

Challenges in Process Control

Interview with Jack Bolick, President Honeywell Process Solution, sponsor of NAMUR „Hauptsitzung“ 2008

? As President of Honeywell Process Solutions and sponsor of the NAMUR Hauptsitzung the title of your talk is about “Innovative Process Automation – The Real Potential”. Could you please give us the 3–5 main challenges regarding process automation in the next 5 to 10 years and what is the contribution of your company to solve this challenges?

Jack Bolick: In general, industries are continuously evolving, and industry workforces and the technology they use to do their jobs always seem to be playing catch up. This is very true in the process industries, and over the next decade, those industries will start feeling more effects from five main challenges:

- Aging automation systems
- Skilled worker shortages
- High technology churn in open systems¹
- Security regulations and concerns
- High energy and commodity costs

The first two challenges are simply inevitable results of time passing. Technology gets older and can become obsolete, and the skilled process engineers who have been manning production plants for years are starting to retire. But investing in new technology can be an expensive and inconvenient proposition, and we're not seeing enough people with the right skill sets eager to step in and readily replace the retiring workforce. As a result, more plants will continue with outdated technology, and valuable knowledge will continue to be lost as workers retire. All of this is happening in the face of skyrocketing demand for plants to respond faster, and for operators to handle more complex processes and make better decisions.

With open systems, the concept is good, but the execution can be challenging. Nobody uses technology from a single vendor, so it makes perfect sense to design systems where third-party technology works together and communicates with a common language. Open systems, therefore, are becoming a path of the future. The challenge with open systems is that having a greater array of technology to employ in your plant also means there's more to keep up with. It's true in any technology industry that something becomes outdated the minute you buy it. This means that companies that may have been used to upgrading their sys-

tems every 15 years now have to worry about upgrades every five years or less.

Then there's security, which is a greater concern today than ever before, especially for process manufacturers who produce valuable commodities like oil and volatile products like specialty chemicals. Additionally, the government has recognized that facilities like chemical plants are potential terrorist targets and should be safeguarded to protect employees and the surrounding communities. Chemical Facility Anti-Terrorism Standards (CFATS) is a perfect example of how government mandates are shaping the operations at U.S. chemical plants. Wireless technology now coming to the forefront will also increase security complexity.

Finally, energy and commodity costs are having an impact on nearly every aspect of our economies, and process manufacturers certainly aren't immune to this reality. Our customers have mandates telling them to reduce energy usage and emissions. If they don't, they not only face penalties, but they're ultimately paying a higher cost to do business.

Our strategy for solving these problems has been to develop technology that will help these manufacturers maximize business performance by improving overall plant safety, reliability and efficiency. Those three elements – safety, reliability and efficiency – are greatly influenced by all of the above challenges.

With aging technology, it's not practical to expect that plants will rip out their DCS and replace with new technology every few years, so that's why Honeywell offers a clear migration path that allows plants to use their existing control infrastructure with some of our newest technology. We have customers still using our TotalPlant Solution with our newest Experion PKS interface. This is a much more cost effective approach that provides the efficiencies of the latest tools on the market. This is also a strong segue to addressing the aging working issue because much of this new technology, such as Experion, was designed to capture the knowledge and best practices of operators who have been driving processes for decades. This is achieved through solutions such as procedural operations, which give manufacturers the ability to encode these best practices into the control system itself. Other solutions such as process simulation are designed to help operators gain confidence in executing processes by training them offline before they are implemented in plants.

In the area of open systems, Honeywell has developed a suite of services that help our customers manage everything from software releases, hardware compatibility and system

¹ Open means independent from a specific supplier, open for the integration of different suppliers.

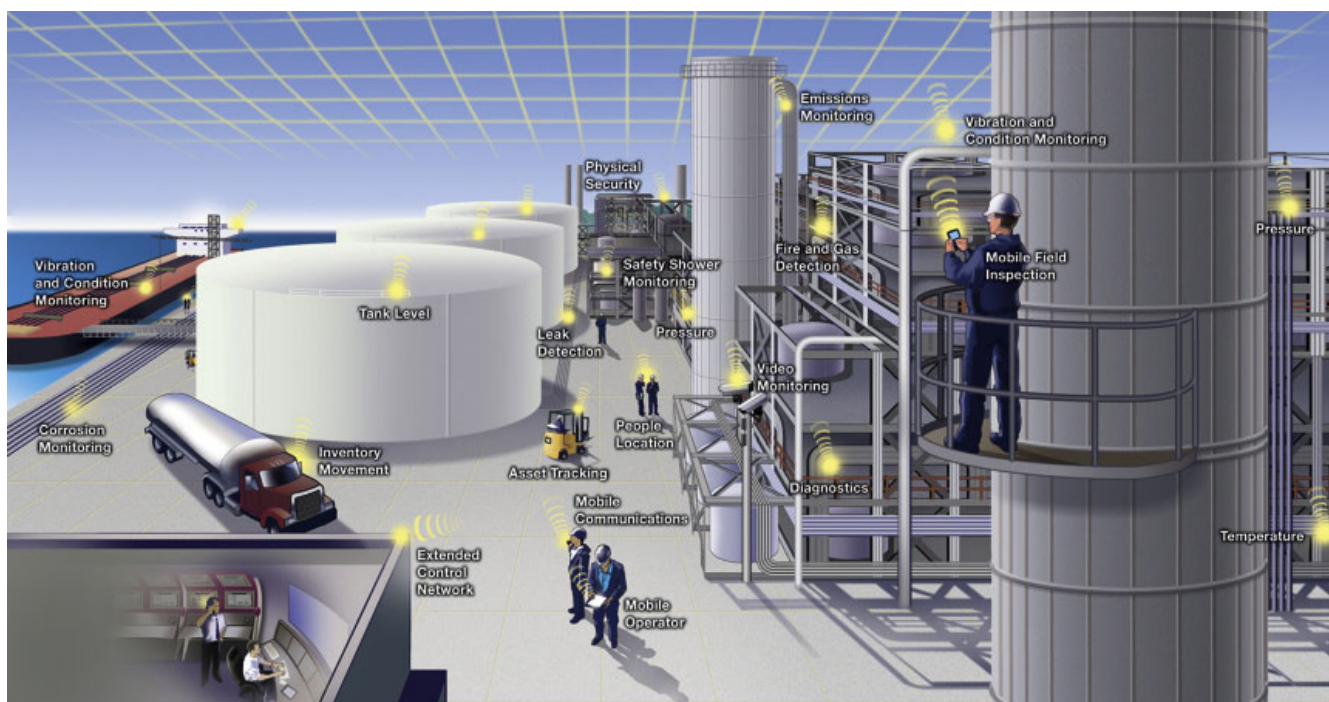


Fig. 1: OneWireless Plant.

integration. These services assist customers by assessing current systems, designing and implementing the appropriate open-system solution, and managing the system to ensure it stays up-to-date and meets future demands.

? **Discussing the more organizational terms I would like to ask one more question in this field: Cost-oriented production or increased productivity is discussed nearly everywhere, what is Honeywell's answer to this customer request.**

Jack Bolick: This question speaks to the core of Honeywell's overall mission. It's no longer acceptable for manufacturers to maintain the status quo – competitive pressures are driving them to maximize business performance. Our customers don't come to us asking to help them maintain production levels, they want us to help them squeeze as much production out of their facilities in the least-expensive way possible, all while maintaining system health and worker safety. It's a complicated goal that sometimes seems counterintuitive. But it is very possible, with the right engineering, to design a comprehensive plant solution that produces as efficiently as possible, while ensuring equipment remains reliable and workers safe. That's our chief philosophy, and it's reflected in our offerings.

One of the latest examples of this is the most recent release of our main automation and control platform, Experion PKS. At our Honeywell Users Group Americas symposium this past June, we introduced an enhanced version of Experion.

Let's start with Experion's original purpose: the system was created to streamline production by giving operators a greater view of not only their plant processes, but of critical non-process subsystems such as fire and gas detection devices. Experion ties everything together and ultimately

gets the right information to the right people in the control room to help them make the best decisions possible.

Next, look at the recent enhancements we've made to Experion: It features tighter integration with our main safety platform, Safety Manager. So, for example, you can be immediately notified of pre-shutdown alerts, sequence of events information and diagnostic data. This helps operators carefully coordinate procedures such as start up and shut down.

? **There are a lot of studies about visions and future of automation. One statement is that automation devices are commodity. On the other hand most operating companies think that the diversity of field busses and the lack in standardization (EDDL/FDT/DTM) etc. are an incredible waste of effort? Could you please give us an idea what Honeywell is doing to overcome these basic problems in operation and maintenance?**

Jack Bolick: Honeywell implements technologies and standards that are of value to our customers and strategic for our business. We participate in appropriate standards bodies, but we cannot control their outcomes. As a result, we sometimes must implement competing or overlapping technologies such as HART and Foundation Fieldbus; or EDDL (Electronic Device Description Language) and FDT/DTM (Field Device Tool/Device Type Manager). That is the nature of open standards. We cannot pick and choose, or we might find ourselves excluded from a significant portion of the marketplace. We really have no option but to adopt and support the predominant technologies and standards used by our customers.

? **You are certainly familiar with the strong effort for operational excellence in German chemical industry,**

e.g. BASF or Bayer. Which of the factors do you rate most important from your companies experience in application. May be you can name already successful solutions/approaches.

Jack Bolick: Operational excellence is a very important initiative with Honeywell as it is with the German chemical industry. We have extended the original definition of operational excellence to account for the need to connect business decisions to manufacturing execution because collaboration is required between the business enterprise and the manufacturing facility. This modified view of operational excellence enables manufacturers to make the right decision for the business and then execute that decision safely, consistently and reliably for improved results (fig. 1).

Safety:

By safety, I mean an integrated safety solution that protects the plant, people and assets. Well-designed procedures and well-trained operators help reduce human error that can cause plant upsets. On the rare occasions that an incident does occur, rapid detection followed by quick and decisive action is critical. Helping operators make better decisions faster when abnormal situations occur and operate your plant within safe limits, while striving to maximize profitability, is the goal. In addition to the inherent risk associated with operating industrial facilities, in today's challenging times being able to anticipate and respond to threats both against the physical plant and against the process control network is important. Physical security incorporates being able to monitor your perimeter and all access points including waterways – and be able to respond quickly to an intrusion. It means knowing where all your people and visitors are at any time, and being able to quickly get them to a mustering point in the event of an emergency. In terms of cyber security, you realize that insufficiently protected networks can leave you open to attacks from viruses, denial of service attacks and other network issues.

You have to think about security as an integral part of the network design; how the process control network can be protected from the broader business network without losing necessary communication links. Even though new technology such as wireless protocols make more data available at lower costs, so can these same technologies make your network less protected if they are not introduced with security in mind.

Our solutions solve key safety challenges like:

- Improving emergency response with fire and gas detection and safety systems
- Reducing human error with operator training, procedural operations, alarm management solutions and intuitive operator displays.
- Reducing unexpected equipment failure with asset management solutions and corrosion detection.
- Maintaining stable control with advanced control and regulatory control.

Examples of Honeywell solution applications that have improved safety include:

- RasGas implemented Honeywell's operator training simulation solution and achieved faster startup times, better

training and certification best practices, and improved safety with early identification of any issues before they occur.

- MAN Ferrostaal increased the safety and efficiency of a large methanol plant in Oman with Honeywell's simulation solution.
- Shell improved alarm management and increased safety with Honeywell's Alarm Configuration Manager, when they reduced their dynamic alarm count from 1,200 alarms per hour to 288 per day.

The Alarm Configuration Manager (ACM) is an integrated tool that works with single or multiple control systems, managing the alarm database to adapt alarm parameters inside the control databases depending on process situations and also handling management of change (MOC).

ACM controls alarms generated by the process control system and masks both standing alarms and dynamic alarms. All changes to the ACM database are logged and auditable. Alarm enforcement history and changes are available to view as post-event reports.

Reliability:

Mature regions like the US and Western Europe are facing the loss of experienced people, while it's often difficult to find experienced staff in developing regions like China and the Middle East. This makes it more difficult to achieve consistent, reliable and safe production globally. As a result it is critical to capture best practices that provide a foundation for future operations.

Honeywell solutions improve availability and reduce downtime through proactive asset management and early detection of potential problems ranging from corrosion to equipment failure. Our various Quality Control Solutions and validation methodologies help plants exceed quality, regulatory and environmental requirements. Our lifecycle management approach ensures that our customers achieve maximum return on their technology investment and their assets. Asset reliability is further increased by our long-term support of our solutions and seamless path to the latest technology based on plant needs, schedule and budget.

Honeywell solutions focus on proactive asset management and lifecycle support by:

- Improving asset management with wireless transmitters, corrosion detection and change management solutions
- Empowering employees with the information to make better decisions faster with alarm management tools, wireless solutions and simulation technology
- Operating consistently with boundary management and advanced process control
- Enhancing asset lifecycle with open systems management and lifecycle services.

Examples of Honeywell solution applications that have improved reliability include:

- LyondellBasell increased data and measurement reliability with Honeywell's IntelaTrac PKS Among other benefits this enabled them to improve their process condition monitoring using both DCS and non-DCS data.

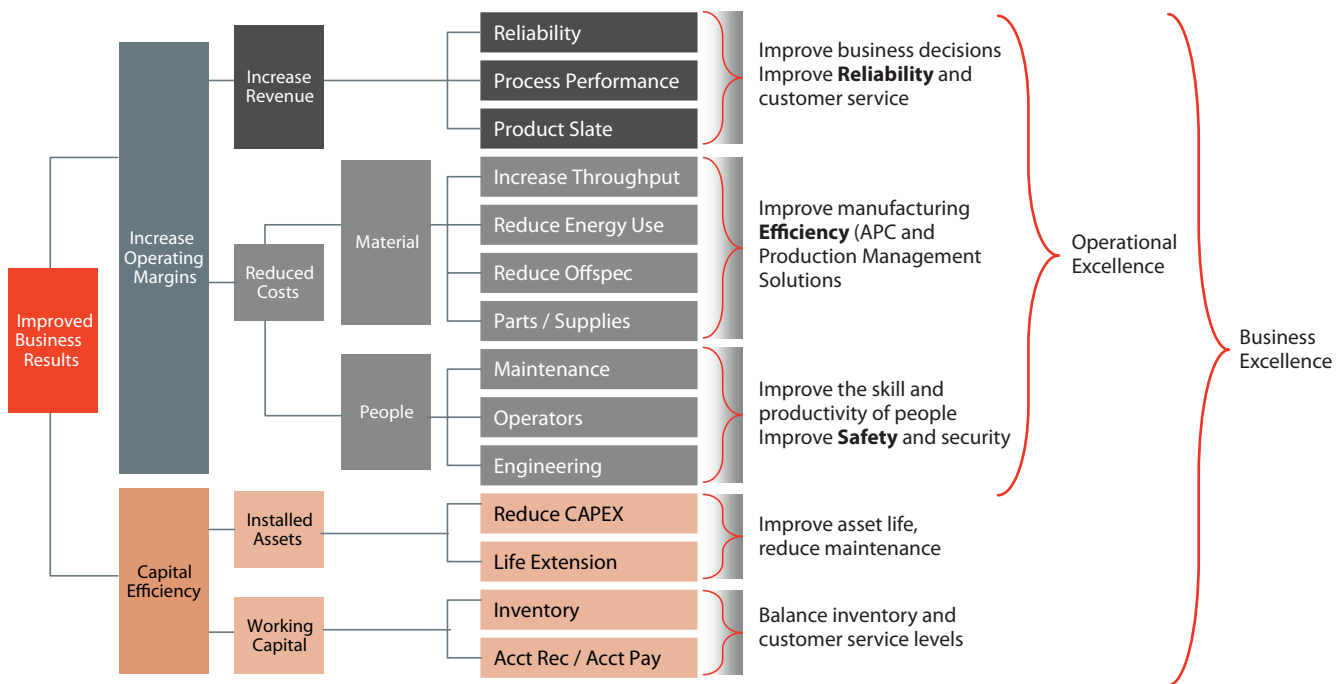


Fig. 2: Modified view of operational excellence. In short, improved business performance is a result of delivering solutions that enhance safety, reliability and efficiency.

- Honeywell's wireless transmitters helped Repsol improve reliability by eliminating data transmission faults, resulting in reduced maintenance costs

Efficiency:

Honeywell solutions help make people, process and assets more effective, resulting in improved productivity and reduced costs. We offer solutions that increase energy efficiency and improve plant profitability by enabling plants to work more effectively and make better decisions. Our advanced control and optimization solutions, MES and planning and scheduling applications help optimize performance of the entire supply chain. Our support services ensure that benefits from these solutions are sustained and enhanced throughout the asset lifecycle.

- Our broad portfolio of offerings is designed to optimize the entire supply chain by:
- Improving workflow efficiency with information management applications and simulation tools
- Improving energy efficiency with production management, advanced process control and quality control systems
- Increasing process uptime and availability with asset management and optimization tools
- Optimizing the supply chain with planning and scheduling applications and Manufacturing Execution Systems

Examples of Honeywell solution applications that have improved efficiency include:

- BASF SE Ludwigshafen improved production capacity 2.5% by implementing Advanced Process Control (APC) in its Ammonia plant No. 4 with Honeywell's Profit Controller Technology

- LyondellBasell in Wesseling, Germany increased their ethylene production by 3% with Honeywell's Profit Suite tools
- Sasol improved efficiency and reduced energy and maintenance costs with Profit Loop
- Honeywell's OptiVision helped Stora Enso's Langerbrugge mill to reduce manual processes by more than 50 percent while optimizing transport capacity by 95 percent

? Costs of energy are discussed nowadays due to the rising prices. Does Honeywell think or work on concepts to support their customers regarding an energy optimized production process?

Jack Bolick: With increasing costs of raw materials and regulatory pressures, our customers are very much interested in energy-optimized production processes. For our customers, the energy challenge is three-fold: first, how to meet target operating margins when raw material costs are rising and there is downward pressure on product prices. Secondly, environmental regulations are becoming more stringent. And third, many customers are trying to upgrade older, less-efficient technology. Many of them are asking themselves: "How do I meet and improve business performance while maintaining environmental regulation compliance AND become more energy efficient with my existing aging equipment and technology?"

Honeywell has solutions available today that can materially impact energy efficiency goals. We are helping industrial manufacturers purchase and produce energy economically and efficiently, prioritize energy usage, improve process efficiency and streamline emission monitoring and reporting. Our solutions can help manufacturers reduce energy consumption between 1 to 10 percent, which can be huge sav-

ings. Company-wide, we estimate the global economy could operate on 20-25 percent less energy just by using existing Honeywell technologies. For example, our Experion® Process Knowledge System has enabled Aluminium Oxid Stade (AOS) GmbH in northern Germany to increase production capacity from 600,000 to the current level of approximately 1.1 million metric tons of alumina per year. At the same time, specific emissions have been significantly reduced. According to the International Aluminium Institute, the AOS refinery has proven to be the best performing refinery in the world in terms of energy efficiency and intensity with approximately 7 GJ per tonne derived from primary natural gas (an industry benchmark) plus equivalent of 1 GJ per tonne as purchased electrical power.

We've been seeing signs for the past couple of years that our customers are investing in this type of technology. The interesting thing, however, is that some of the technology they're employing was originally used to streamline production. The more they used it, though, the more they found it could be extremely beneficial from an energy and environment perspective. In fact, nearly 50 percent of the Honeywell product portfolio company-wide is linked to energy efficiency.

? Wireless is a hot topic in the industry. What key technical aspects should industrial companies consider when choosing wireless applications? Can you give us an overview of Honeywell's industrial wireless solutions?

Jack Bolick: Wireless is changing the way our customers think about manufacturing. According to a 2008 ARC Advisory Group study, wireless for process manufacturing is projected to grow 32 percent annually through 2012. Process manufacturers have been asking for wireless networks that can handle thousands of wireless devices in a plant: transmitters, meters, sensors, hand-held devices and countless others. Needing to have a separate wireless network for each kind of device is an expensive and cumbersome proposition.

Honeywell has been in the wireless network business for 10 years, but see this technology just as an extension of our over 30 years in the process control network business. Wireless offers an innovative way to just extend the wired control networks and capture additional value in the plant. From a strategic perspective, Honeywell has partnered with our customers to design a multi-functional mesh network that they can use to support many applications that improve their safety, reliability and efficiency. And, it can grow as new applications and uses are discovered.

Mesh networks are considered the most comprehensive of industrial wireless solutions, in general there are two types of mesh networks, sensor meshes and backbone meshes. Sensor meshes use a series of sensors to communicate with one another in a localized area. Backbone meshes involve powered nodes that communicate with each other across wider distances, connecting various parts of the plant together. These nodes allow thousands of devices from field instruments, mobile worker devices and voice and video

communication to co-exist on a single network infrastructure.

Honeywell has chosen a multi-functional mesh network. Multi-functional mesh networks are deployed for two main reasons, firstly based on the number of points a company wishes to monitor and secondly the high value that is placed on reliable communications. Mesh networks by definition offer multiple redundant paths, this increases reliability compared to non-meshing architecture. Our standards-based platform is scalable to 30,000 devices and can stretch a wireless mesh across operations that span miles on a side. This OneWireless infrastructure is a management layer for deployments and isn't proprietary at the device level, meaning that any number of other manufacturers' products can be integrated into the overall data exchange framework for any number of purposes. In fact, we've just announced that our current platform is ISA100-ready and only requires a simple over-the-air software download to make it comply with the emerging ISA100 standard.

This mesh network uses technology that optimizes network performance by sharing the airwaves and prioritizing messages to critical information is received first. Honeywell supports multi-speed monitoring to support different update rates simultaneously based on the application. All information gets back to the control system through a high-speed backbone to manage traffic aggregation and high bandwidth applications. For example, we support industrial wireless field instrument transmitters publishing at varied rates (1, 5, 10 and 30 seconds), message prioritization and quality of service of wireless the traffic and on-demand reads within 5 seconds regardless of the reporting period of the device.

Below are five things customers should consider when choosing the right wireless approach for them:

- **Network compatibility and functionality:** Single-purpose networks may appear to be the most cost-effective approach. However, there are very few plants that have only a single use for wireless technology. A multi-purpose network (i.e., one that supports multiple types of applications for multiple departments) will be a more efficient and effective solution for the long-term. They must consider if they want to use their network for multiple applications and for different departments or whether they need their field workers to have access to data.
- **Reliability and availability:** How reliable is the network? Can your plant afford to lose, for example, 10% of the data transmissions? Is it important the data is available within the scheduled update time, or is data timeliness not important? Different applications have different requirements, so to ensure future flexibility, look for a system that can provide 99%+ data reliability inside the update rate availability window. Look for a system that is not only reliable but has latency controls to make the data available before the next update.
- **Speed of information transfer and alarm or alert frequency:** Certain applications may require fast transmissions, while others will tolerate slower transfers to conserve battery life. A high-speed backbone is needed for data-rich applications like video, mobile workers and Eth-

ernet backhaul. A network that accommodates multiple speeds over the same network at the same time will match specific applications to speed requirements. And, many sensor networks report information on a periodic basis, such as every five minutes. However, many applications need to quickly transmit an alert or alarm when a specific threshold is exceeded. Additionally, for slower operating rates, operators may require a reading before a scheduled update. As such, a system should allow you to choose regular and on-demand updates.

- **Power management and maintenance predictability:** When selecting battery-powered wireless products, determine the required reporting rate and then ask for the battery lifetime at that rate. Most plants use a five-second update rate as a good baseline. The expense of swapping batteries could negate the cost savings from eliminating wiring. Determine the length of time the devices should be self-powered. Most users expect a battery lifetime of three-five years. Consider whether a system will consume battery power at a deterministic rate or a more unpredictable rate.
- **Consider the future:** Wireless technology has the advantage of being able to prepare a plant for the future, and this needs to be taken into consideration for any implementation. Companies need to consider whether they will use the wireless network for a single or strategic network, or whether they want to enable handheld devices to access data and interface with servers over a wireless

network. They need to select a network that will expand as the business grows while not degrading the availability or speed of information transfer. And, to further protect their wireless technology investment, wireless networks must support today's applications as well as future protocols. The network should easily interface with legacy applications and ensure support for the entire operation – not just a single department.

The interview was conducted by Professor Vogel-Heuser, Editor in Chief of atp.



Jack Bolick is president of Honeywell Process Solutions. Prior to assuming this role in 2002, Bolick was vice president and general manager of Honeywell Electronics Materials in Sunnyvale, California.

Bolick joined Honeywell in 1998 and has more than 20 years of diverse business experience with a focus on semiconductor and manufacturing materials supply, global marketing, and manufacturing strategies that support high-growth markets. He was president of Johnson Matthey's Wafer Fabrication business before joining Honeywell. From 1980 to 1990,

he held leadership positions at International Resistive Company, Analog Devices, and Burlington Industries. Earlier, he was an industrial engineer at United Merchants and Manufacturing.

Bolick is Six Sigma Black Belt certified and holds a master's degree from North Carolina A&T State University. He also earned a bachelor's degree in industrial engineering from Western Carolina University in North Carolina. He is based in Phoenix, Arizona.

Aluminium Oxid Stade Revamps Refinery Units with Experion

"We chose Honeywell and Experion PKS because we wanted the best process control solution we could get with experienced project delivery we could count on. The result has been very positive for our company. The project was executed on time and on budget, and Experion has proven to be highly reliable and robust."

Holger Grotheer, DCS Manager, AOS

Benefits

Aluminium Oxid Stade (AOS) GmbH was looking to completely revamp its alumina refinery units with minimal shutdowns. The company needed to update its aging AEG control system to help increase safety, reliability and efficiency at its German refinery. The company turned to Honeywell and its Experion® Process Knowledge System (PKS). The control system migration has generated the following benefits:

- Project delivered on time and on budget
- Hot cutover to the new control system avoided process downtime
- Quick and smooth startup and shutdown processes for complex plants realized by sequence flows
- Improved access to process infor-

mation for faster decision making has helped increase production

- Long-term archiving of process data and events

Background

The AOS alumina refinery is owned by DADCO Alumina & Chemicals Ltd. It is located in Stade in northern Germany. Built in 1973, its major activities are the production of alumina and aluminium hydroxide.

Due to improvements to the process and production facilities, particularly through financial support after 2004 from 100-percent owner DADCO for productivity-based expansions and infrastructure renovations, AOS has been able to increase production capacity from 600,000 to the current level of approximately 1.1 million metric tons of alumina per year. At the same time, specific emissions have been significantly reduced. According to the International Aluminium Institute, the AOS refinery has proven to be the best performing refinery in the world in terms of energy efficiency and intensity with approximately 7GJ per tonne derived from primary natural gas (an industry benchmark) plus equivalent of 1 GJ per tonne as purchased electrical power.

AOS started working with Honeywell in 2003. The upgrade of originally installed wall-mounted panel instrumentation from different suppliers started with Experion.

Challenge

AOS was seeking a complete revamp of all units with the main implementation work done as a hot cutover to minimize downtime. AOS was looking for low energy consumption, high quality and zero unplanned shutdowns.

System availability and reliability was a major challenge. For the tube digestion area there was no possibility of stopping the flow. This created a problem as the liquid would easily solidify.

Lack of spare parts for old installed equipment and environmental restrictions were the other major considerations.

AOS had the following requirements for choosing a new control system:

- Modern and proven technology
- Redundancy of network and components, such as server, controller, I/O modules
- Hot cutover
- Data historian with fast sample rates for process pressures

- Open system for possible connections/expansions to other subsystems
- Training for engineers and operators
- Service support 24 hours a day, seven days a week
- Service contract for the future

Solution

AOS chose to migrate its control system to Honeywell's Experion PKS for the following reasons:

- Honeywell's project and hot cutover expertise for chemical plants
- Performance of Experion PKS was best-in-class compared to four other DCS systems
- Very good redundancy concept
- High availability and uptime
- Online migration of control system available
- Integration of video surveillance into control system

Holger Grotheer, DCS Manager, AOS attributes the project's success to on-time delivery and the continuity of working with the Honeywell project team for five years.

Another key success factor was that Victor Phillip Dahdaleh, owner and chairman of AOS, fully supported the project from the start.