An innovative 2008

In ABB labs and research centers across the world, more than 6,000 scientists and engineers are hard at work developing the technologies that will make the products of tomorrow possible.

Numerous successes are scored every year, and selecting the “greatest innovations” from among these is no easy task. The technologies presented here are but a small sample of the achievements worthy of note. They have been selected to give an insight into the various areas in which ABB’s research and development teams are active.

The features presented on these pages provide a brief overview of these innovations. They are discussed in more detail in full-length articles elsewhere in this edition of *ABB Review*.

Function and style

Energy-efficient buildings play an increasing role in mitigating challenging climate changes. Intelligent components in buildings equipped with sensors and actors can automatically adjust the sunlight or the lighting of rooms at night. Heating and cooling can also be tuned to optimize comfort with the lowest energy consumption for the inhabitants. But a smart infrastructure in the building also provides people with security systems, music, video or Internet connections. The technology for these universal functions in buildings is available, but will it be used?

Busch-Jaeger, a member of the ABB group, has – with its Living Space® concept – developed a new generation of building technology that combines flexibility and comfort with energy efficiency and security.

The communication of the user with the system is highly intuitive and similar to platforms people are familiar with in modern information and communication systems. Intuitive touch screens allow broad and flexible control of all infrastructure in the building and even provide information about the electricity consumption and the news or weather report, while the music of Sebastian Bach is playing in the bedroom upstairs.

Saving energy in buildings has never been more straightforward than with the easy-to-use panels and sleek design of the ABB Busch-Jaeger Living Space technology.

For more information see “Living Space” on page 11 of this edition of *ABB Review*.

A relay in one step

The development process of a new product is often burdened with budget constraints and time overruns. These are often caused by unclear specifications or changes made to the specification during the design process. ABB is bringing new low-end relays onto the market that were developed under the “first-time-right” philosophy.

By carefully analyzing the functional requirements of the product and by strictly adhering to the specifications, a rapid product development cycle was achieved. The principle of the “first-pass-yield development approach” is that one prototype is created and redesigns are avoided.

This was made possible through simulation of the relay’s hardware and software using advanced tools.

The relays are for low-end distribution applications. REJ601 and REF601 are auxiliary-powered, three-phase over-current and earth-fault relays with Rogowski-sensor interfaces. REJ603 is a self-powered, three-phase over-current and earth-fault relay with a customized current-transformer interface. REJ603 was the first of these to come onto the market, with the others to follow shortly.

For more information on these relays and their development, see “Getting it right the first time” on page 15 of this issue of *ABB Review*.

Gas-insulated switchgear reaches record voltage levels

China, with its huge distances between the power plants in the west and the main consumers in the east, is attacking the next level in transmission voltage by installing 1,100 kV AC transmission lines. Doubling the voltage from the traditional level of 550 kV reduces the transmission losses by a factor of four, which is a significant saving of energy.

To keep reasonable dimensions of the substations at this extraordinarily high-voltage level, gas-insulated switchgear (GIS), the very compact arrangements of circuit breakers and switches will be installed. ABB has made the leap to this ultra-high-voltage level and developed, together with its partners, the world's first 1,100 kV GIS. The substation with this GIS will be installed near the city of Jingmen in Central China. It will transmit part of the energy produced by the Three Gorges power plant to the northern part of China.

Type tests of the GIS components have been carried out simultaneously in Chinese, Swedish and Swiss laboratories. This successful project was not only the start of a new era in ultra-high-voltage transmission but also a powerful demonstration of the combined engineering capabilities of the world technology leaders.

For more information see "Breaking news" on page 20 of this edition of *ABB Review*.

Early warning

The electric grid that supplies all of us with high-quality energy is woven together with thousands of kilometers of overhead lines and cables. Millions of consumers are connected and hundreds of different power plants feed in their energy in different locations. Such a system is very sensitive to even small disturbances that in unfavorable conditions can amplify to a complete breakdown – a so-called blackout.

The earlier a network manager gets an alert about such a critical development, the better he can take preventive steps to counteract it. Long-network operators look for these early warnings about a frequency drop in Spain, for example, that could develop into a tripping of a power plant in Sweden. This permits them to take preventitive measures. The traditional Supervisory Control and Data Acquisition (SCADA) systems used by the operators do not provide this information. Now Network Manager, ABB's solution for SCADA and Energy Management Systems, offers wide-area grid monitoring and a new set of tools to get full control over the grid, even if it extends over thousands of kilometers. Relatively few strategically positioned phasor measurement units in the grid

are sufficient to get a full, real-time understanding of the system stability.

For more information, see "Taming the electric grid" on page 34 of this edition of *ABB Review*.

A new quality control system for papermakers

ABB's new Network Platform, the key component of its quality control system (QCS) for papermakers, is helping to reduce costs and maintain ABB's place as the number-one provider of QCSs in the paper industry worldwide.

The modern production of paper involves an almost unimaginable array of technology, of which the scanning platform is the focal point. The sensors in the platform measure conditions such as the moisture or fiber orientation of the paper as it is manufactured. The sensor data is then collated and fed into sophisticated control algorithms, which generate instructions for the paper machine.

Network Platform features state-of-the-art technology, is fully compliant with modern standards and has the capacity to accommodate many new technology advances.

New diagnostics tools and displays help increase customers' access to the paper process data. This, coupled with the overall simplicity and flexibility of the system, reduces training requirements and eases the configuration in the factory and during project delivery.

Building, installing and testing object code when the source is modified can now be done in just two to four hours. In addition, the de facto standard application language C++ is used in the scanning platform for maximum portability and supportability.

For more on ABB's Network Platform, see "Smarter platform, smarter process" on page 25 of this issue of *ABB Review*.

Stormy weather

With globally increasing requests for renewable energy, power generation with turbines are constantly on the increase. Meanwhile, wind farms with a total rating of more than 15,000 MW are being planned for the North and Baltic Seas, with the first of them already in the implementation phase. Germany, a pioneer in wind energy, is building the world's largest wind farm far out in the North Sea. On completion of the wind-farm projects currently underway in this area, the North Sea wind-farm network will have a rating of approximately 6,300 MW.

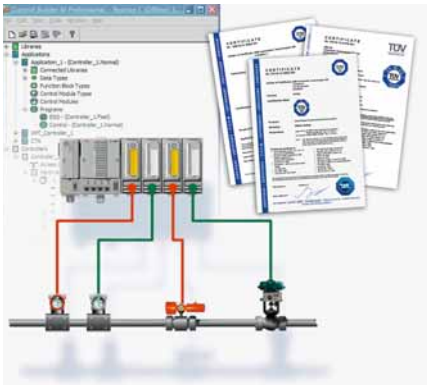
To transport the electrical power over more than 100km requires HVDC transmission systems with cable connections. ABB had recently demonstrated how the appropriate HVDC Light® technology could provide such a service, when it completed the Estlink between Finland and Estonia in less than 20 months – a world record for the installation of such a system.

Now ABB is going to supply the first connections to the North Sea wind-farm network, featuring an HVDC Light system rated at 400 MW. 128 km of submarine cable and 75 km of underground cable will transport energy from this first connection node for several wind farms to the transmission grid at the transformer substation on the German coast.

For more information, see "The future is now" on page 40 of this edition of *ABB Review*.

Putting the safety into the control system

No matter whether we are at home or at work, a disregard for safety is an open door for accidents. In process plants, safety monitoring relies on sophisticated systems supporting humans in their vigilance. Whereas traditionally these were typically add-ons, operating independently of the control system, the growing complexity of plants is making this option increasingly inflexible and costly. ABB's response is the 800xA High Integrity safety system, which can be fully integrated into the company's System 800xA control-system platform.



Because the 800xA High Integrity safety system is an integral part of the System 800xA control platform, it has access to all necessary process data and is able to supply all safety-relevant information to the operator. Supported by a common sequence of event and alarm-handling functions, operators are able to analyze hazardous events as they unfold and make key decisions that can potentially prevent or significantly mitigate the consequences thereof.

With largely similar equipment and software tools in place for process-control and safety systems, the overall operator training required is reduced, understanding is increased and complexities are removed.

In 2008, ABB's 800xA High Integrity platform was awarded an SIL3[1)] safety certificate.

For more information on the 800xA High Integrity platform, see "Integrated safety" on page 44 of this issue of *ABB Review*.

Footnote

1) Safety integrity level (SIL) is a measure of the relative level of risk reduction, with SIL3 being the highest level typically found in the process industry.

The new generation FlexPicker™

The newly developed second-generation FlexPicker™ will ensure that ABB remains at the forefront of robotic solutions, meeting the rapidly growing demands made by the picking and packing industry to improve productivity.

The new FlexPicker IRB 360 takes advantage of the highly successful design features of the IRB 340, allowing heavier payloads, reduced floor space usage, easier maintenance and improved operation flexibility. The basic delta robot design remains. It consists of three arms, each a parallelogram, connected by universal joints to the tool interface. The heavy motor components remain in the base box, so that the lightweight arms can move rapidly with reproducible accuracy.

A smaller version was developed to increase productivity within restricted factory floor space. Improvements in the QuickMove™ and TrueMove™ motion controller produce faster cycle times so that productivity can be maintained with fewer robots, again saving space. This improved motion controller, fitted to all FlexPicker IRB 360 generation robots, allows increased payloads due to its superior movement control and also reduces collision damage by detecting malfunctions and automatically stopping operations.

The high demands of the food industry led to the development of a version that is easily cleaned using hot, high-pressure water at close range. Further universal improvements in component durability ensure that the new generation FlexPicker is more robust and requires less maintenance.

For more information, see "Picking a winner and packing a punch" on page 29 of this edition of *ABB Review*.