

## Tech Now

# INTELLIGENT MEASURING TECHNOLOGY FOR THE FACTORY OF THE FUTURE



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**Measuring devices are indispensable in the world of Industrie 4.0. Production measuring technology already plays an important role in the smart factory, while networked measuring technology is crucial in digital production. An analysis.**

By Nikolaus Fecht

Digitalization is changing the world. Internet and modern technologies are increasingly leaving their mark on the manufacturing industry. On the cusp of Industrie 4.0, production is faced with a profound change. "In the digital world of tomorrow, new requirements will be placed on

production systems and machines," says Utz Wolters, Head of Industry and Application Marketing at Mahr GmbH, Göttingen. "They need to be adaptable in the future, as production becomes more individual, more flexible and faster. In the field of measuring technology, this results in completely new approaches and application possibilities."

### Digital measuring devices offer greater flexibility

However, Industrie 4.0 also means smart factories where automatic, fast and user-friendly measuring takes top priority. The range varies from manual measuring technology with radio transmission to automated, electronically-controlled measuring machines with robot loading. "Our digital micrometer gauges, calipers and dial counters make day-to-day quality assurance in production plants much more convenient," says Wolters. "These measuring devices are equipped with the user-friendly radio system 'integrated wireless', which greatly increases the users' freedom of movement." For example, when performing measurements on processing machines or larger workpieces, the tedious work with data cables is now a thing of the past. Mahr holds the European patent for integrated radio.

Wireless data transmission also simplifies the process of recording and documenting measuring data. The data can be adapted to the measuring task at the push of a button on the measuring devices or via remote control commands sent to a radio receiver on the computer. The company from Göttingen demonstrated how production measuring technology works in combination with Industrie 4.0 at EMO Hanover, where they also showcased their new, most powerful wireless micrometer gauge for the first time ever.

"We are meticulous!" Tekon Prüftechnik GmbH from Kernen near Stuttgart sells itself and its products using this slogan. It's very apt, since a specialty of the Swabian team is contacting, with which systems manufacturers can test electrical and electronic components with high precision. "Our customers already record various process data in production in a meticulous manner - from the torque of a screw to the condition of a feed cylinder," explains Daniel De Monte, Head of Construction and Pre-Development. "The trend towards predictive maintenance plays a major role. This is essentially about avoiding errors through timely maintenance."

### The test adapter inspects itself

In the case of predictive maintenance, Tekon is particularly benefiting from the further development of contacting systems into smart test elements, which have proven particularly successful in the high-current range (up to 600 amperes) in electromobility applications. "In a figurative sense, we are now capable of checking the condition of these test adapters at any given time. We are able to monitor to what extent they heat up during the test processes and whether they exceed the specified limits," explains De Monte. In

contrast to typical, conventional measuring systems, the focus is therefore not on control operations, but rather on detecting when it is necessary to replace or repair the test adapter. "We have made our adapters smart, so they can report independently that they are not working correctly," explains the expert.

In most cases, Tekon does not make such developments at the wish of a customer, but does so instead at its own initiative in order to live up to its pioneering role by creating cutting-edge innovations (such as the smart test adapter). "In the pre-development phase, we also try to tackle potential problems that we may be facing in the future," says De Monte. "This approach led to the development of the smart test devices, which have enabled us to considerably reduce the number of pseudo errors." This also reduces the costs that otherwise occur in the case of pseudo errors, due to the associated production downtime. The smart test devices offer the possibility of counting the number of test cycles independently of the controller (PLC) and thus determining the period of use. It is basically some kind of electronic tachograph that supports users in predictive maintenance and quality assurance thanks to the recording of temperature and acceleration shocks.

### **Customer-supplier processes are changing**

The customers of the Wenzel Group GmbH & Co. KG from Wiesthal have very heterogeneous requirements when it comes to digital transformation. They expect changes in customer-supplier processes as well as in products and services. Prof. Dr. Heiko Wenzel-Schinzer, Chief Digital Officer (CDO) of the Wenzel Group: "As we began working on solutions for Industrie 4.0 from early on, many of our customers want to partner with us for the joint conception and implementation."

The digitalization of the customers' processes demands and promotes a digital exchange of data. This includes digital order and invoice processing, configuration and production processes at Wenzel (keyword: customer-oriented solution) and the improved data exchange during maintenance and service (keyword: predictive maintenance). "Digital products and services involve the use of sensors and actuators that we fix to our products or that had largely always been integrated into our products," says the CDO. "Sensors for temperature control, machine capacity utilization and for displaying the measuring progress thus play an increasingly important role." With regard to measuring results and constant availability, the high reliability that has already come to be expected now requires more precise monitoring of the machines, including via remote applications.

### **Pooling data on the IoT platform**

In order to address these requirements, Wenzel presented products in 2016 that are based on Industrie 4.0 concepts. At its headquarters in Wiesthal, Wenzel developed an intelligent machine interface that collects a wealth of information on the use of the machine. This data can then for example be pooled on an Internet of Things (IoT) platform at Wenzel or at the customer. "For us, big data means that we collect data that is independent of a previously defined application scenario - the keyword here is 'digital twin'," says Wenzel-Schinzer. "The data is available and archived so that customers can also devise new analysis scenarios. We use apps and web-based solutions, which support a very decentralized control and monitoring of the machines, to display the key figures."

Wenzel has introduced a new full-service concept based on the information available on the wear and tear and the resulting maintenance intervals and tasks. The customer has the option of concluding an all-in service contract for a maximum of seven years, according to which Wenzel fully accepts the cost risk for the service. Professor Wenzel-Schinzer: "This provides investment and cost security for our customers and is based internally on an intensive analysis of all previously collected information."

### **New systems need to be adaptable**

The customers of Zeltwanger Holding GmbH from Tübingen, who are active in areas such as automation, mechanical engineering and leak testing, also have quite varying requirements. According to Product and Market Manager Rainer Paul, the customers expect that new test equipment will be able to fully integrate with existing systems (for example SAP, control stations and control systems).

In addition, test and measuring data are to be linked with the serial data of the customer product in order to ensure traceability and process optimization. What is more, the equipment is also expected to meet the requirements on production measuring technology that have become standard today, including user-friendly touchscreen interfaces, fastest response times during system failures, short set-up times, error-free automated set-up processes and, most importantly, high measuring accuracy and repeatability.

### OPC UA standard used worldwide

As an important measure, the mechanical engineer cites the introduction of a new electronic interface into a new leak test device according to OPC UA, the new industry standard. "At VDMA, we are actively determining the future scope and implementation of this standard together with other companies in the automation sector," emphasizes Paul. "We are convinced that this industry standard will be globally implemented in the medium term. While the other standards will continue to apply, we can react flexibly to that."

But the company does not only have Industrie 4.0 in its sights. Offering controlled predictive maintenance for test devices is Zeltwanger's answer to the demand for quick reaction times in the event of system failures. "If necessary, we also support our customers via remote maintenance. Our service technicians can connect to the customer's devices in next to no time and then make diagnoses and perform remote maintenance," says Paul. Some customers require high measuring accuracy and repeatability even in the smallest installation spaces. The solution of the Tübingen-based company is a measuring satellite that measures directly in the process and transmits the result via Ethernet or Bluetooth to an evaluation unit.

### Sampling detection with robots

The automation of test processes also plays an important role. Zeltwanger meets this requirement, for example, in a customer project focusing on a robot-based processing cell which, among other things, enables automatic sample detection and selection of the corresponding test program. "The automatic storage of both measured and test values as well as process parameters for the respective product identification number allows for a wide range of evaluation and analysis options and traceability."

### In-process measuring is increasingly in demand

The customers of Diatest Hermann Költgen GmbH from Darmstadt are manufacturers from all over the world who demand the highest degree of accuracy and quality. Diatest technology is used in the aerospace industry, the automotive and hydraulic industries, as well as in general mechanical engineering. This means that their customers place very high requirements on production measuring technology, especially with regard to Industrie 4.0.

A survey conducted by Diatest showed that, in addition to the increasingly important collection and processing of measuring data, companies also value in-process measuring, automated and robot-based measurement technology, complete solutions and hand-held measuring instruments with digital interfaces. "It has come to be a given that digital measuring data is to be used within the context of Industrie 4.0," explains Sales and Training Director Stephan Greulich. Diatest has now developed an automated measuring cell that integrates with production processes. It operates automatically and transmits measuring data via industrial radio to an electronic system such as programmable logic controllers for further processing. This measuring cell allows for the integration of various measuring instruments, such as high-tech BMD plug gauges which are used to measure the diameter of bores to 0.2 thousandths of a millimeter. ■

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