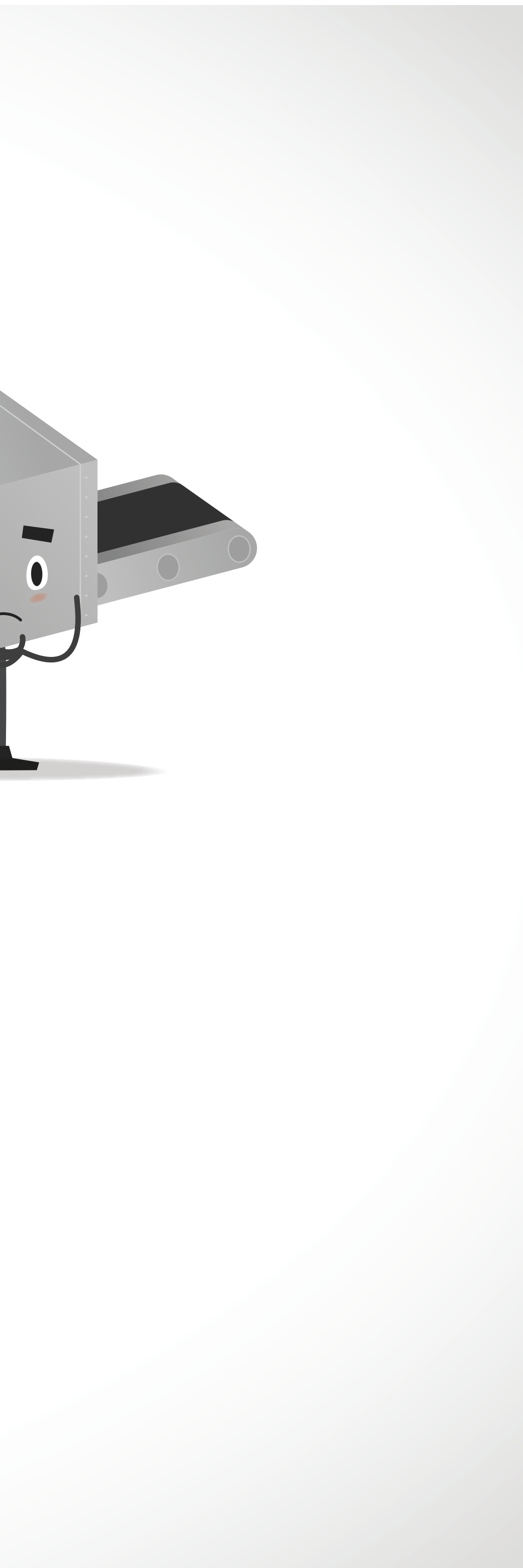

SPOTLIGHT

BREAKOUT.

AUTOMATED ENGINEERING AS A WAY TO THE SMART FACTORY?

It could be so simple: anyone who wants to equip a production hall orders from the machine-manufacturing company's catalog. Anyone with particular demands has a one-off made from a special machinery company. It's a possibility – because nowadays, production plants are just as diverse and individual as cars. The megatrends of individualization and connectivity are already having a widespread effect. The Industrial Internet of Things and the call for lot sizes of one demand tailor-made equipment in the smart factory. Individualized plants and manual engineering – how does that fit together? Not at all.

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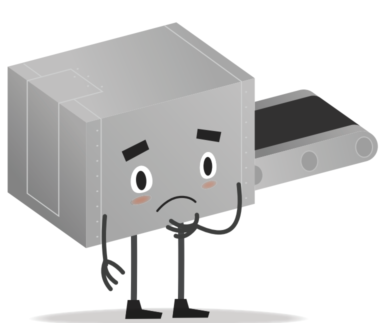
Whether self-driving cars, automatic reactions in communication or small everyday conveniences, such as smartphones that automatically use a different profile at home than the one in the office – the trend towards automation cannot be overlooked. We love them all, these configurations, with which we compile our computers individually, model our cars as we want, or mix our muesli.

As consumers, we have discovered “a lot size one” for ourselves. It is “mine” means not just “it belongs to me”, but also “it has been made for me alone”. But what do we actually trigger with a few mouse clicks in the configuration? The manufacturer of our individualized product must be in a position to create it individually at a reasonable price. Equipment manufacturers, machine builders and integrators need to make it possible for the manufacturer to produce products in small amounts. And somebody must then create the visualization and control for each individualized machine and each unique plant. It sounds like a lot of work, and indeed it is if it’s done manually.

FROM A LARGE WHOLE TO A FLEXIBLE WHOLE

Everything from one place, from the first machine to the last machine, from the PLC, through to the driver and on to visualization, from planning to maintenance – the current norm has undisputable advantages. Planning is easier and the costs can be calculated more quickly. There is just one contact person and a service partner for the complete plant. However, this is at the cost of flexibility. Why not manufacture medicine packaging that is amended for different patients and medicines? Why not, as a contract bottler, fill many different drinks for different clients using the same equipment? And while we’re on the subject, why not connect processes to operational control, production to distribution, machines to the office? Manufacturer to supplier, machine to machine? All this is possible if all systems can communicate comprehensibly with one another.



However, this requires thinking in terms of sections and modules instead of as a complete plant; breaking away from closed systems and allowing standardized interfaces. This is just as applicable for hardware as it is for software, such as HMI and SCADA for example. The payoff is quick reaction times and new market opportunities, more independence from system equippers and less costs incurred by retooling at short notice.

How is the necessary increase in flexibility to be achieved? The modular structure of equipment and the corresponding modular structure of machines therein creates a number of possibilities. But these numerous individually configured machines and the modularly-built equipment must also be controlled and visualized.

It is clear to machine manufacturers that this only works with sufficient automation. During the configuration of the machines, when creating the PLC programs, and even when engineering the visualization. The conclusion: Automate the engineering or refrain from this level of flexibility at all.

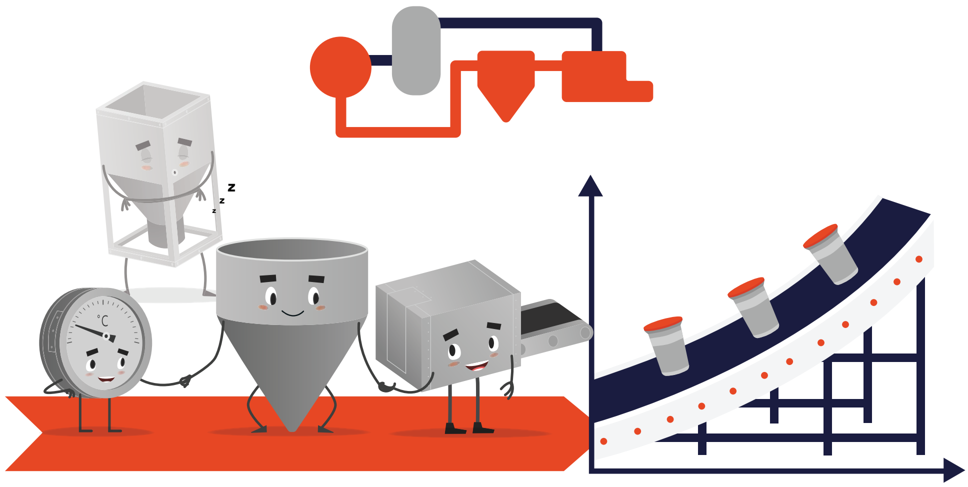
BREAK OUT OF NARROW LIMITS

The first stage of automated engineering requires a breakout from dearly held habits and the seemingly more secure mastery of one’s own tool. It primarily needs much more openness than before. This is because “automated” also always means having an effect from outside, using interfaces.

Machines, controllers and software that are to work automatedly must support a standardized connection to external systems and equipment. All parties concernced must be familiar with one another, must know who is preparing what and must be in a position to exchange data and information. It is not one individual participant who gains, instead everyone and everything involved achieves gains and is beneficial for others.

It is, most of all, joint access to data that offers a high potential for saving and automation. For example, variable lists for visualization can come directly from the controller, the graphics from the CAD program, and the electrical plans from the corresponding software.

However, a uniform standard for open communication is not in sight yet – and will also be difficult to agree. This is because the different components involved make very different demands. If automated production communicates with ERP, office and banking mingle, geodata is required and much more – then many existing standards meet one another. In the area of machine and equipment building, many companies are already researching the possibilities of secure networking and the automatic exchange of data and information. We want to take a closer look at two of the many approaches: DIMA and the Diabolo concept.



DIMA – MODULAR APPLICATIONS FOR CUSTOMIZABLE PRODUCTION

First, there was the question: how should companies, whose equipment is compiled in a complex manner and must pass detailed checks, design their operations more flexibly and prepare them for new requirements? The automation company WAGO reacted to this and, together with partners from research and commerce, developed a concept for modular equipment: DIMA. The abbreviation stands for "**D**ecentralized **I**ntelligence for **M**odular **A**pplications". The starting point for the concept is the NAMUR recommendation NE 148.

There is already an initial prototype and many people expressed interest in it at the SPS IPC Drives 2015 trade fair in Germany. COPA-DATA is also involved with DIMA, providing zenon, expertise, manpower and financing.

The fundamental idea is a modular approach. Equipment is made up of individual complete, pre-configured modules, which are simply connected using Ethernet. A separate tool creates an MTP configuration file for each module, which is imported into the SCADA system by means of an interface. A module could be an individual device, or a part of equipment or an equipment group. Communication between control level and the modules is effected by means of manufacturer-neutral semantics. Anyone who supports the protocol can simply click in.

DIMA shortens the conception phase and speeds up the construction of equipment, which leads to things being put into operation more quickly.

FROM THE PYRAMID TO DIABOLO

The Practical Robotics Institute Austria (PRIA) and COPA-DATA offer another way in their joint "BatMAS" project. In the search for a way to make the engineering smarter, the roles are redistributed and the established automation pyramid is restructured to the Diabolo: the configuration here does not start with the PLC, but instead with the model that is orientated to binding standards such as ISA 95. It connects ERP and process as a central management tool.

In order to use the information from a machine, a sensor or an item of equipment, it is no longer necessary to link a new variable to it each time. The model is familiar with it and its significance and establishes the connection if required. Information is used many times and wizards then work not just stubbornly according to the program, but instead, their behavior depends on the model. For example, to create a waterfall diagram, it is sufficient to tell the model the part of the equipment for which the waterfall diagram is to be drawn. The rest happens automatically. Such a model is also in a position to link data from different sources with a different structure by means of mapping.

FROM A MODULAR SYSTEM TO DECENTRALIZED INTELLIGENCE

There are of course already many flexible visualizations that implement different customer wishes into a user interface. The conventional practice was that a very, very large project covers all possible configurations and options. Modules are shown or hidden, depending on the task. However, this can lead to problems for maintenance and in the appearance of the user interface.

A modular structure of equipment increases the rich diversity of a visualization considerably. Huge SCADA projects that form each variant are no longer a reasonable possibility. However, the labor-intensive manual creation of individual, customizable user interfaces is no alternative for machine builders and integrators. That would require too much time and manpower, and would be too expensive in any case. So the possibility to also create the visualization of machines and equipment in an automated manner must also be created. SCADA projects are thus compiled into large parts by wizards and only individualized in small parts. How can that work? It is best with clearly-structured modules, with a clear overview of versions, and decentralized.

We are familiar with modular systems, which provide individual libraries and modules to make larger systems out of them, from many scenarios. Modern machines are constructed in such a way that PLC programs are created and there are also modules ready for visualization. zenon, for example, contains, and has in many previous versions contained, wizards which create basic projects in an automated manner and take on documentation or configuration work.

Anyone who starts to create visualization projects in an automated manner must keep the requirements of the user in mind. Industries such as the chemical industry, pharmaceutical industry or food & beverage industry must document each change or even have it confirmed by the authorities. For automated engineering, this means that each change must be documented in a traceable manner. However, it also means that a change in a module must not have an uncontrolled effect on other modules.

Automated engineering also means that many components must interact in a controlled manner – from mechanics and electrics through to visualization up to intra-machine and inter-machine communication. Standards and cooperation are also required; human intervention and automatically-running processes need to be skillfully linked.

AUTOMATED ENGINEERING? IT'S RUNNING!

Despite a lack of general standards and insufficient support from the big players, automated engineering should not be considered a dream of the future. It is not a matter of having everything run automatically from start to finish. But just as individualized equipment consists of individual modules, visualization can also be based on combined modules.

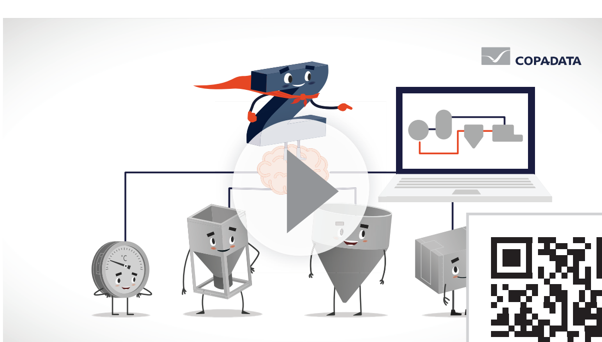
Many visualization projects can already be partly created in an automated manner. It starts with a configuration tool, which contains parameters for new visualization projects and then automatically creates a project with the appropriate variables and alarm configurations, and ranges up to the wizard, which provides the appropriate project on the basis of the given machine type.

The interaction of individual modules will become ever more close and complex. The human intervention that is now necessary will certainly be further reduced in the future. Automated engineering now also permeates the subsequent area of maintenance. Direct communication between SAP and zenon, for example, is already now possible. Why should orders from a customer meeting not soon go directly to ERP and a zenon project be created automatically using the planning system?

BREAKOUT

The manner in which we produce, optimize processes and combine data is changing. Different methods are on offer and are being tested. The key word for all is "automation". It is, most of all, automated engineering that will decide how quickly and how well ideas for Industry 4.0 and the IoT will be implemented.

Video:
Experience the benefits of automated engineering with zenon
Scan & Play!



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