AUCOTEC
Create Synergy – Connect Processes

Whitepaper

Industry 4.0: The race is on

The impact on electrical and automation engineering

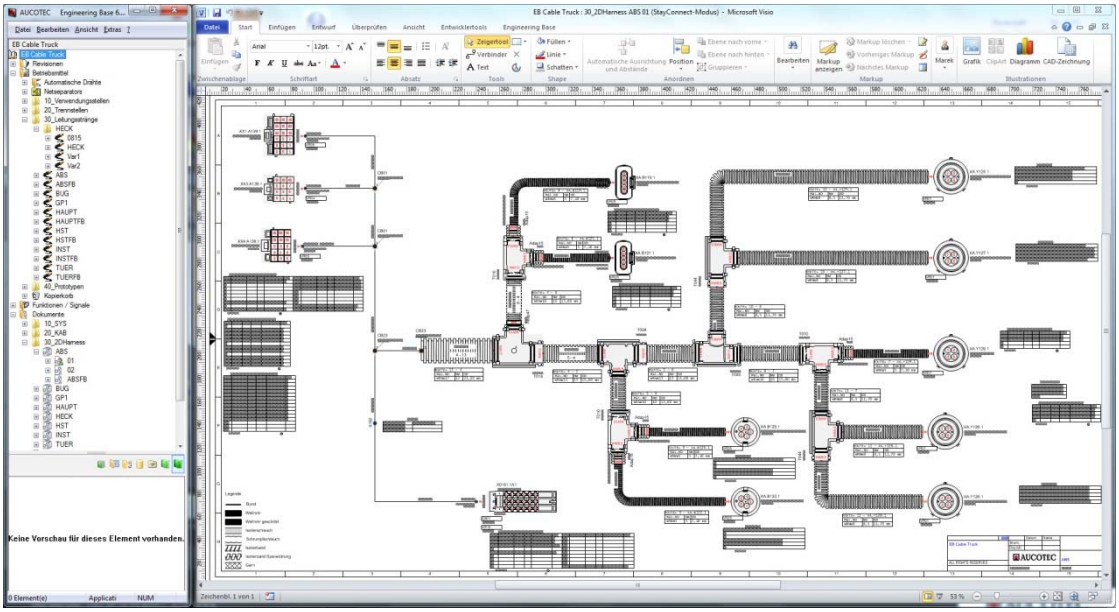
The concept of "Industry 4.0" is setting completely new standards for production and will cause a major upheaval from the point of view of both products and manufacturing. The German associations BITKOM, VDMA and ZVEI have specifically established an office which deals solely with this topic. What then were 1.0 to 3.0? The invention of the power loom was seen as the first industrial revolution while, according to this reckoning, the electrification of production was 2.0 and the introduction of PLC and bus technology was 3.0. We now come to 4.0. Electrical and automation technology will greatly increase in importance, as will the corresponding engineering.

Instead of rigid production lines for large volumes of a product, individual orders will then be processed with the high efficiency and low costs of mass production. Thus, for example, a production line would no longer be set up, as in the past, for the construction of a specific car model. Instead, production will be so flexible that a line will produce saloons, convertibles and SUVs in alternating sequence, but as fast as ever. A bottling plant will be able to take different recipes and decant them to various containers, configured to suit the customer. This eliminates complex building conversions or modifications whenever a product variation arises.

What role does engineering play in electrical and automation technology? This question can be approached from two perspectives: on the one hand, increasing customisation will have significant influence on the engineering of the product itself, whilst having considerable impact on the manufacturing plants on the other hand. To take the product view:

Customisation wins
Here we are concerned with the customised planning of the product itself, insofar as it has an electrical engineering content. The automotive industry has already progressed very far in this respect. The major German manufacturers rely on customised wiring harnesses and modularity. This is the major advantage of German premium manufacturers because their customers expect absolute freedom in the assembly of their desired vehicle. This diversity cannot be compared with the predefined trim levels which, for example, US manufacturers provide. There, they manage to produce about 150 variants, while the advocates of customised wiring harnesses give rise to some 100,000 variants!

To achieve this level of choice, engineering has to offer maximum flexibility and the best possible overview. All possible combinations of the wiring harness must be conceived in advance using a draft of the entire design space in the planning tool, after which they can be reduced to the final design - as with Engineering Base (EB). Here, the graphics are connected to an intelligent, flexible database. This guarantees a continuously up-to-date connection logic. EB's experience with the huge range of variation in the automotive industry can be easily transferred to the flexibility requirements of other industries in terms of Industry 4.0.



The manufacturing view:
The second field that is facing striking changes is mechanical and plant engineering. Lines with increasing robotics content and highly flexible manufacturing cells will become prevalent to enable manufacture of "lot size 1" at the same rate as mass production.

Recognising geometries and the information contained in the blank and responding to them within fractions of a second requires any number of sensors and actuators to be planned and documented. Their intelligence will also increase. More complex data streams and more time-consuming control tasks demand a planning system that is adequate for the job.

The engineering complexity increases at the same rate as the automation technology proliferates. Engineering has to counter this development with time-saving flexibility, consistency and quality.

The process industry shows the way
The handling of mass data is part of everyday life in process engineering and EI&C planning. EB is in use in those areas in major plants from sugar refineries to cement factories. Mechanical and plant engineering can benefit from its use, for example, with the tabular editing of tag data that is prevalent in process engineering. The trend is already progressing in this direction with the design process, but it can only be implemented using a central database. This is the only means by which time-consuming steps in graphic operations can be omitted or automated. EB automatically updates all further displays when an object is edited in a report, worksheet or drawing.

The database-supported management of measurement and actuator tags and the automated assignment of inputs and outputs from PLCs and control systems are among EB's other capabilities gathered from process engineering that can assist in making the future flood of data in Industry 4.0 more manageable.

Machine modularity is on the increase

When considering the individual machines in a plant, the manufacturing view quickly becomes the product view and completes the circle: A machine that can process 10 different products in sequence must be nearly as complex as a car. Thus the topic of modularity will receive a powerful impetus in the field of special-purpose machinery. Highly complex modular systems will become even more essential. Conventional engineering without a central database ("single source of truth") will not be able to cope with the pending flood of data and combinatorics. EB, which already has the vast amounts of data of the pioneering industries under control, not only paves the way to the goal, but makes it possible in the first place!

"Prepared for Industry 4.0"

Andreas Kurth is Engineering Director for Electrical Technology at Oystar's Hassia site in Ranstadt, which has been working with EB for some time. The Oystar group is one of the world's leading firms in the field of packaging. As a variety of machine lines converge at Hassia sites, the highest demands were made on consistency and uniformity in their engineering. EB also combined the electrical and process engineering. "This combination of expertise is unique," says Kurth, "and the various departments are today working together almost automatically on a database that speeds up matters significantly. As a result of EB's database concept, we have also made significant strides in minimising the error rate in the creation of drawings and parts lists in highly varied fields such as electrics, pneumatics and process engineering."

The options that are now available for a virtual modular structure are making Hassia's modularisation and standardisation concept much simpler to implement. "EB secures knowledge for us by its use of modules that require processing only once, and generates time savings, for instance, with its highly flexible handling of variants and freely scalable application by multiple users", says the engineering expert who continues: "We believe that with this system, we are well prepared for the challenges of Industry 4.0."

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