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Picture: archives

Process automation trends

Achema, the world's leading chemical equipment engineering and biotechnology show, places special emphasis on automation engineering. Without automation systems, cost-efficient operation of today's plants would be inconceivable. However, the automation industry is going through a restructuring phase which is being driven by business, organizational and technological developments.

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The current market situation in the automation industry is encouraging. If initial forecasts are correct, we will see sustained growth again in 2005 following a 6.3% increase in production during 2004. Exports continue to rise, but turnover is stagnating at a high level in Germany and the rest of Western Europe. Nevertheless, trends such as business process optimization offer ex-

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cellent opportunities. Few new systems are being installed, and that is partly because the installed base of automation systems and instrumentation is being used to exploit existing productivity potential. However, it would be a mistake to underestimate the Western European market, because the region provides stimulus for new technologies, and Western Europe is still experiencing high growth in absolute terms. China, India, Eastern Europe and Russia in particular still lag behind, and this is reflected in

higher growth rates in percentage terms. Overall, growth rates will continue to reflect regional differences (on average 2–3%).

Incessant cost pressures in the chemical and biotechnology industries leave no alternative to improved productivity. Companies will take a holistic approach to quality, cost and time issues, and automation engineering will play a central role. This technology will help increase productivity, improve quality and accelerate system modification and retrofitting activity (to increase flexibility).

Pushing the process to the limit

In summary, production management will be driven purely by business considerations. The objective will be to improve plant utilization, yields, product quality, availability, safety and delivery performance. In addition, companies will have to reduce energy consumption, raw material consumption, stock levels, labor requirements and capital investment. Work force reductions are no longer the driving force. The goal today is to enable plant operators to push the process to the limits. The importance of industrial communications will continue to increase, and this trend will be influenced by standards (Ethernet) and new customer needs (e.g. remote diagnosis).

Another major trend is the integration of marketing (i.e. requirements planning) into production planning, production operations, documentation and claim management. The goal is to optimize distribution networks and stock levels in order to maximize delivery performance. Centralization of product control and monitoring at the management level offers the following potential benefits: reduced turnaround time from order receipt to delivery, improved quantity, quality and delivery performance, higher plant utilization and lower production costs. However, the associated risks must be realistically assessed. Complexity is the major concern, because the process is only as good as the design. It is important to keep in mind that producers currently do not (yet) understand state-of-the-art IT technology, and designers (engineers) often do not understand the production process. Payback on investment is also an unknown, as IT cycles in the office world are significantly shorter

than investment cycles in the process industry. Information networks are highly complex, and today's engineers cannot always use them without error.

MES: on a stable technological footing

Nevertheless, developments in recent years have placed MES (Manufacturing Execution Systems) on a stable technological footing. Integration into higher and lower level software still needs improvement. Many companies are addressing this issue, and a battle for market share is likely to develop. From the user's perspective, MES solutions will only reach their full potential if the organizational structure can be harmonized with the goal of enhanced data transparency.

“Wireless technology and the Internet will revolutionize automation technology.”

Projects which are managed by production teams are more likely to reach a successful conclusion.

Status monitoring to ensure high availability and avoid unplanned downtime is becoming increasingly important. This is why the deployment of Asset Management Systems, which provide the framework for status-based maintenance on systems, equipment and components, is so important. This technology uses diagnostic func-



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Picture: Siemens

tions in field devices in combination with field bus systems to transfer data. It also exploits the intelligence which is built into process equipment and machines. These devices form closed, intelligent package unit modules which can be assembled into systems. Asset Management is by no means restricted to field devices. Its range of applications extends to status monitoring of process equipment subsystems.

Training simulators offer another approach to system optimization. When they are used in conjunction with automation projects, these simulators allow engineers to use the system model for control optimization purposes prior to commissioning and to generate and optimize control strategies for autonomous load changes. This is already being done on large-scale projects, and we expect that the initial positive results will lead to use of simulators on medium-size and small projects.

For a very large number of control systems which were installed during the past 30 years in Europe, system optimization means ensuring availability and improving functionality. Many of these systems are now at the end of their life cycle, and plants operator have to cope with increased downtime, uncertain spare part availability, restricted scope for expansion, increased life-cycle costs and higher operating costs in production. Migration strategies are needed that not only ensure the continuity of cur-

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rent functionality but also offer production optimization potential.

Reduced demand for controllers

Another trend which we expect to see is reduced demand for controllers, because distributed intelligence will lead to a migration of functionality away from the controller layer. Alternative products and technologies and new system architectures will erode the profitable system component segment. In addition, completely new automation structures, which represent a shift from the classic central control system paradigm to distributed control solutions, will be making their mark on systems engineering in the near future.

Automation goes wireless

Wireless communication warrants particular attention. Despite the fact that the majority of our future systems will still be cabled together and wireless communication will initially only be the solution of choice for mobile systems or systems that are distributed over a wide area, we nevertheless believe that wireless technol-

ogy and the Internet will revolutionize automation technology. Networks using protocols which find their own way from the sensor to the controller will replace hierarchical designs.

Decentralized intelligence will be accompanied by a value shift to the field level, and we believe that new and improved field devices can help increase production output.

A process sensor technology roadmap

NAMUR and other associations for measurement, control and automation, VDI/VDE-GMA, have jointly developed a process sensor technology roadmap to consolidate engineering and market data and identify demand for new sensors. The goal of the initiative was to stimulate development activity which is directed at finding cost-effective solutions for production processes that still present significant difficulties. The focus is on the process industry including biotechnology and micro technology as well as on the area and spatial distribution of process instrumentation. The need for area and spatial distribution of sensors is nothing new, but the technological obstacles have proven to be insurmountable up to this point, and there is growing demand for sensors in biotechnology processes and microprocess technology.

Due to the high price of crude oil, we are seeing a shift away from petroleum-based raw materials to sustainable sources of raw materials. Sensors designed for use in biotechnology processes warrant particular

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attention. This is an area where the use of process sensors is still in its infancy. Online instrumentation still relies on conventional sensors. Laboratory analysis is still used for quality and process monitoring, but users are looking for much more. Among other things, they would like inline/online determination of target proteins in biotechnology processes and analysis of other biochemical substances

and organisms (viruses and bacteria). This measurement technology will significantly reduce the amount of time which currently elapses between end product qualification and final approval.

Process analysis technology in the pharmaceutical industry, where biotechnology processes have been used for quite some time, represents a particular challenge. New applications for spectroscopy and chromatography technology could reduce the use of laboratory resources. The FDA is promoting this approach to avoid the situation where the product is not approved until the end of the production chain following time-intensive laboratory analysis.

Instrumentation in the millimeter range

Advances in microprocess technology will produce a fundamental technological change in the process industry. Today's multi-purpose systems will be replaced by dedicated, continuous micro systems. The new approach to process engineering will of course have an impact on the automation world. Instrumentation in the millimeter and sub-millimeter range will be needed, and new control loop designs will have to be developed. Corrosion control will also become a bigger issue. Simply increasing wall thickness is not an option on micro systems.

RFID in automation applications

The last trend which we will discuss is the use of RFID technology in automation applications, because logistics processes will be integrated to an increasing extent into automation strategies.

All of the technological changes in automation technology are reflected to some degree in products which will be on display at AICHEMA. There is an enormous need to disseminate information about the opportunities and risks which are associated with these developments. As an international association of automation technology users in the process industry, NAMUR, in collaboration with ZVEI, will provide information about these issues to trade visitors in the context of discussions with the experts at the NAMUR Forum in Hall 10. ■