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## Digital Tools in Production

With digital twins towards a better environmental balance

There are many ways of improving processes by digitalisation. And the current situation shows how urgently needed a fundamental re-think is – ideally across the complete product lifecycle. Automation and digital applications deliver flexible availability, sustainability, price stability and personalisation. This constitutes added value for producers, buyers and users.

If a machine in a production line experiences sudden failure what counts is the cost of the downtime of the plant rather than that of the spare part. By way of simulation with the help of digital twins a part of such unplanned standstills can be avoided. Digital twins are virtual images of plants, of production with all its steps or of performance. They allow linking virtual with physical worlds. “With a digital twin you can go through the complete production before commissioning and later make forecasts on the basis of permanent measured data,” says Stefan Denker of Dräger in Lübeck.

## Predictive maintenance cuts costs

Developing digital twins requires the corresponding software systems on processors that are connected to the plants. In this way they can create the data of connected twins of one line and generate sensor data for various defect conditions by simulation. Denker explains: “When you put data into existing lines, measuring sensors will show you whether pumps are operated at increased temperatures or whether this causes leakages. This probably does not trigger an alarm yet but predictive maintenance can reveal a malfunction that might entail failures.” Such predictive maintenance based on real-time data cuts costs versus unplanned repairs because they are only carried out when really needed. Being one application of Industry 4.0, predictive maintenance increases productivity and prevents deterioration in performance thereby also giving customers more predictability. Other benefits may include avoided accidents with likely negative effects on people and the planet.



Messe  
Düsseldorf

Messe Düsseldorf GmbH  
Postfach 10 10 06  
40001 Düsseldorf  
Messeplatz  
40474 Düsseldorf  
Deutschland

Telefon +49 211 4560 01  
Telefax +49 211 4560 668  
Internet [www.messe-duesseldorf.de](http://www.messe-duesseldorf.de)  
E-Mail [info@messe-duesseldorf.de](mailto:info@messe-duesseldorf.de)

Geschäftsführung:  
Wolfram N. Diener (Vorsitzender)  
Bernhard J. Stempfle  
Erhard Wienkamp  
Vorsitzender des Aufsichtsrats:  
Dr. Stephan Keller

Amtsgericht Düsseldorf HRB 63  
USt-IdNr. DE 119 360 948  
St.Nr. 105/5830/0663

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U78, U79: Messe Ost/Stockumer Kirchstr.  
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### **Goggles round the clock**

Digital twins can map products across their complete lifecycle, from manufacturing and use to reclamation. At Uvex in Fürth the design and production of goggles, for example, have been software-assisted and automated for quite some time now. Even tools and equipment are produced using computer-aided design and are therefore available as digital twins. Commenting on this Dr. Marco Wacker says: "Over the past two years we have digitalised our shop floor. So we quickly learnt when and where we were losing most time. Time was often lost through rejects due to soiling, moisture or material defects as well as through colour, material or model changes. We were able to find out digitally where and when these individual defects occurred and eliminate them." The result: production is becoming more efficient and sustainable because fewer rejects are produced. The added benefit for customers is stable price levels. Last year another aspect moved centre stage: "The full automation of our head band production made it possible to produce the full vision Ultrasonic style, which has been in high demand since the COVID crisis, here in Fürth working three shifts plus on Sundays." So, production volumes can be changed in line with demand.

### **Documentation of gas measurements in 17 languages by mobile**

At Dräger, the Lübeck-based specialists for medical and security technology, automation of the production of sampling tubes for portable measuring devices led to higher product output and improved quality years ago. These sampling tubes used for detecting up to 500 harmful gases at the workplace, used to be manufactured and filled by hand. The construction principle of the tubes has remained unchanged to this very day. Most of them are scaled tubes and the length of the colour change indicates the concentration of the substance to be measured. Automation has increased the quality, measurement accuracy and selectivity. Furthermore, documentation is eased for users by App-based mobile data capture. Using a mobile phone the sampling tubes can be scanned, measurements made, data collected and the measurement log be produced in just a few steps and in 17 languages. Collecting data on paper is a thing of the past.





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### **Different subjective comfort – personalisation not a problem**

Shoe machinery manufacturer Desma in Achim, Germany specialises in direct soling lines and automation systems. The sole material polyurethane is directly injected and cross-links with the upper. “The material ‘anchors in’ the raised texture of the shoe’s upper – regardless of the material – thereby ensuring perfect hold,” explains Desma Managing Director Klaus Freese. The sole material encloses the upper, which opens up many possibilities for an individual sole design and specific sole properties. In various areas, each injection of material can attain differing degrees of hardness. For wearers this ensures comfort over a longer period of time, targeted energy absorption and stability. “Harder soles are more recommended for heavier-built people than for ‘featherweights’”. Quiet apart from weight every person has a personal feeling of comfort. “Theoretically, we can even produce shoes in batch size 1,” says Freese and adds: “In practice, however, we mostly do group customisation. This way custom footwear with corporate logo and design can be realised for companies. Depending on the application and associated loads, one type of shoe could be produced in different versions with three shoe sole hardnesses.”

Freese has been in business for a long time already. “When I started safety shoes were either brown or black. The protective function ranked first, wear comfort and design played almost no role,” recounts Freese. Today, safety shoes are hardly recognisable as such, they are chic, lightweight and comfortable. “Production in Europe is only made possible and commercially viable through suitable automation. This improves the quality and the environmental balance. Automation reduces the consumption of resources and materials to a minimum, shortens transport distances, and the consistent quality makes for rugged, durable products.



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## Brief glossary

**Industry 4.0** – This term describes the fourth pillar of the Industrial Revolution: after steam engine and electrification, IT systems and electronics have changed the world. Industry 4.0 is about the digital connection of all sectors of business.

**Automation** means that artificial systems take over process control.

**Digitalisation** means that analogue values are converted into digital formats.

**Digital twins** are virtual copies of products, production with all its steps or of performance.

**FEM** means Finite Element Method. With the help of this method small areas of a components or a calculation area are used to map the physical behaviour of this component. In this way, a body and its behaviour when exposed, for instance, to forces, heat or vibration, can be calculated.

**Shopfloor** in the figurative sense of the word means the site of value creation.

**SFM** (Shopfloor Management) summarises improvement measures in the administrative area of manufacturing.

## Predictive Maintenance

**Digital Thread** refers to a single set of data for a product across its entire lifecycle, which can contribute to process optimisation.

## Captions

Dräger Smartphone App

Dräger – Predictive Maintenance

Uvex – Automated goggle production

Uvex – Shoes with vulcanised soles

Desma – Safety shoes made on DESMA's direct soling lines

Desma – Atlas safety shoe production



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