Industry 4.0 – Opportunities for small and medium-sized enterprises

“Industry 4.0”, “cyber-physical systems” or the “Internet of Things”: the paradigm shift in the production economy is cheerfully progressing under various names. What they all refer to is the digitalisation and networking of production processes and environments. The idea is by no means new. The difference is that there are now technologies that offer a level of precision, speed and flexibility to a previously unknown degree. In large companies within the automotive industry, these processes are already offering enormous efficiency and diversity. These companies will set the pace for numerous supplier industries and thus take “Industry 4.0” to small and medium-sized businesses. It is precisely here that the attractive potential for value generation needs to be made visible and concerns and fears assuaged. One important aspect is that although we may always refer to an “industrial revolution”, Industry 4.0 is far more about an industrial “evolution” that demands tailor-made solutions. Production measuring technology and sensor technology are key tools on this path.

Global megatrends such as resource efficiency, mastering new process technologies, greater flexibility and transparency exert a strong influence on the production industry. The requirements and customer preferences that companies must address are growing: diversity, personalisation of products, correspondingly small batch sizes or the desire for seamless documentation. These issues require answers if a company is to be successful in the market and remain competitive in the location over the long term.

Large companies that have consistently invested in the automation of their production processes can now expect optimised machine capacity utilisation, rapid production times and a lower number of rejects. They are able to react promptly to changes in the market and to produce small product series at low cost. This is made possible by the intelligent networking of systems, starting with order management and the material administration and on to the management of the production machines and automated control and quality assurance.

Production or measurement technology plays an essential role here. It provides the high-precision data that the intelligent factory requires. Whether it is the position, the surface properties or the integrity of production pieces, through recognition by means of intelligent measuring systems, data can be gathered and numerous subordinate processes triggered. For example, product patterns in the production process ensure that the subtle wear and tear of tools can be identified early on with the help of measuring instruments. With a system of “predictive maintenance”, counter-measures can be taken automatically in plenty of time. This saves on raw materials, reduces rejects, cuts maintenance and service costs and optimises lead times.

If all information flows are connected optimally with one another then the production process is launched in the system as soon as the order arrives. This steers and optimises the complete process chain automatically, from material flow to the ordering of individual parts and on to the packing and dispatch. Ultimately, it is the workpiece that instructs the production line on how it should be worked. This way, the development of the value-creation chain is turned completely on its head. It leads away from the central management and rethinks the manufacturing process entirely.

In global competition, this also means that wage-intensive locations can benefit particularly from the automation of production processes by means of cutting-edge production technologies and embedded systems. Smart factories can produce products to the highest possible global scale thanks to a high level of quality, individuality, efficiency and speed, and thus help to tap into new markets.

New opportunities for small and medium-sized enterprises

This development is increasingly having an effect on small and medium-sized businesses. It opens up opportunities to be present and act quickly and flexibly in a volatile environment.

Intelligent measuring and evaluation systems are an important key here. It is optical processes and components in particular that play a big role when it comes to digitalisation of production processes, since they supply comprehensive information about product quality, for example, promptly and readily. With increasing automation, measuring technology can be incorporated even more thoroughly in the production process. Data are available not merely following laborious measurements in the measuring room, but to flow into the networked system immediately. Comprehensive measuring processes boost transparency in production, but require suitable software solutions and compatible interfaces that make reliable communication between the systems possible.

Intelligent measuring technology that can be integrated straightforwardly into the existing IT infrastructure can be an important signpost in the direction of Industry 4.0. Optical systems score points for their speed and precision. With carefully considered interfaces in what is almost a “plug-and-play” process, they can both measure as well as supply the data for further processing. Be it for an “early-fail” diagnosis or to generate a faster, more precise improvement process through continuous feedback of relevant information from the production to the product development or to tool and testing equipment construction. Further possible applications involve, for example, prototype construction or reverse engineering and product development. Consequently, products can be developed so that they are better suited to the production process or suppliers can be given the ability to produce with adaptations to suit the specific requirements.

Where required, intelligent systems can enable the development of quality assurance measures that are

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already heading step by step in the direction of digitalised production, even if the IT structure does not yet permit full flexibility. Investment costs can be adjusted step-by-step to relevant requirements along the entire value creation chain.

Reshaping working environments
Automation will change the workplace structure within the company. In fact, the question of the precise impact in relation to the labour market cannot yet be answered definitively. Certain trends are nevertheless taking shape. Monotonous routine tasks or activities that can be risky to health or burdensome when carried out by people are increasingly being executed through automated processes or with the help of robots. Here, collaborative robot systems offer an entirely new form of cooperation between human and machine. Intelligent assistants ensure a high level of reliability and productivity, which strengthens companies at wage-intensive locations and thus secures jobs. A further plus point is that if the employees are relieved optimally by means of automated solutions, this creates more freedom for areas of work in which their creativity and efficiency is required, be it in the development of new products, services or processes.

However, Industry 4.0 will not succeed without human labour when it comes to overseeing the automated processes. The control elements for managing the machines will thus become much more important, for example. With their user-friendly interfaces, they ensure that processes run intuitively and can be controlled safely. The latest generations of control elements can be designed to be so highly flexible that technicians as well as measuring and software experts will be able to use them with the utmost precision. Current human-machine interfaces, for example, make use of the properties of user interfaces from entertainment electronics.

If these learnt structures are integrated into areas of work, they can help employees with the application and can boost motivation and the willingness to assume responsibility. Ongoing further training measures will make a key contribution to a company’s success in the future as well. Yet with user-oriented control elements, labour and therefore costs can be reduced considerably.

Automation solutions
- can take over dangerous, monotonous or strenuous tasks
- operate in areas not fit for humans
- increase productivity and secure wage-intensive locations

Measuring specialist for perfect-fit solutions
On the path towards Industry 4.0, experts in measuring and imaging technology can offer solid support. When it comes to entirely individual and bespoke solutions in quality assurance and automation, FARO, the specialist in measuring technology and imaging processes, can offer a comprehensive portfolio and a wealth of experience.

FARO deploys high-precision instruments both for tactile and for non-contact recording of objects, whether by means of visual imaging procedures, tactile measuring arms or laser
scan technology. In addition, there are various software solutions that enable both communication between all measuring systems and interfaces to all common software applications. Measured data can be recorded quickly where required in multi-sensory mode and optimally prepared for further use. This cuts complex programming tasks and costs for system integration.

FARO uses these competence building blocks to develop individual solutions directly tailored to the requirements of its customers, from individual building blocks through to complete solutions. The newly launched business area; 3D Solutions & Services, specialises in working together with the client to find freely configurable, rapid and cost-effective measuring and automation solutions in order to support companies on the path towards Industry 4.0.

“We offer a strong knowledge and exchange platform, both for big and small or medium-sized firms”, stresses Markus Grau, Director of Product Management 3D Solutions & Services. “Our goal is to bundle the whole range of competences and thus create the best possible individual measuring and automation solutions for our partners that are more than just ‘state-of-the-art’. The systematic further development of application solutions within FARO, for example, as well as the interdisciplinary cooperation in a network of research institutions and businesses thus ensure intelligent innovations suitable for practical use.

The FARO Robo Imager is one example of the possibilities the combination of optical measuring systems and a collaborative robot arm offers. Various measuring tasks are being successively integrated into production as a mobile measuring station along the production line. The Robo Imager reduces the need for laborious measuring in the measuring room, for example. As a fixed installation, it serves for continual quality testing along the manufacturing line, and can thus support the automation process down the line. Intelligent interfaces ensure that the data gathered can quickly be made available for further use in all common software applications.

“In quality assurance, measuring is a standard – for the automation process, it is an important building block”, explains Markus Grau. “Only intelligent measuring technology makes it possible to ensure seamless operation along the fully-automated process chain. The key to success lies in the communication and interaction between the systems”, says Grau. “And we’ve got just the response to these demands.”