries with an alternative source for energy reserves and support during emergencies.

Improving weld quality with ArcPack

The newly integrated robotics solution with 10 times faster internal digital communication speed for robotised arc welding offers full integration of all welding equipment, easy programming and powerful performance for automated welding applications.

The robotic welding package, ArcPack, is designed to offer high quality welds with minimum downtime. The package includes ABB's fifth generation IRC5 controller, the touch screen interface FlexPendant, RobotWare Arc programming software and an IRB1410 industrial robot to deliver an integrated solution for hassle-free arc welding. The package is also provided with ABB's new RPC welding power source suited for MIG (Metal Inert Gas) and MAG (Metal Active Gas) welding automation.

The new RPC welding power source



Robotic welding package, ArcPack

offers enhanced control of welding applications enabling manufacturers to specify process parameters such as voltage, current and gas flow, managed via the ABB FlexPendant controller. Using efficient fieldbus-based communications, the RPC power source internal digital communication speed is 10 times faster than previous models. It offers faster reaction speeds and consistently smooth and reliable wire feeding for better control in MIG and MAG welding applications.

Working at the centre of the ArcPack

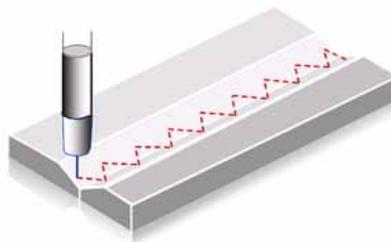
solution is ABB's IRB1410, a well-proven and cost-efficient robot with a stroke and reach accurate for arc welding applications. It is based on the IRB 1400, which has been installed in over 14,000 units worldwide out of which most are arc-welding applications. The IRB1410 is only delivered in the function package IRB1410 ArcPack. The package combines these benefits with those of the IRC5 world leading robot controller including superior path motion, user friendly FlexPendant programming, flexible RAPID language and powerful communication capabilities. This provides manufacturers with the tools for unmatched quality and improved productivity in arc welding installations. The welding torch, wire feeder, bobbin plus the power and signal cables, are also integrated with the RPC power source and the IRB1410 robot. The ArcPack robotic welding package provides manufacturers with intelligent controls to manage welding applications in metal fabrication industries, from bicycles, sporting goods, automotive parts to agricultural equipment. The technology can also be used to fabricate small and medium size components.

For more information: www.abb.com/robotics

Easy-to-use weld joint seam tracking system introduced

ABB robotics has introduced WeldGuide® III, an adaptive sensing system that performs weld joint seam tracking during the robot arc welding process. The system identifies variations in the weld joints and dynamically corrects the robotic torch path whilst in motion. Utilizing voltage and current sensors, the system takes real-time measurements through the welding arc to make any adjustments necessary to keep the robotic welding torch on the joint path; regardless of the path programming.

A combination of hardware and software, specifically designed for ABB's IRC5 robot controller, WeldGuide® III is half the price of the Advance Weld Controller (AWC) system (available from ABB since 1994) and is very much easier to use.



WeldGuide® III uses adaptive, thru the arc sensing, to keep the weld torch on the joint path

WeldGuide® III requires less initial programming than traditional robotic seam tracking systems and is ideal for applications on heavy weldments.

In heavy, high heat welds, WeldGuide® III provides more precise path accuracy and better weld integrity than would

be achieved with standard welding systems. With the tracking system automatically adapting to the part, WeldGuide® III provides consistent welds, even on parts where there is considerable part variation, providing far better throughput and less re-welding.

WeldGuide® III is easy to use and so cost effective that it is even appropriate for the smallest welding and fabrication shops. Primary application areas for WeldGuide® III on ABB robotic welding systems include off-highway and agricultural equipment, transportation, defence, and other manufacturers that fabricate large, heavy metal parts requiring longer, wider welds.

ABB robot ramps up productivity

The new IRB 2600ID robot with 15kg handling capacity increases productivity, simplifies programming and lowers overall operating costs in materials handling and machine tending applications.



IRB 2600ID-15/1.85 robot

An additional Integrated Dressing (ID) robot has been added to the IRB 2600 range of mid-sized robots. The IRB 2600ID with 1.85 metre reach has a 15kg payload capacity and a total upper arm load of 26kg. The new robot is designed with materials handling and machine tending applications in mind and comes complete with a flexible conduit for routing cables and hoses for signals, air and power inside the robot's upper arm and wrist.

According to Per Lowgren, product manager at ABB, the current trend in industrial robotic design is for integrated cables in the upper arms of robots. A robot with integrated dressing increases output and lowers operational costs, but until now, ID robots have been designed only for arc welding. With its increased load capacity the IRB 2600ID is well suited for applications such as case packing, machine tool tending, small format palletizing, plastic injection molding machine tending and foundry parts handling.

"Integrated dressing" or the use of integrated cables in the upper arms of robots

brings several benefits to robotics operations like operating at maximum speeds. It also simplifies off-line programming, as swinging cables do not need to be taken into account when simulating robot systems. The complete robot program can be made off-line resulting in a much faster start of production. Using this method programming time can be reduced by up to 90%. Cable and hose replacement costs are decreased by 75% and up to three production stops per year can be eliminated.

With its compact design, the IRB 2600ID has a very small footprint. The reduced risk of interference with other robots allows for productive, high-density installations with 50% more robots, and up to 50% higher output from a typical production cell.

The 15kg, 1.85m IRB 2600ID is available with ABB's well proven IRC5 Robot Controller and is fully supported by the ABB robotics global sales and service organization in 53 countries.

For more information: www.abb.com/robotics

Powering electric vehicles at Davos summit



One of ABB's AC charging stations at the Pavilion on the Davos Promenade recharging a Nissan Leaf during the World Economic Forum 2011.

Promoting sustainable transportation methods, ABB technology is charging the electric vehicles that are provided to political and business leaders during the World Economic Forum's annual meeting.

Seven ABB charging units are installed in the overnight parking lots used to recharge the vehicles. In addition, two ABB charging stations in the center of town will keep a Nissan Leaf and a Renault Fluence Z.E. topped up with clean fuel and available for test drive.

The push for lower emissions and also for quieter as well as less polluted cities has prompted innovation in electric vehicles.

ABB is developing a complete range

of systems for charging the vehicles, whether they are parked at the home or office, or during short stops to recharge while on longer journeys. The range includes fast chargers that use direct current (DC) and low-voltage chargers that use alternating current (AC), such as those in Davos.

"The infrastructure needed to charge electric vehicles and to ensure the grid remains stable when their numbers increase is crucial to the success of this sustainable mode of transport," said Ulrich Spiesshofer, head of ABB's Discrete Automation and Motion division.

ABB has invested \$10 million in ECOtality, a San Francisco-based developer

of charging stations and power storage technologies, to enter North America's electric vehicle charging market.

The AC station can fully charge an empty battery within 6 to 8 hours, while the DC fast-charge station can charge a vehicle within 15 to 30 minutes.

ABB's DC fast-charge technology was certified as fully compliant with the widely accepted CHAdeMO standard in 2010. It is now installed in a pilot scheme at the Hong Kong Science and Technology Park in partnership with the China Light and Power utility company.

For more information: www.abb.com/powerelectronics

Saving energy: The ABB way

Significant savings will be seen at ABB's Santa Palomba site near Rome, as ABB drives have been fitted to fans and compressors within the heating, ventilation and air conditioning (HVAC) system. This is in line with meeting the ABB goal of 2.5 percent per year energy efficiency gains.

In the HVAC system inverters were installed so that the operating frequency of two motors could be reduced without compromising the effectiveness of the system. The introduction of another inverter in the air conditioning ventilation system pro-

duced further savings.

The most significant savings made at this site, however, have been made by installing a variable speed drive to the air compressor and reconfiguring the operating logic so that the compressor now works with maximum efficiency.

The payback time of the whole program is approximately one and a half years. For some investments, such as the inverter installed on the air flow intake, payback comes within three months of operation. This initiative will allow ABB to

achieve energy efficiency goals, but it also allows us to avoid 147,000 kg CO₂ emissions per year, equivalent to taking 50 cars off the road or planting a 50,000 sq m tropical forest to absorb the carbon dioxide.

In 2008, the replacement of chillers in the air conditioning system reduced energy consumption by 1,000 megawatt hours per year, representing a 15 percent saving in the factory's total electric energy consumption.

For more information: www.abb.com/drives

Marine technology for new super seaway

The first ever cargo vessel to sail from Murmansk to Shanghai via the northern sea route without the assistance of ice-breakers - recently completed its maiden crossing, cutting a 65-day journey on the return leg down to 19 days. ABB's Azipod® electric propulsion technology makes the year-round journey possible.

The was completed by the Monchegorsk, one of a fleet of five ice-class container ships owned by Norilsk Nickel, one of the world's largest mining and metals companies. Prior to the Monchegorsk's historic journey, vessels crossing the frozen waters of the Northern Sea Route had to travel in convoys and needed the costly assistance of ice-breakers. They also faced a 60-65 day journey home via the Indian Ocean, Suez Canal and northern Europe.

Now the journey time between Dudinka and Shanghai has been cut to 19-20 days, without the icebreaker-escorted convoys which in turn saves time, energy consumption, shipping costs and greenhouse gas emissions.

This achievement is accomplished with a combination of ABB's Azipod® azimuthing electric propulsion system and Aker Arctic's double-acting ship (DAS) concept, which gives the container ships the capability of an icebreaking vessel and enables them to operate at high levels of efficiency.

Azipod® and DAS can cut through 1.7 meters of level ice and more than 10 meters of ridged ice with considerably less installed power and lower energy consumption than conventional diesel-driven vessels of the same weight and hull design. This hull strength and Azipod's unique ability to rotate the vessel 360 degrees with full torque and thrust in any direction creates the ultimate solution for icebreakers and icebreaking vessels.

ABB and Aker extended the concept to freighters a decade ago with the Tempera and Mastera, the world's first double acting oil tankers with icebreak-



Specialized solutions for marine vessels and systems

ing capability. Now with the Norilsk Nickel fleet of container ships, ABB and Aker have successfully extended the

concept to yet another shipping application.

For more information: www.abb.com/marine

Longmeadow, a shining example of ABB environmental best practice



Longmeadow is a shining example of a sustainable green building

ABB South Africa's new headquarters, factory and logistics centre on a 96,000 square meters site at Longmeadow near Modderfontein, Johannesburg, is a shining example of a green building built with the very latest environmental concepts and technology.

The new headquarters, factory and logistics centre for ABB in South Africa located on a 96,000 square meters site at Longmeadow near Modderfontein demonstrates an impressive depth of research and focus on design, construction, facilities management, automation, recycling and ongoing minimal environmental impact.

The Longmeadow facility reduces energy through use of solar heating, the recycling heat from air conditioning motors, extensive use of "grey" water and by implementing the building automation systems developed by ABB.

There is a rain water collection system. The roof area of Longmeadow amounts to 22,000 square meters and is designed as a catchment. Should a rainstorm deliver 10mm of rain, a total of 2,200 litres of rain water will be diverted from the roof catchment into two attenuation ponds and fed to tanks from where it can be used to water the gardens and top up water features. A ball valve system automatically distributes this water.

A north-facing solar heating system on the roof heats the water delivered to the showers. This natural, free energy source replaces the need for electrical heating and does not produce carbon emissions. Energy consumption for the building's heating system is also reduced with a heat reclaim pump system that captures hot air from the air conditioning system and diverts it to

supplement the building's boilers.

The building's H-shaped design contributes to lower energy demand for lighting by ensuring the office workstations are located in the exterior portions of the building where they receive good natural light. Each workstation is fitted with a photo-sensitive switch that turns the light on when people arrive at their workstations and off when they depart. All lights are low-energy and all of the service areas are located in the middle where 12V down-lighters and emergency lighting are installed.

In the factory section, low energy consumption, compact fluorescent lights are fitted. The power reticulation grid to the lights allows individual units within the factory to turn their lights on and off as required. For working overtime, only the section involved need be lit.

The Longmeadow facility has the ABB Building Management System (BMS) which is programmed to automate, control and manage all of the energy demands in the building with the result that the entire operation is as energy efficient as possible. The BMS provides a wide range of control functions, including fire control, security, power monitoring and air conditioning control. Variable speed drives, or VSDs, provide infinite control over the speed of motors driving pumps and fans, maximizing the building's environment by matching the temperature and humidity to the demands of the prevailing weather and the number of occupants.

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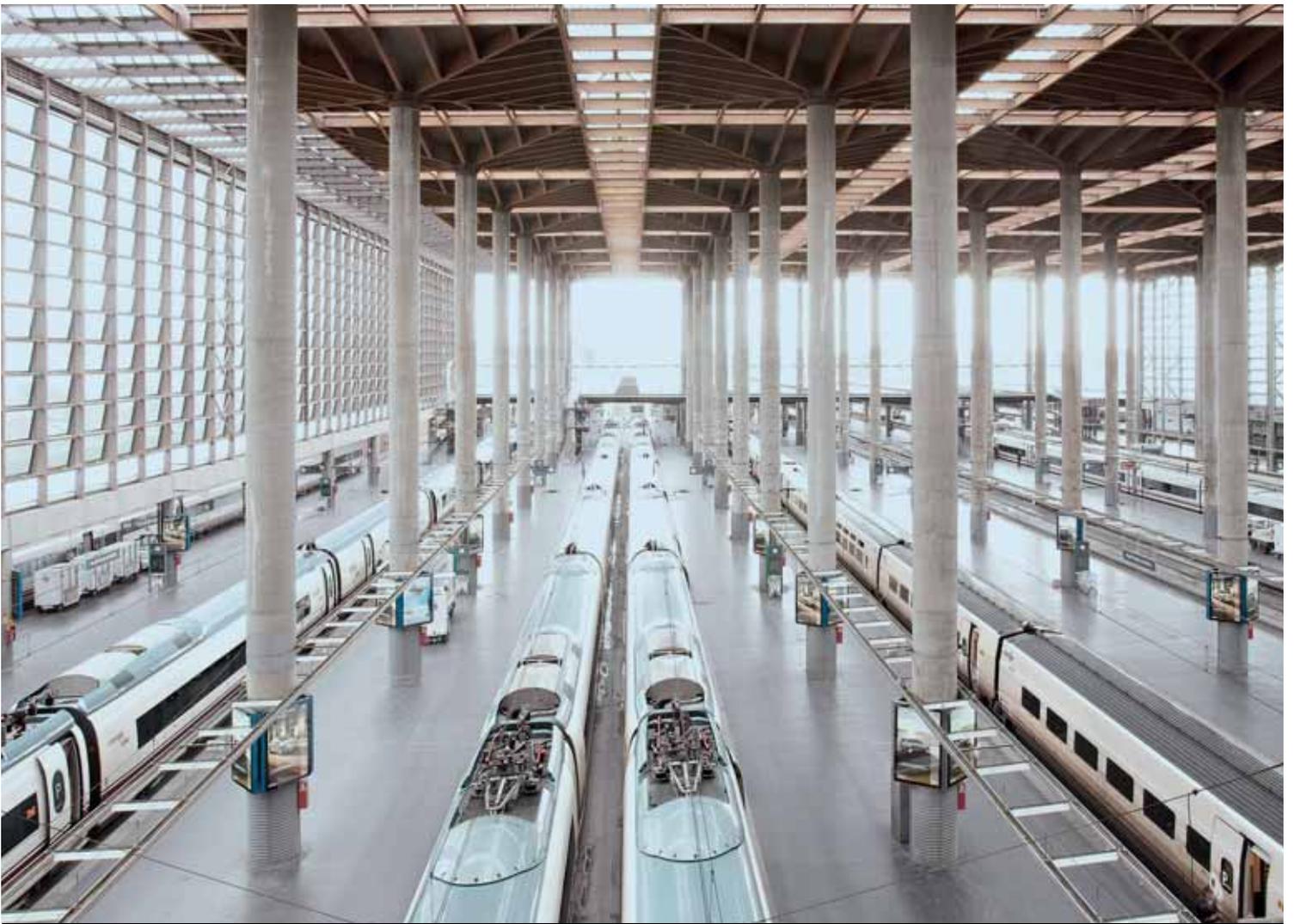
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Products and solutions for the complete water cycle

Water is the elixir of life. It is an essential resource for our ecosystems and the key factor supporting development activities from agriculture and industry to energy. It is of utmost importance to use this precious natural resource in a scientific and sustainable manner. Our goal is to optimize the employment of water and energy resources and to manage the integrated water cycle with efficiency and effectiveness.

ABB products and solutions are designed to improve the performance of water plants and networks. Our high efficiency motors and variable speed drives improve energy efficiency by up to 60 per cent. ABB water leakage management solutions help utilities to monitor and reduce losses from distribution networks. Irrigation solutions help to monitor and optimize water consumption in agricultural applications.

Learn about how ABB can serve you in the entire water cycle. From collection, through purification and transportation to distribution and re-use, we are ready to serve you with enhanced, efficient and reliable product and solutions.



Powering the railways. Efficient and reliable solutions for sustainable mobility.

As the world's leading company for energy and automation technology, ABB plays a vital role in the efficient and safe operation of railway public transportation systems and therefore also the sustainable care of the environment. Our reliable products can be found wherever railway services are set in motion by means of electrical energy, for example with energy-efficient on-board traction power supplies, infrastructure systems and network management solutions. www.abb.com/railway