From the sensor to data to added value

White Paper

By Dipl.-Ing Martin Riedel

"Industry 4.0 not only means organizing technical IT infrastructure, but also ensuring meaningful content of measurement data so that they can be filled with life.

This includes optimally adapted analog front ends, powerful intelligent data loggers, live data analysis for reduction and refinement, as well as cloud connectivity and the support of standard protocols.

When provided with integrated and intuitive tools from one single source, this task is no "black magic", reserved to specialists only – but it can be managed by anyone. In fact, this is how the vision of "Smart Data" has become a living reality in many of our customer applications."

For many product designers and developers, the topic of Industry 4.0 has long been part of their reality that they have to deal with in daily life. But what does "data of the cyber-physical systems" really mean and when do they actually provide an added value?

What remains at times rather vague, in superficial considerations regarding Industry 4.0, needs to be defined and analysed more precisely here: What do measurement data, or generally speaking physical test and measurement, mean for system designers and product developers? Data are representing, for example, the results of tests that capture the real world performance under realistic operating conditions, in order to match them with the design specifications and simulations. This often marks the transition from "digital prototype" to real prototype. Not only in the development environment, but also in the regular operation or production of standard products, the use of such test and measurement processes is a very important area of growth in the course of the "digital revolution" associated with IoT and Industry 4.0. Keywords such as component test benches, durability testing, condition monitoring and predictive maintenance all hint at the broad range of relevant application fields.

Data is, of course, not an end in itself ("Because we can!"), but helps to achieve very concrete progress and benefits:

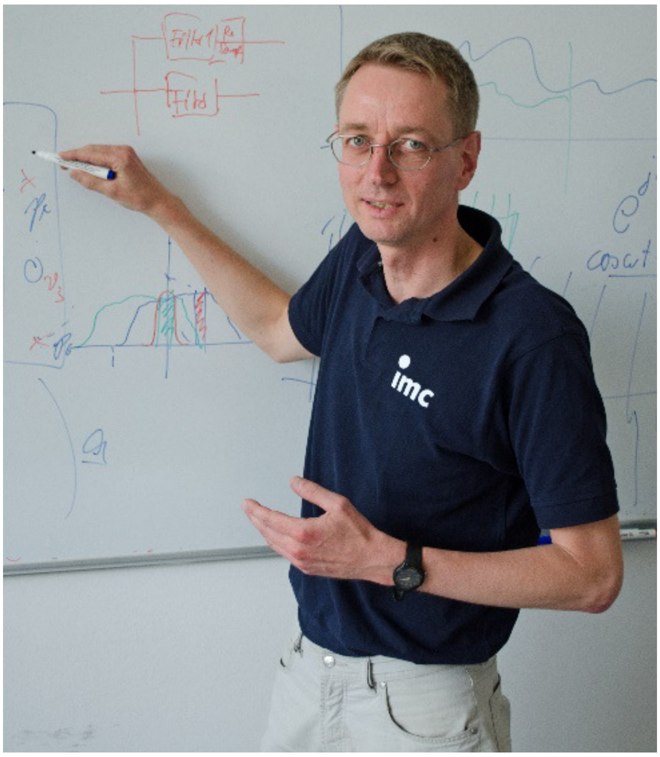
- Time-to-market as a decisive factor in fast-moving and highly competitive markets
- Early detection of potential failures and avoidance of later costly recalls
- Productivity gains and efficiency of development and design processes
- Optimal product performance with minimized use of time and resources

In order to thoroughly pursue these "evidence-based" approaches, measurement data must be sound and consistent and be prepared for the extraction of usable content. This begins with the optimally adapted conditioning of the sensor used, e.g. through a measurement amplifier for strain gauges with the choice of suitable amplification, bandwidth and sampling rate of the digitization.

Modern systems are able to immediately further refine the data by means of online processing and analysis, both live and locally in the measurement system. This not only allows drastic data reduction. Preprocessing delivers much more: it can already provide meaningful results, characteristic values and parameters. Through algorithms that can range from averaging, filtering, statistics and RMS to spectral analysis and classification.

Metadata add information about sensor sources or further variables and parameters from the process environment. Such valuable information can usually not be subsequently conjured up with "Big Data"! In fact it rather needs to be captured and linked directly at the "source" where it is still available. This is the prerequisite to establish connections and associations beyond the all too obvious, in order to finally gain findings and conclusions. It is thus the actual basis of data mining approaches for knowledge generation.

In order to achieve all this smoothly, efficiently and reliably, integrated tools are required that enable practical handling and seamless workflow: from analog signal conditioning and digitization to data logging (interactive or autarkic), connectivity for transfer to cloud databases and off-line data analysis.



Dipl.-Ing. Martin Riedel is Head of Product Marketing at imc Meßsysteme GmbH, Berlin

Additional information:

imc Test & Measurement GmbH
Voltastr. 5
13355 Berlin, Germany

Telephone: +49 (0)30-46 7090-0
Fax: +49 (0)30-46 31 576
E-mail: hotline@imc-tm.de
Internet: http://www.imc-tm.com

imc Test & Measurement GmbH is a manufacturer and solution provider of productive test and measurement systems. imc implements metrological solutions for research, development, service and production. imc has particular expertise in the design and production of turnkey electric motor test benches. Precisely outfitted sensor and telemetry systems complement our customer applications.

Our customers from the fields of automotive engineering, mechanical engineering, railway, aerospace and energy use imc measurement devices, software solutions and test stands to validate prototypes, optimize products, monitor processes and gain insights from measurement data. As a solution provider, imc offers their customers an attractive and comprehensive range of services. These include project consulting, contracted measurements, data evaluation, specialist deployment, customer-specific software development and system integration. imc consistently pursues its claim of providing services for “productive testing”.

If you would like to find out more specific information about imc products or services in your particular location, or if you are interested in becoming an imc distributor yourself, please go to our website where you will find both a world-wide distributor list and more details about becoming an imc distributor yourself:

http://www.imc-tm.com/our-partners/