

sentenso

From Equipment Supplier to System Engineering Provider

SINCE 2009, sentenso in Datteln, Germany has provided intelligent and innovative tools for process and quality management in shot peening. With the ongoing digitalization in industry, plus increasing complexity and growing demands at the same time, the company is rapidly developing from an equipment supplier to a system engineering provider with strong R&D activities.

The sentenso team has two engineers; one physicist; four technicians for product design, electrical control systems and programming; one quality inspector; and three employees for marketing, sales and administration. sentenso's founder and manager Volker Schneidau describes the company this way: "Our evolution is the consequence of challenges that customers brought up. For our development it has always been crucial that we do not just resell products from a limited range. Our customers expect advanced services such as product support, calibration and repair. Moreover we need to introduce and develop new equipment that fulfills extended technical requirements. Finally we are facing growing demands in automation and digitalization for smart peening solutions."



*Volker Schneidau,
Founder and
Manager of sentenso*

The basis for all this is sentenso's process know-how that was developed over time. Volker Schneidau himself is looking back at more than twenty years of experience in shot peening. Starting as product designer at Schlick resp. Wheelabrator, the mechanical engineer left the company as sales manager for wheelblast machines in 2006. In 2007, he started his engineering firm, strahlportal, which is still active today.

In the summer of 2019, the sentenso team celebrated 10 successful years of sustainable work in shot peening with their best business partners who supported a remarkable donation to SOS Kinderdörfer for worldwide projects in children's education. "Education and sustainable development are the keys to progress in the whole world, we just follow the same principles in our company," says Volker.

With sentenso's commitment to excellence in shot peening, the young team of engineers, technicians, marketing and sales will carry on to improve their products and services. So product development, automation and digitalization in blast cleaning and shot peening processes are in sentenso's focus for the next 10 years.

In fall 2019, sentenso strengthened its competence in shot peening process development and training when Wolfgang Hennig joined in. Wolfgang has been engaged in surface enhancement for aircraft landing gears and engines for almost 30 years. He is well known in national and international peening circles like the ISPC and his innovative ideas led to several patents. Before coming to sentenso he was the shot peening process owner from Rolls-Royce worldwide. Wolfgang said, "I am excited about the open atmosphere to develop shot peening solutions in the motivated sentenso team." The other main part of his activities is shot peening training which he started in 2005 for MFN. Wolfgang will further develop training concepts and contents for sentenso in close co-operation with Electronics Inc. Shot Peening Training.



Wolfgang Hennig

The sentenso shot peening portfolio is divided into products and services for **Process Management** on one side and for **Quality Management** on the other side.

PROCESS MANAGEMENT

The Process Management takes care of clearly defined and reproducible peening operations. To achieve this it has to be clear which parameters have to be controlled by suitable actuators and sensors, how the machine and alternative equipment should operate, and how the process itself should be designed.

Process Technology

In peening machines, the process is mainly controlled by combination of actuators and sensors for air pressure or wheel speed and media flow rate. sentenso provides MagnaValves for steel media but has also developed flow sensors for any kind of media. The capacitive FlowScout sensor measures the flow rate in free-fall condition whereas the microwave-based FlowScale/FlowGrade sensor can be used in the media flow path.

However, the flow rate control system can only work as well as the precision of its adjustment procedure. Changing media properties over the time and contamination can falsify flow rate measurement and control. Furthermore, a flow rate check by complete and continuous detection of the media emerging from the nozzle is useful. Such flow rate charac-



The patented flux:on Media Flow Management system

teristics can be used for a calibration, but possibly also for a readjustment of the control system. The patented flux:on Media Flow Management (U.S. patent No. US 10,513,010 B2) provides a fully automated system for this purpose which can be integrated into the peening machine.

Machine Technology

sentenso offers engineering support on special machine components which need to be redesigned or optimized. The company can also build and deliver components such as part fixtures, Almen fixtures, drives or robots for the suitable movement of parts and nozzles, as well as peening equipment with pressure pot and fully controlled media flow management.

Special Processes

One important alternative for mechanical surface enhancement is Rotary Flap Peening. The process is not only used for repair purposes on aircraft but can also be applied for small spot repair for minor damages like scratches in part production. The available tools in place did not fully satisfy the customers' requirements, so sentenso decided to develop their own tool. The new RotoFlapMaster provides compact design, speed control, various setting options and, above all, a fully mobile use by its long-lasting battery.

Process Development

Process development is an engineering service that sentenso offers to customers to setup their peening processes. Very often when new parts have to be peened, the time and available



The new RotoFlapMaster from sentenso

machines to run saturation curves, coverage development and tests is not sufficient. sentenso and its partner strahlportal own a wide range of testing machines for air and wheel peening with PLC control and visualization of all peening parameters as well as motion control of parts and nozzles with automatized drives and robots. Additionally sentenso has aerospace customers for which processes need to be developed on machines at their own site. Nozzle design and optimization is one other feature of the advanced services. In any case customers receive full documentation of their process with all required quality parameters from media properties up to residual stress.

QUALITY MANAGEMENT

The Quality Management in shot peening takes care of the inspection of peened parts but also covers the provision of proper peening media, reliable condition and calibration of sensors and measurement equipment, as well as education and training—if possible with practical exercises.

Quality Control

sentenso's portfolio in quality control equipment for shot peening covers all related parameters such as media properties, intensity and coverage, as well as hardness, surface topography and residual stress. sentenso has composed special kits such as the Intensity Kit and the Coverage Kit to provide ease of use of measurement and inspection equipment.

A special tool that sentenso provides is the μ -X360s X-ray stress analyzer from Pulstec in Japan. This unique device introduced an area detector for recording diffraction rings (Debye-Scherrer) and for evaluation of residual stresses using the cos-alpha method that now allows for mobile, user-friendly and extremely fast measurements of typically less than one minute on shot-peened steel surfaces.

sentenso puts special emphasis on the automation of measurements, using various small robot types such as from KUKA or Universal Robots. The automation provides batch measurements and stress mappings with visualization of results. The system can easily be integrated into production environments.



The μ -X360s X-ray stress analyzer from Pulstec in Japan

Operational Supplies

If needed, sentenso provides peening media and additives according to customers' requirements. sentenso helps to define the suitable media characteristics and performs media testing with the Ervin tester but also more realistic test procedures in its own airblast media testing machine.

Services

Since the beginning sentenso has performed calibrations for MagnaValves and Almen Gages to make sure that these devices operate according to specifications. All calibrations of MagnaValves and flow sensors are performed in Datteln prior to shipment. In most cases machine OEMs and peening facilities provide the operating media mix of their machines to achieve the best possible accuracies.

The determination of residual stresses is one new service that was started after a long period of training and practice. sentenso's engineer Jörg Behler has developed measurement procedures to receive best possible results for various materials and surface conditions, using a robot and a software tool of his own development. One special feature of the service is a precise depth determination by 3D measurement of the electropolished holes for residual stress profiles.

Training

Volker Schneidau and his team have been very active in shot peening training in the past years. These events are performed as customized onsite trainings or in sentenso's facilities in Datteln. As an education partner with Electronics Inc., sentenso developed a specific workshop with an additional practical training and exercises performed on real peening machines. This unique emphasis of shot peening practice led to growing numbers of students from Germany and Europe. sentenso is now offering two Workshops per year with Level 1, 2 and 3 and rotary flap peening; one of these in German and English language.

Alternatively to the workshop program, experienced students can book recertification courses with concentrated content at reduced time and cost.

FIRST EAST EUROPE WORKSHOP

sentenso is now expanding training activities to eastern Europe where a growing need of education can be seen. Together with EI and the media manufacturer KrampeHarex, a three-day workshop with practical training will take place in the Czech Republic in March 2021.

SMART PEENING

When looking into the near future it is obvious that more data will be needed to meet the challenges of a fully digitalized production process. For shot peening this requires the collection of all relevant machine, process and quality parameters as well as other machine-related data in real time to allow for:

- Records of the shot peening process to enable complete traceability of peened components (traceability)
- Investigation into technical relationships between machine parameter stability and peening results (cause and effect chain analysis)
- Recognition of required maintenance (predictive maintenance)

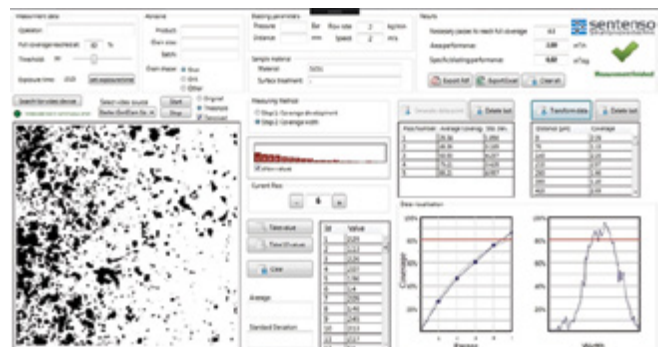
This data will also support lean peening concepts with reduced energy consumption which is getting more and more relevant with the growing problems of global heating.

However, there is still a lack of consistent use of these technologies and their implementation in intelligent control systems. With the utilization of the available data, blast cleaning and shot peening processes or programs could be made much more adaptive and flexible. A greater diversity and individualization of the surface properties would be possible, even down to only one single manufactured custom part. The quality of each single part would still be completely documented by its digital twin.

sentenso is working to provide further technologies for process and quality management in shot peening for the realization of smart peening concepts for the 4th industrial revolution in progress. ●

Contact Information

www.sentenso.com, info@sentenso.de, +49 2363 3606988



sentenso's camera-based tool for coverage determination