

KSA Develops New Automated Peen Forming for Wing Skins

by Axel Friese, KSA

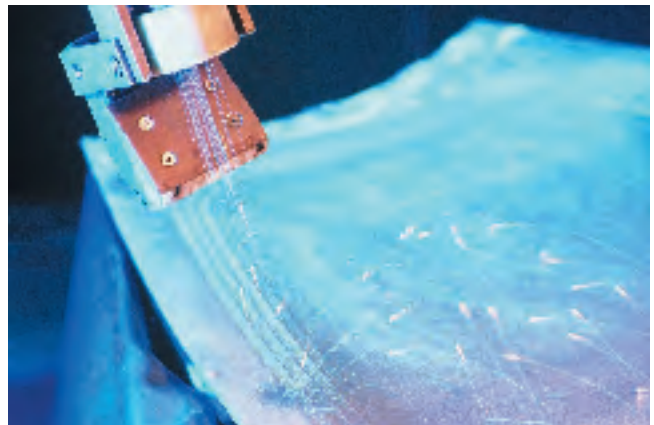
Founded as a spin-off of the Institute of Metal Forming (IBF) at Aachen Technical University in December 1993, KSA (*Kugelstrahlzentrum Aachen*) is a German limited company which specialises in Automated Peen Forming (APF) solutions and robot-aided process automation for the aeronautic and aerospace industries. Most of the company's key personnel, including its CEO Dr. Frank Wüstefeld, came to the company from IBF, bringing with them invaluable knowledge of the latest research on shot peening and of new technological developments in the industry. The company's mission is to support customers worldwide in implementing automated shot peening processes. It has consciously adopted an "open" transparent business policy, providing customers with process documentation and unlimited access to all relevant peening and quality control data.



Ariane 5: KSA's 'launch' customer

APF launched as a contract peening service for Ariane 5. KSA has rapidly made a name for itself in the shot peening industry through its development and application of CNC-controlled software for peen forming. After a development and certification phase, the company achieved its commercial breakthrough in 1999/2000 when MT Aerospace AG placed substantial orders for tank segments for the European space

launcher Ariane 5. In 2001, KSA started operating its own machine for robot-aided peen forming at its site in Aachen. A second facility is a 7-axis, CNC-controlled machine located at the nearby university institute. The company has already peen formed more than 2000 aerospace panels on a contract basis in Aachen, notably for the Ariane space launcher and for Airbus aircraft.



APF of Ariane 5 tank segments, performed as a contract peening service

Implementing APF at Airbus site

A further breakthrough occurred when Airbus Germany needed final peen forming to be carried out to its new laser-welded fuselage panels for the A 380 and approached KSA as a potential partner in 2001. The peen forming process needed to be flexible enough to accommodate design changes and also had to be applicable to a wide range of panel sizes. Above all, it had to be automated and integrated directly into production in a 3-shift operation at the Airbus plant. After successfully completing a 9-month joint testing programme, KSA peen formed more than 100 qualification parts and serial shells in Aachen. At the same time, a large-scale peening machine was developed and built by a sub-contracted machine manufacturer. The machine was then installed at the Airbus plant in Nordenham, Germany in November 2003 and programmed by KSA to peen form 8 different types of fuselage shell. APF has proven to be such a reliable and efficient process that it has already been extended to other aircraft models such as the Airbus A 318, A 340 and the new A 350.

The implementation of APF at Airbus can be seen as a first benchmark for shot peen forming as a state-of-the-art industrial process, i.e. an entirely automated process which is fully integrated into the production chain, thus contributing effectively to the reduction of throughput times and to lower costs. KSA continues to work closely with Airbus and is

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Airbus A 380, reference for APF implementation at customer site

responsible for full APF support, including process development, system integration and service, program transfer, back-up capacities and so forth.

Co-operation with AeroSphere Inc. on APF4WINGS

With experience and know-how of this kind at its disposal, it was only logical that KSA should look for further applications of automated peen forming. A first contact between Frank Wüstefeld and the management staff of the Canadian company AeroSphere Inc. revealed a similar mindset with regard to the desirability of using automated peen forming for wing skins.

The AeroSphere Inc. team has many years of experience in the manual forming and fabrication of wing skins for corporate jets and regional aircrafts. They have participated in the development of over 15 different wing projects in collaboration with various aircraft OEMs. Their mission is to improve peen forming technology and to achieve higher repeatability and control standards. After an analysis of the technology available around the world, they concluded that KSA was the best company for a partnership. Not only was it already peen forming components with an excellent repeatability rate, it also had next-generation technology and a highly-qualified staff at its disposal, making it an ideal partner for developing new peen forming technology and extending it to aircraft wing forming. KSA and AeroSphere have now developed a detailed APF program based on AeroSphere's wing forming expertise and KSA's references for shot peening process control and automation (APF4WINGS).

"Now we are in a position to transfer our standard-setting APF to wing skin forming. Both aircraft OEMs and wing suppliers will profit from this situation," said Frank Wüstefeld.

AeroSphere believes that the manual peen forming process entails costly training and often results in serious health problems for the operators. According to AeroSphere, manual peen forming can, will and must be replaced—APF is the solution and an excellent value proposition to meet future aircraft design and fabrication standards.

First test programme on wing skin specimen

As of October 2006, the companies will work closely together on testing and perfecting the APF wing programme. This will initially take place in Aachen, where the process will be applied to small-scale wing skin specimen for corporate jets. Apart from the obvious advantages of APF4WINGS over manual peening such as control, efficiency, repeatability and reduced man-power dependency, the process will benefit from the latest shape-monitoring techniques and the possibility of using bigger shot of up to 10 mm / 0.39 inches. Bigger shot leads to improved surface conditions and reduces the need for sanding and surface finishing.

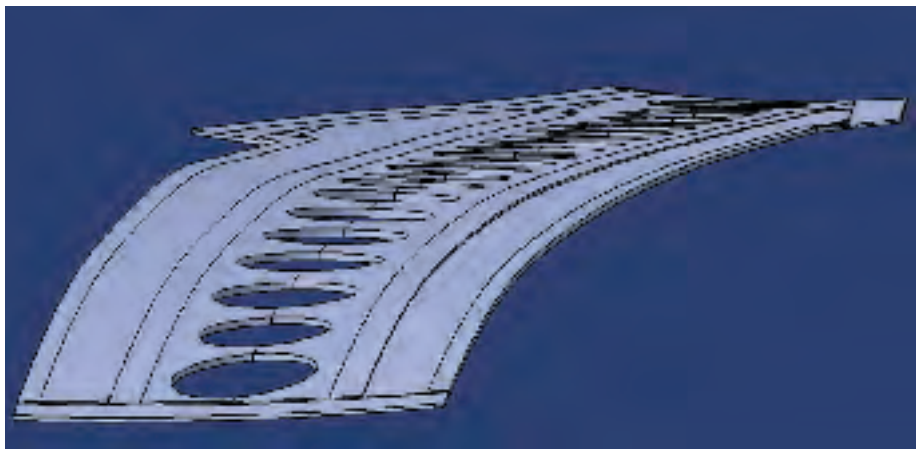
Following the first test phase, the intention is to use the knowledge and insight gained to apply APF to larger wing skins. As with the successful peen forming of fuselage panels on site for Airbus, it should be possible at a later date to integrate APF4WINGS directly into the production chain as a turn-key solution.

KSA has already worked very successfully with other partners to develop new peening. It has just completed a two-year trial phase at Rolls-Royce Germany to test its patented ISIC® - System (ISIC® = Integral Shot Intensity Control) for measuring shot velocity and distribution. By calibrating these values against Almen intensity, the system yields a computer-controlled measurement of shot intensity. The results of the two-year test period have been so convincing that Rolls-Royce Germany has now decided to integrate the ISIC® - System directly into its production process. KSA is extremely pleased about the successful development of this innovative technology, which is, incidentally, crucial for the inter-machine transferability of APF processes. The company is very optimistic that the exciting APF4WINGS proposition will be just as rewarding for the aircraft wing industry.

KSA is certified in accordance with the latest DIN EN ISO 9001 – 2000 and DIN EN 9100 for "Controlled Shot Peening" and "Automation Solutions". It also holds several patents related to process control and automated peen forming (APF).

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APF4WINGS – KSA's proposition for future wing skin forming