

Aligning R&D with business strategy

In today's competitive business environment industry must innovate. In the process industries, this often means finding a new automation solution to known problems – for example, to reduce investment, increase energy efficiency, or improve quality and reliability.

Developing innovative solutions of this kind requires a whole range of capabilities and technologies:

First of all, we need to thoroughly understand the processes themselves. Then we need the individual building blocks – the products and technologies we apply to automate these processes and create the solution. And, finally, there is the foundation or platform upon which the products are built and seamlessly integrated to obtain a unified solution.

In the new 'customer-centric' ABB, we are quickly transforming our R&D and technology base to develop precisely these kinds of solutions.

Our R&D projects are defined and launched in close cooperation with business and marketing people who have a clear understanding of customers' requirements, and with engineers who know ABB's products and technologies. And we involve scientists from our research laboratories around the globe, who contribute with in-depth knowledge of the latest technology.

The project itself is multidisciplinary. It is no longer enough to put together a talented group of mechanical engineers to design and build, say, a new shaft for a ship's drive. A ship's drive is a highly complex system, with links between the generation unit, safety controls, environmentally optimized exhaust and total energy management system. And



there has to be seamless integration of all relevant operating data, to enable the entire system to be optimized exactly in accordance with the customer's needs.

This multidisciplinary approach is especially important for the solutions we provide for customers in the process industries, where production plants of every type and sophistication are found. An industrial R&D organization such as ours has to be tuned to a broad range of skills in process industry applications.

By bringing our technology areas together, we add value to the solutions we provide: mechatronics, which unites mechanics with electronics, is needed, as are contributions from fields like control and optimization, power electronics, software processes and IT architecture.

With our flexible and multi-skilled R&D organization, we are able to combine all these technology platforms and build teams to speed up specific solutions for the process industries. This common knowledge base lets us reuse our modules in many different applications to maximize cost-efficiency and quality. And each customer benefits individually from the experience we gain across the entire branch. Synergies between industries such as printing, petrochemicals, mining and marine, can be used to form a

broad technology base for all our process industries customers.

The building blocks of these solutions are products and systems such as motors, drives, valves, sensors and instruments. We invest heavily in product innovation – improved functionality, size reduction, more intelligence and, most importantly, their ability to communicate with the rest of the system. We believe that this will play an important role in the future.

And, finally, the very foundation upon which such solutions are based: The platform for seamless integration; the technology that enables sharing of the huge amount of information in complex automation systems, extending across and between plants; the technology for describing the many objects and processes in a plant, and which enables us to navigate through this information so that we can quickly find the right information for an application; applications that take care of functions such as control, planning, optimization, asset management, etc.

This is ABB's Industrial^{IT}. A rich collection of technologies and products, it is our vision of the future of process industries.

In this issue of *ABB Review* dedicated to process industries, we are proud to share this vision with you. We hope it will give you an idea of the kind of solutions we are able to develop by bringing our capabilities and technologies together to generate more solutions with more value for our customers.

A handwritten signature in black ink that reads "H. Markus Bayegan". The signature is fluid and cursive.

Markus Bayegan
Chief Technology Officer

Technology innovation for the process industries

The transformation of ABB from a 'product-centric' to a 'customer-centric' organization has significance not just for ABB, long the standard-bearer for corporate innovation, but, because many companies follow our lead, for industrial high-technology business in general. Our approach is simple: instead of being an organization where *separate* product groups all serve the *same* customers, we focus product groups to create best-in-class products while *industry* divisions develop and apply unique industry-focused innovations to our world-class product base.

One such industry division is Process Industries, dedicated to serving petroleum, chemicals, pharmaceuticals, pulp and paper, printing, metals, minerals, cement and marine customers. This issue of *ABB Review* visits some Process Industries innovations and examines how they add value for customers. As other companies now quickly follow our lead, never has pressure been greater in ABB to find true competitive advantage through *innovation*.

Charged with creating innovative customer solutions, technology development in Process Industries naturally starts *with* the customer. Together, we identify and agree on the customers' most important needs, map these needs against existing products and services, then jointly select areas for further innovation. ABB's solutions are created as reusable 'building blocks' that can be shared within and across industries. This approach ensures the most interoperable, open, cost-effective and fully supportable solutions.

Customers served by ABB Process Industries encompass diverse markets and needs. Apart from a shared geographical



presence, what do these industries and their customers have in common? Is there a pattern in our customer requirements?

One common element is *real-time control*. While real-time control is a traditional focus of automation, it is quickly becoming a defining element at all levels of an enterprise. Says Ned Colo, General Manager of Visy Paper, Australia: "You have to move with fast, rapid information, and on time, right now."

Another element is the importance of *collaboration*, recognizing that competition today is not between isolated companies, but between partnerships and value chains. "We need to work on partnerships and collaborative working relationships, and that is what we are looking for with ABB," says Margaret Walker, Director for Process Control at The Dow Chemical Company, USA.

A third common denominator is the importance of *solutions*. As Jürg Meili, CEO Holcim Group Support Ltd, puts it: "It's not just a piece of software; it's not just a piece of hardware; it's the whole solution."

In discussions with customers across industries, continents and all organizational levels these same three factors consistently surface as priorities. It is therefore natural that they became cornerstones in ABB's *Industrial^{IT}* direction. *Industrial^{IT}* allows our

customers to extend real-time control from the plant through all levels of the enterprise, thus achieving unparalleled levels of efficiency and flexibility.

ABB's Transformation includes the certainty that *all* ABB products are built and comply with *Industrial^{IT}*. This way, customers are absolutely assured that all ABB products work seamlessly with each other, as Microsoft products do. As with Microsoft, third parties seek to become *Industrial^{IT}*-certified. Why? Because they see the opportunity to bring more value to customers than previously was possible. Thus, ABB's applied innovation again benefits industry on a broader scale.



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Executive Vice President
Member of Group Executive Committee of
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Head of Process Industries Division

The future of process industries with IndustrialIT

A tour of a pulp mill, pharmaceutical plant, cruise ship, newspaper printer, refinery, or cement mill, to name a few examples, is always impressive. Within a single plant, one gets the impression of visiting many plants. Some production stages are continuous, some discrete, some meticulously clean, others not. The visitor is left with a picture of enormous complexity. Going through different process industries, one can find a significant number of industry- and even site-specific characteristics and the question arises: can they have technology innovations in common? If so, in what areas will they be most needed? What are the chances of realizing such innovations?

As stated by Dinesh Paliwal on the previous page, technology development in Process Industries starts with the customer. Each customer and each project is unique and innovation starts when cross-functional teams from customers and ABB jointly map needs and opportunities. Taking a step back



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from the diversity of process industries, it turns out that many industry drivers and challenges extend beyond individual industries. Broadly speaking, successful operation of industrial processes requires integrated optimization of assets, labor, material and energy, taking into account safety, environment and regulatory compliance.

Understanding process industry needs

Most process industries are highly capital-intensive and require significant

production assets. A high customer priority is to maximize asset utilization by increasing output, yield and uptime, or by reducing the capital required to produce a certain output. After decades of operation aimed at maximizing production, attention has shifted toward maximizing *profitability*. Certainly for parts of plants, and increasingly for entire plants, production is now optimized to run at less than maximum capacity. The reason for this is that a shift in production to higher margin/lower volume products, and better understanding of marginal variable costs, is often more profitable than operating at full production capacity.

Energy cost often accounts for double-digit percentages of total production cost. Optimum energy use is a decisive competitive factor. Accommodating variations in energy, raw material and product prices, and smart real-time control on all levels can help leverage existing production buffers for optimum profit.

Speed and flexibility have become particularly important in the process industries. Low inventory levels reduce working capital and allow faster, more flexible reaction to changing markets. On the other hand, buffers provide protection against unpleasant surprises, such as the failure of a production element, so speed and flexibility gains are only achieved by using real-time information up and down the production chain, at all levels of a corporation.

While most process industries have traditionally operated according to a



produce-to-stock model, speed and flexibility requirements are prompting some companies to increasingly adopt produce-to-order models. In both cases, the *ease* of doing business in a given organization, and with suppliers and customers, has gained greatly in importance. This is especially true when raw material and multiple manufacturing stages are geographically distributed, within one organization or spread across many.

A necessary first step towards performance improvement is to understand how a given operation performs relative to how it *could* perform. Benchmarking, as a comparison against industry peers and leading organizations in other industries, is a powerful tool for identifying gaps and opportunities. It is also a vital source of organizational learning. This is an increasingly important aspect as current management science measures the value of organizations not only in terms of physical and monetary assets but also in terms of intellectual capital, including knowledge and learning capabilities. ABB offers unique services in this area to identify and free up underused potential. Is benchmarking ultimately an art or a science? The benchmarking article in this issue will let you decide for yourself!

Real-time control throughout the enterprise

Real-time, closed-loop control as a means of driving a physical process to a desired outcome has been a proven



concept in the process industries for years. Extending the same concept to higher levels of a corporation has often been discussed, but manual information updates and unacceptable dead times have been major hindrances. ABB Industrial^{IT} extends real-time control, with consistent up-to-the-minute information sharing, from the plant floor to levels of the corporate enterprise previously used to only paper-based weekly or monthly reports.

Until the early 1990s, automation seemed limited and simple; a peaceful co-existence of unconnected islands. External devices were always hard wired and interfaces between automation systems were proprietary, even after evolving from analog to digital. Plant-level information systems were rare and, if they existed, information was typically

entered manually, the same data often more than once, and thus hardly consistent over time. Enterprise resource planning systems were used by people in separate depart-

ments who were far from the shop floor and not connected to the automation systems. Customer relations were 'managed' on different systems again. In addition, automation for power generation, transmission, distribution, and utilization was provided by different systems in separate parts of an operation.

ABB's Industrial^{IT} uses one set of consistent building blocks to seamlessly automate not only in the power generation, transmission and distribution areas but also in industrial processes. This means any process plant can control co-generation, electrical systems and manufacturing using just one system, making it possible to benefit from daily fluctuations in energy and raw material prices, etc. Beyond the advantage of having one control platform (common hardware, software, spares, training, etc),



ABB's Industrial^{IT} builds on an unparalleled knowledge of the underlying equipment, providing the opportunity to optimize equipment based on models and context information. Or to maximize performance by using predictive instead of scheduled maintenance. The article on dynamic process optimization is a case in point. Combining achievements in modeling, control and optimization technologies to predict and control *dynamic* instead of only *steady-state* operations, has significant economic potential, as is illustrated by two practical cases.

Collaboration is essential

The 21st century is one of relations. Collaborative relations are now essential for companies to be able to rapidly establish dedicated value chains across multiple enterprises. For example, customers may inquire on the telephone whether a producer is able to deliver large orders at short notice. Or a manager might need to re-distribute production after capacity has been damaged. In both cases, speedy assessment of raw material availability and production capacity, often in different locations, is a key source of competitive advantage. Increasingly, producers also consider sources outside their own operation, and in doing so recognize the importance of collaboration – enabled by Industrial^{IT}.

Simplicity and speed of collaboration along value chains and between corporations greatly impact success and

profitability. Sharing business and production process information can create benefits for all involved. The article on eBenefits provides a brief on the fundamentals of concepts such as availability-to-promise, capability-to-promise, and profitability-to-promise, an update on ABB's Skyva collaborative software alliance and applications in the pulp and paper industries.



The article on the global Dow-ABB Industrial^{IT} Alliance demonstrates the importance of collaboration from a different perspective. The Dow Chemical Company, the world's second-largest producer of chemical, plastic, and agricultural products, decided that ABB's Industrial^{IT} best met its business needs and was able to ensure continuity by performing functions previously available only in Dow's proprietary system.

A key success factor in collaborative relations is the ability to provide unique value-adding services to customers over and above the actual sale of the product or system. Consider the example of ABB's turbocharging business, which will be covered in more detail in an upcoming issue of *ABB Review*. As a complement to its market-leading product offering, its global network of

service stations can immediately identify any of more than 180,000 different turbochargers ever produced by ABB, and access the charger's product documentation and complete maintenance history. If a required spare part is not available at a specific service station, the nearest part is found in the global network's inventory and expedited promptly to

where it is needed.

The reliability and speed of this service network creates tremendous customer value. It minimizes downtime of cost-intensive assets, eg large ships (degraded to quarter power if the turbocharger is faulty) without the need for each customer to carry separate inventories of spare parts and to own networks of service expertise.



Solutions

Finally, Industrial^{IT} is conceived of as ABB's way to make sure that benefits of an entire solution surpass benefits of individual hardware and software. I am sometimes asked if ABB has turned completely into a software company. Certainly not – even though *software solutions* are an essential element of ABB's Industrial^{IT} delivery to the process industries, our perception of solutions encompasses much more.

The Industrial^{IT} solutions article in this issue illustrates for the Life Sciences how ABB takes a fresh look at needs in particular industries and defines specific solutions for maximum benefit.

Innovation often starts with a question. "Can a smart automation solution, a combination of the right hardware and software, help reduce a bulky mechanical structure, reduce investment cost and increase flexibility?".

Such questions lead to innovations such as Compact Azipod vessel propulsion, featured in this issue. The Azipod idea was born when a mapping of existing products and solutions against customer needs revealed a gap. Shipbuilders needed improved maneuverability, lower fuel consumption



and increased design flexibility. Traditional diesel-mechanical propulsion with heavy mechanical shafts, gearboxes, and sub-optimal engine operation had been optimized over years; incremental improvements were small; innovation ground to a halt.

ABB's Azipod (azimuthing podded propulsion) came as a real breakthrough, essentially replacing mechanical power transmission – with its disadvantages of space constraints, noise, vibration and energy inefficiency – with electrical power transmission to an electrical outboard motor. Read how the latest member of the family, the Compact Azipod, extends the benefits of this concept – originally developed for icebreakers and other large vessels – to small marine vessels.

Consider a very different field, the newspaper printing business. Ever since the invention of offset printing machines, mechanical shafts have always been needed to ensure exact synchronization of printing cylinders, imposing constraints on press design. Minor deviations could cause sheet breaks or poor superposition of different colors; a deviation of even a few micrometers rapidly degrades image quality. With machine maker Wifag as a partner, ABB pioneered the 'electronic shaft' breakthrough where *electronics* are used to synchronize mechanically separate

shafts. This breakthrough has subsequently changed machine design across the industry. Read for yourself how ABB's Industrial^{IT} solutions have since migrated from control and operations into the new frontiers of value-chain optimization, starting at pre-press planning and extending into and beyond maintenance.

Printing and propulsion are just two examples of how innovative electrical and electronic links can replace or enhance classical mechanical connections, and how software solutions extend the scope of real-time control from small units of equipment to the entire plant, and from control and operations across the life cycle and value chain. Many more are found in other industries, be it pulp, paper, mining, minerals, or metals.

Innovation often occurs at interfaces between disciplines and organizations and I am convinced that it is not by chance that so many process industries innovations originate at ABB. The combination of world-leading product technology, deep industry knowledge and dedication to value creation is an ideal environment for incremental and breakthrough innovations.