Industry 4.0 inspirational for quality management

Interview with Professor Robert Schmitt, who heads the Faculty of Production Metrology and Quality Management at the Machine Tool Laboratory of RWTH Aachen University

Frankfurt am Main, 9 November 2015 – With a view to Industry 4.0, the integration of quality assurance (QA) into production operations is seen as particularly important. The Director of the German Society for Quality (DGQ) in Frankfurt am Main, maps out his vision of QA’s future and explains why the DGQ and its faculty are involved in the Quality Area at the METAV 2016 in Düsseldorf.

Professor Schmitt, what does Industry 4.0 mean for quality assurance: do we need QA 4.0 or does the existing computer-aided QA suffice?

Robert Schmitt: The revolutionary upheavals entailed by Industry 4.0 mean that more data will be generated, which will be interlinked more swiftly with each other: the game is going to get faster. Whereas previous quality management was based on carefully established causal chains, tomorrow the correlation of numerous variables,
apparently unconnected at first, will lead to faster QA measures. Industry 4.0 will in any event speed up quality management.

Quality management is an important constituent of any managerial remit

Your CV shows that you have a particularly close relationship to metrology and quality assurance in production operations. In terms of your career, what has especially motivated and inspired you?

Robert Schmitt: Quality management must not be allowed to rigidify into additional monitoring. Rather, its aim is to help people to perform the tasks in the value creation chain and improve the production operation overall. Quality management organised in this way is a constituent part of any managerial remit.

If the machine tool and the production line can acquire more data with the aid of sensor technology: what does that mean for signal processing in regard to real-time capability and coping with the enormous quantities of data involved - known as “big data”?

Robert Schmitt: We could succeed for the first time in technologically closing the current gaps in control circuits by means of feedback. We work closely together with computer scientists in projects tasked with projecting information as required onto what are called “wearables”, e.g. spectacle lenses. This necessitates systems with a real-time capability. Which seems so technologically fascinating that sociologists are talking of the “irony of automation”. When I task the computing power of a model-based system with more jobs, I have to model large amounts of specialised knowledge. When the system is in place, the factory concerned will actually need fewer highly qualified staff in the short term for excellent results. But to keep a company at the leading edge of modern-day technology, then on the contrary need more and
more highly qualified staff will actually be required. But because of automation these are lacking: a future-threatening downward spiral despite high operative excellence in the short term.

Even if very fast data-driven quality improvements are now possible – e.g. through an automated “Six Sigma in minutes” (Six Sigma is a quality management methodology developed in the USA), which links statistical methods to a rigorous project management approaches. A level of Six Sigma means fewer than four defects per one million possibilities: that practically corresponds to zero-defects production (editor’s note) –, a company should comprehend the specific know-how regarding the customer benefits of its own production operation, and be able to integrate its customers deeply into the value creation chain. Companies that do not do this, companies that rely solely on operative excellence, will lose their knowledge, and become replaceable. Research institutions like the Machine Tool Laboratory in Aachen can supply ideas to ensure that things do not get that far.

**What role do quality data play that are generated in the factory of tomorrow?**

Robert Schmitt: Measuring instrument manufacturers have to consider who in future will be the master governing the structures of the data concerned. Because he will in future be determinant for the business model. And due to the fundamentally transformative effect of digitisation, driven in particular by consumer electronics, all users of smartphones are accustomed to convenient handling of even very complex data. They want a level of operator-friendliness in the workshop comparable to that encountered in metrological kit: they want information at the click of a mouse, and definitely do not wish to operate specific devices with complicated control systems. I would accordingly venture to doubt whether in ten years’ time there will still
be the classical operator control concepts and thus also the systems for computer-aided quality assurance (CAQ). There will also be difficult times ahead for measuring instrument manufacturers who cannot integrate their products into the IT world of their customers. The message is: understand your business and the value of your customers’ data!

**How can the different worlds - meaning the shop floor (the machine tool industry), networking (the web) ad the hardware and software (the metrological sector) - grow together?**

Robert Schmitt: What’s special about Industry 4.0 is the creation of models as an image of the real world as a digital shadow. Here’s an actual example: a manufacturer whose products are apparently interchangeable will perhaps be well advised to have a data interface to the planning system of his customer. Automatic triggering of a parts list as per plan, bringing the parts together, pre-assembly, automated testing in accordance with automatically generated test schedules, logistics and assistance with final assembly by means of an app: none of this is any longer utopian: ingenious companies have already put it into successful practice. If this is done well, the boundaries will blur between the physical and the real worlds. Here, manufacturers can create enhanced benefits in cooperation with the customer. Therefore, measuring instrument manufacturers will be successful in the long term only if their products can be seamlessly integrated into the requirements and model worlds of their customers.

**Can a machine tool be transformed into a measuring machine?**

Robert Schmitt: Perhaps it won’t be possible to turn a machine tool into a measuring machine, but we and our colleagues at the Machine Tool Laboratory and the Fraunhofer Institute for Production Technology are
working on sensor integration. The task is to determine and correct inline a majority of the potential metrological errors. However, more progress is required here in the control systems as well, which so far have not been designed for metrological strategies and are for structural reasons frequently unable to handle metrological tasks. But here, too, apps on powerful hardware will be transforming the landscape.

**What is your advice to a manufacturer of machine tools or metrological equipment?**

Robert Schmitt: Model your machines and devices on the systematology of RAMI 4.0, the new reference architecture for Industry 4.0. If we do not succeed in thus getting to market fast in terms of standardisation as well, then suddenly entirely quite different players like search engine providers will be crucially influencing the internet of things. This is because they will then make available a gigantic treasure-trove of data, which can be marketed: unique expertise is then available for everyone – affordable and reproducibly. In view of the numerous functions offered by a smartphone, soon hardly anyone will then still be prepared to accept high prices for metrological hardware unless it is extremely specific. What counts is functionality – and this comes from the data.

**Quality Area: Inspiration from the field of metrology**

**So under Industry 4.0, things must grow together that in the consumers’ world already belong together: what role does the Quality Area at the METAV 2016 play here?**

Robert Schmitt: The Quality Area will indubitably render this development experientially accessible. Indisputably, the machine tool will continue to constitute the METAVs principal focus. But obviously the
innovation for Industry 4.0 also comes from the metrological sector. I would accordingly advise every visitor to set aside a few hours to gain inspiration from the sensor and metrology sector. I also see it as an opportunity to break down the functional-organisational walls between the fields of production and metrology. Productivity, you see, is more than just short machining times.

And what support does Industry 4.0 offer?
Robert Schmitt: Anyone who believes that Industry 4.0 will now solve all our problems, and relieve him of the responsibility for researching into the production operations of tomorrow, is making a profound mistake. As is anyone who believes that staff without the appropriate qualifications can be easily integrated into the factory world of tomorrow. But the source of valid data is metrology; it offers driving factors for enabling things to be produced in Germany again, thanks to innovative automation, that allegedly cannot be produced here at an affordable cost. This has meanwhile been discovered by some large internationally operating corporations as well, who are increasingly coming to appreciate Germany as a location for research and production. Very recently, in fact, we again had visitors from a large US corporation, whose representatives told us: “You can work effectively here, because here there are highly sophisticated, performatively excellent, short-distance networks”.

Prof. Schmitt, thank you for talking to us.
The interview was conducted by Nikolaus Fecht, specialist journalist from Gelsenkirchen

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Background

Faculty of Production Technology and Quality Management, RWTH Aachen
The Faculty of Production Metrology and Quality Management the Machine Tool Laboratory of RWTH Aachen University is tasked with research and teaching in the following core areas: development and optimisation of metrological processes and instruments, production-integrated metrology and close-to-machine quality control circuits, plus quality management systems. The faculty has since 2004 been headed by Prof. Dr. Robert Schmitt (54). An electrical engineering graduate (electronic telecommunications technology), he joined what was then MAN AG in Munich and Steyr/Austria, tasked with senior executive remits in assembly and quality management. Since 2004, Professor Schmitt has been a board member at the Machine Tool Laboratory and the Fraunhofer Institute for Production Technology in Aachen. He is particularly involved in issues of industrial technology-driven quality management, for which as a director of the Germany Society for Quality (DGQ) in Frankfurt am Main he formulates answers for the production operations of the future.

Further information under: www.wzl.rwth-aachen.de/de/mq_lehre.htm

METAV 2016 in Düsseldorf
The METAV 2016 – the 19th International Exhibition for Metalworking Technologies – will be held in Düsseldorf from 23 to 27 February. It showcases the entire spectrum of production technology. The principal focuses are machine tools, production systems, high-precision tools, automated material flows, computer technology, industrial electronics, and accessories, complemented by the new themes of Moulding, Medical, Additive Manufacturing and Quality, which are now permanently anchored in what are called “areas” with their own nomenclature in the METAV’s exhibition programme. The METAV’s target group for visitors includes all branches of industry that work metal, particularly machinery and plant manufacturers, the automotive industry and its component suppliers, aerospace, the electrical engineering industry, energy and medical technologies, tool and mould-making, plus metalworking and the craft sector.

Quality Area at the METAV 2016
Methods for quality assurance are developing at a rapid pace, belong in every manufacturing process, and are therefore of interest to all production experts. One of the crucial elements for quality is modern-day metrology. Users are demanding progressively shorter measuring times, which is why more and more functions are being integrated into the individual machines. In addition, consistent processing of the measured results during the course of machine monitoring and process control is gaining steadily in perceived importance. Industry 4.0 is now being complemented by Quality 4.0. The Quality Area is ideally intermeshed in the keynote topics addressed by the METAV, and the declared aim of ensuring high standards of quality throughout all phases of the production process. It showcases the entire bandwidth of measuring and testing technology, plus QM and analytical systems.

Further information under www.metav.de
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