

APPLICATION NOTE

Forges de Courcelles: Multi-Part Measurement in Production

Forges de Courcelles is a forging company based in the Haute-Marne department of the Grand-Est region in France. It is a specialist manufacturer of crankshafts for prestigious automotive brands. With its new automated optical 3D measuring cell – the ATOS ScanBox – the business has been able to improve its production processes by shortening inspection times and increasing the amount of data collected.

Site / Country: Nogent (52) / France

GOM systems: ATOS ScanBox 5120, ATOS II Triple Scan and ATOS Triple Scan 12M

GOM software: ATOS XL Professional VMR, GOM Inspect Professional VMR

Sector: Forging



Forges de Courcelles is the second largest European manufacturer of crankshafts for well-known automotive brands and a leading forging company in France. It is part of Sifcor, a family-owned group, founded in the 1880s in Nogent which is located in the Haute-Marne department (no. 52). Originally specializing in the manufacture of cutlery blanks, the group diversified in the 1950s into other business sectors such as the automotive industry. Today, the automotive sector is the group's main market. Forges de Courcelles is a specialist manufacturer of steel parts for suspension systems, engines and transmissions. It uses semi-hot stamping and hot stamping steel processes combined with industrial presses and forging hammers.

Major clients include established French automotive brands like Renault and Peugeot and brands further afield such as BMW and Volkswagen. Today, the business has around 450 employees with a turnover of €150 million and sells over 65,000 tonnes of steel, 41 % of which is via exports.

Forges de Courcelles: a leading hot forging French business in the automotive industry

Since the 1970s, Forges de Courcelles has been introducing industrial presses and induction heating methods to deliver on a mass production scale. The first presses weighing 6,300 tonnes were installed in the 1990s. In 2007, the business invested in its first 8,000-tonne press enabling it to supply to manufacturers based in Germany. A second press of the same weight was purchased in 2014 to help manufacture crankshafts at high speed.

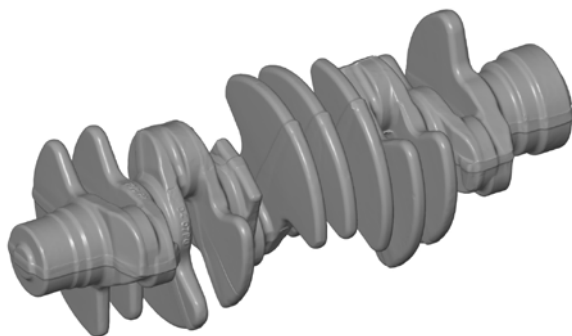
Forges de Courcelles has always banked on innovation and development. This includes investment in new machines, production of new parts, robotization and automation of production lines, etc. Their zeal has led them to use robots, for example, to expand on the production of heavier part types and improve upon production lead times. The business knew it had to embrace technological change within its production machinery. As part of its innovative approach and continuous strive for improvement, the business grew an interest in optical 3D metrology and considered the solutions offered by GOM.

A growing interest in optical 3D measurement

Cyril Schäfer has been the Methodology and Research and Development (R&D) Manager at Forges de Courcelles for 15 years. He was one of the leaders on the project to acquire a GOM measuring system along with Vincent Bouet who has worked at Forges de Courcelles for 17 years, 5 of which as Quality, Safety and Environment (QSE) Manager. The company began to gain an interest in optical 3D measuring systems about 10 years ago. It started talks with GOM during the initial stages of its R&D benchmarking analysis. At this point, Forges de Courcelles did not have any prior knowledge of 3D scanning and had only adopted conventional methods of coordinate measuring machines (CMM) using probes.

"We attended the Forges and Foundries Workshop organized by the GOM office based in Metz in 2016. We took a complex crankshaft with us that the ATOS Triple Scan was able to measure in just a few minutes when set to manual mode. This was when we started to consider using the ATOS Triple Scan in production control," Cyril Schäfer told us.

Assured by the GOM system demonstration carried out at this technical workshop, Cyril Schäfer and his colleagues initiated a demonstration and technical validation period of the ATOS ScanBox as an automated solution. In June 2018, the ATOS ScanBox 5120, fitted with the ATOS II Triple Scan sensor and the Plus12M module, was installed in the workshops at Forges de Courcelles.



Complex scan of a crankshaft W12 – Demo GOM 2016 (Image: GOM)

Automated and accelerated inspection

The ability to carry out inspections quickly was a key factor for Forges de Courcelles. Depending on the measuring points, a measurement taken with a CMM probe would usually take between 10 and 20 minutes per crankshaft. "We initially saw an opportunity to speed up inspection times. In addition, a CMM inspection only provides a limited amount of data, enough for the production control, but we could miss information on part geometry, particularly during the start-up stage," said Vincent Bouet.

Now, the full-field digitalized data allows us to continue the statistical process control of the production while at the same time providing the forge workers with a 3D

view, in color, of the deviations and material deficiencies of the parts they are manufacturing. They are therefore able to detect variations that previously would have been missed. "So we are making the process faster and more intelligible for the workers!" explained Vincent Bouet.

At Forges de Courcelles, the ATOS ScanBox is installed at three production stations in the crankshaft forging workshop. About 15 production workers regularly bring their parts to the production measurement laboratory. The Kiosk Interface makes it easier for them to begin inspecting a multiple-part assembly with four modes of operation enabling them to obtain 30 or more reference point markers.

ATOS ScanBox – Series 5

The ATOS ScanBox is a complete optical 3D measuring machine that was developed by GOM for efficient quality control in the production and manufacturing process. There are 11 models available for different-sized parts and applications. While mechanical measuring systems capture data on a point or linear basis, optical 3D measuring systems provide full-field data on deviations between the actual 3D coordinates and the CAD data. An ATOS 3D digitizer is fitted to a fast and robust industrial robot which is essential for this automated measuring machine.



The ATOS ScanBox 5120 is able to handle parts measuring up to two meters. This model is mainly used for mechanical components such as engine, transmission and exhaust parts. The ATOS ScanBox 5120 has also performed well in molding, forging and stamping applications.

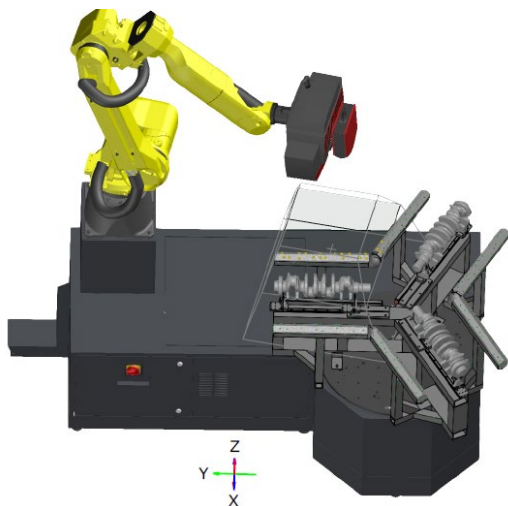
The virtual measuring room – VMR acts both as the central control station and the measurement planning software for all elements of the ATOS ScanBox 5120. The robot can be completely controlled through a simple and safe software interface. Therefore, users require no knowledge of robotics.

The Kiosk Interface is a human-machine interface (HMI) which simplifies interaction with the measuring machine. It automatically handles the complete measurement and control workflow, as well as the display of pages of reports and exports. As human interaction is greatly reduced, high precision and data quality are guaranteed, and measurement parameters, data and operating system are protected.

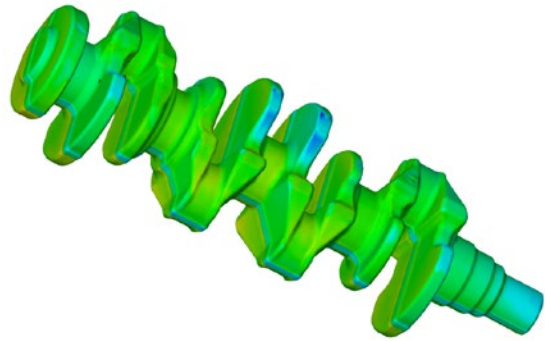
Find out more at: www.gom.com/metrology-systems/atos-scanbox/atos-scanbox-series-5.html

“During the manufacturing process, production quality control is carried out on three parts. This is to guarantee the geometrical compliance of the parts produced. The complete automation of our crankshaft production lines has greatly increased the production rate. Previously, three parts were measured in mass production using CMM methods. We had to load up the crankshaft, take the measurement, unload it and then redo the whole process twice over for the other two parts. This would take between 10 to 20 minutes per part. Thanks to the GOM setup and its quick measuring procedure and ability to inspect three parts simultaneously, we have improved our response times in case of issues with parts or deviations from the standard process. We now take 15 minutes to inspect three parts using the GOM system,” explained Cyril Schäfer.

Vincent Bouet added, “Also, as much as the objective to reduce the amount of time was important, so was the need to take reliable measurements. We confirmed with GOM in advance that their measurements were reliable and accurate by comparing them with our conventional measuring tools and methods – a key factor in guaranteeing the compliance of parts.” In modern metrology, where processes are driven and regulated by measuring data, you need to be able to trust the data produced by the digitizer. Forges de Courcelles therefore worked closely with GOM to establish optimal settings that met the criteria for accuracy, resolution and speed of data acquisition.



Virtual measuring room (VMR) – Universal three-part assembly (Image: Forges de Courcelles)



Full-field data design deviation on GOM mesh (Image: GOM)

“The main reason for choosing GOM for this application was because of the quality of the collected data and the speed of its acquisition in comparison with other well-known technologies such as 3D laser scanning,” said Vincent Bouet.

The company also valued the opportunity to work in partnership with GOM to adapt the standard ATOS ScanBox 5120 solution to the specific application required by Forges de Courcelles. GOM helped the company to design a multiple-part assembly in proportion to the forging environment to ensure a high-performance level of metrology and particularly a compliance with ergonomics to maintain the safety of its employees.

The cell was adapted at the installation stage to allow for parts weighing up to 35 kg to be loaded on with a jib crane. The necessary safety and security measures were put in place to ensure the cell operated correctly. It really was a true collaboration between the teams at GOM and Forges de Courcelles, not just when installing the system but also during the training, familiarization and post-installation support.

A personalized Human Machine Interface (HMI) for autonomous users

Hervé Maupied, an employee at Forges de Courcelles for 32 years (27 of which as a metrologist) and Franck Dorlet also an employee at the company for 19 years (3 of which as a metrologist), are both user experts when it comes to GOM systems and software.

They use the GOM Inspect Professional VMR software when programming offline and for assessing measured data. The ATOS XL Professional VMR software is an essential part of the installed system. It processes the captured images and transforms them into meshes for the purposes of conducting the analysis. So that this solution is easy to follow, only the HMI, known as the Kiosk Interface, is made visible to the users. "GOM helped us to customize these modules and now we have autonomy over three systems," explained the two metrologists.

New company prospects

The majority of Forges de Courcelles' turnover originates from the automotive industry, an extremely competitive sector. Pricing pressures along with maintaining productivity in this sector have been significant and ongoing for many years now. In Nogent, the business has grasped this and taken the necessary action to ensure it is continuously evolving.

"Because of the 3D digitizer, the business is now able to measure 100% of its parts' surfaces. This opens up new prospects for improving the product/process balance. Measured data is contributing to new confidential R&D projects," said Cyril Schäfer.

"It is not only thanks to the installation support of the GOM teams and the increased efforts of the experts at Forges de Courcelles that this ambitious project was achieved. The army of in-house employees deserve credit too for their commitment to transforming this standard 'plug and play' single measuring machine into their very own figurative multi-functional pocket knife," added Cyril Schäfer. This is not surprising given Nogent is the birthplace of French cutlery!



Franck Dorlet, metrologist (Image: Forges de Courcelles)

Forges de Courcelles

A family-owned business established in the 1880s, Forges de Courcelles is part of the Sifcor Group: a specialist manufacturer of forged automotive parts. It is the second largest European manufacturer of crankshafts for renowned automotive brands such as Renault, Peugeot and BMW. Based in the French department of Haute-Marne, the business currently has over 450 employees and exports its products worldwide. Regarded as the leading French forging company in the automotive industry, the business is continuously striving to improve and always looking to take an innovative approach.

GOM GmbH

GOM develops, produces and distributes software, machines and systems for industrial and automated 3D coordinate measuring technology, 3D computed tomography and 3D testing based on latest research results and innovative technologies. With more than 60 sites and over 1,200 metrology specialists based throughout the world, GOM guarantees professional advice as well as support and service. More than 17,000 system installations improve product quality and accelerate manufacturing processes in the automotive, aerospace and consumer goods industries.