

## Application Note

# Moules et Outillages de Bourgogne: 3D Scanning of Molds Used for Investment Casting

Site / Country: France (71) / France

GOM systems: ATOS II Triple Scan, GOM Rot 640 / MV560 and 170

GOM software: ATOS Professional Live

Sector: Moules et Outillages / Investment casting

Moules et Outillages de Bourgogne is a moldmaking company based in the Bourgogne-Franche-Comté region of France that specializes in the design and creation of molds and tooling for investment casting. With its new optical 3D scanning system, the ATOS II Triple Scan, the company has improved its production processes and diversified its business to include novel inspection services for its customers.



A leader in its field, the company Moules et Outillages de Bourgogne holds a rare and very specific knowledge of the investment casting process. The company was well established when this type of casting was introduced in France and the rest of Europe.

Now with close to thirty employees, the company has gradually developed its international business so that 66% of its sales come from exports. It has a large presence in the Middle-East, North America, South America and Turkey. Major multinational clients of Moules et Outillages de Bourgogne include Turbine Casting; Howmet; PCC and CPP; and Safran. Its main markets being the aerospace and energy industries.

#### **MOB: expertise like no other**

Moules et Outillages de Bourgogne was founded in 2004 by Mr. Jean Patenet, the present company Director, after the company Atelier de Mécanique et d'Outillage (AMO) closed down. The aim of the new business was to concentrate on a niche market and continue with the investment casting mold part of the business only. Investment casting is a metal shaping process. A ceramic mold, called a shell, is made by coating a wax assembly several times.

A steam autoclave is then used to melt out the wax (known as the lost wax process) and the pre-fired shell is subsequently filled with molten metal. After solidification and cooling, this shell is eventually broken away (the shake-out stage) to leave the desired metal part. As to be expected this piece requires a full inspection. The investment casting process creates high value parts with complex features, while also complying with extremely precise dimensional control to the nearest tenth of a millimeter. With over 15 years of experience in the investment casting mold sector, the SME's recent goal has been to diversify into novel inspection services for its customers, while improving its production processes with the capability to inspect all manufactured parts.

#### **A curiosity for optical 3D measurement and benchmarking**

Didier Simon, an employee at MOB since 2004, is the current 3D Printing Manager. In 2017, the company developed its interest in 3D printing and at the same time began looking into methods of 3D inspection that could replace the more conventional methods of Coordinate Measuring Machines (CMM). Prior to this, MOB had no real knowledge of 3D scanning, apart from a bad experience with a laser scanner that was slow and burdensome. The company was therefore on the look out for an inspection method capable of testing 100% of its production line in the quickest time possible, but importantly one that was easy to use.



Didier Simon, 3D Printing Manager (Image: MOB)

“We first heard about GOM in 2017, while visiting one of our customers who was already using a GOM scanner and GOM software. So we carried out a benchmarking analysis of the different systems on the market,” explains Didier Simon.

Didier Simon and his colleagues were particularly impressed with their on-site demonstration of the GOM system. Not long after this, they attended an international Casting Workshop in Guibeville (headquarters of GOM France) in January 2018. It was at this event that they decided to invest in the GOM 3D measurement technologies and in March 2018 Moules et Outillages de Bourgoigne purchased their ATOS II Triple Scan 3D digitizer.

#### A flexible measuring system

MOB had been unable to offer certain services to its customers because of its reliance on standard coordinate measuring machines. It was unable to inspect complex metal parts such as blades because it took too long and gave inaccurate results. However, the purchase of the easy-to-use ATOS II Triple Scan 3D digitizer has enabled the company to use different measurement volumes giving it greater flexibility when it comes to inspecting blades for gas turbine sections. The GOM system helps MOB deliver the speed, flexibility and responsiveness expected of them from their customers. Now, the company can perform an inspection service on parts in as little time as a day, sometimes even half a day.

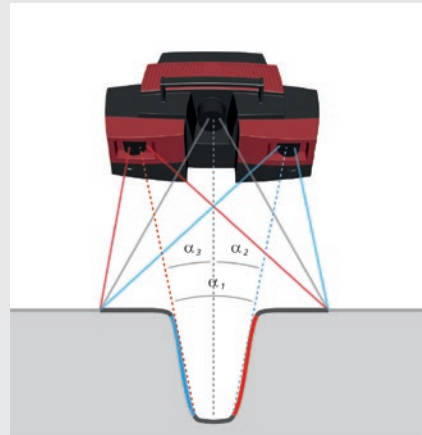
#### ATOS Triple Scan and the Triple Scan Principle

The ATOS Triple Scan is a high resolution, optical 3D digitizer that delivers rapid and precise three-dimensional measuring data. It is fitted with cameras able to provide a measuring resolution of up to 16 megapixels. Its sensor can be used fully automated in the ATOS ScanBox 3D measuring machine; in semi-automatic mode using a 3-axis motorization kit; or manually with a marking gage.

The ATOS Triple Scan 3D digitizer uses a specially developed measuring and projection technology from GOM known as Triple Scan. In addition to GOM's stereo camera technology, ATOS Triple Scan also uses the right and left cameras individually in combination with the projector. This method results in 3 individual sensors each with different viewing perspectives of the object. Using this proven technology the ATOS Triple Scan produces a high accuracy and improved measurement of shiny surfaces, complete data on complex components with deep pockets or fine edges, reducing the number of individual scans and resulting in a simple handling.

The ATOS Triple Scan also comes with Blue Light Technology. Narrow-band Blue Light Technology enables precise measurements irrespective of ambient lighting conditions.

For more information visit: <https://www.gom.com/metrology-systems/atos/atos-triple-scan.html>



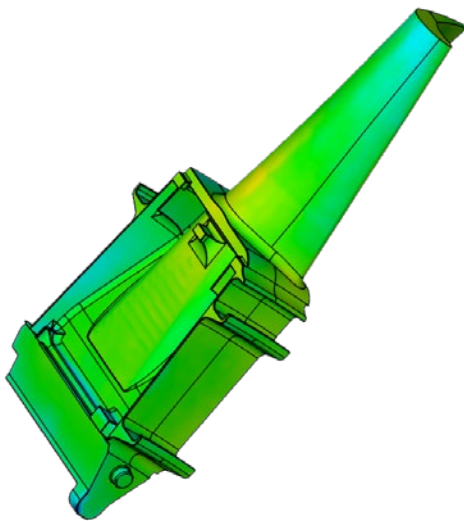
“With the manual ATOS Triple Scan 3D digitizer I can visit my customers on site and easily inspect their different sized parts. I don’t need the particular set-up that is often necessary to operate rival machines,” says Didier Simon. “I can even inspect some parts directly on the pallet!”

#### A powerful and intuitive software

“In the past, we were only able to carry out inspections point by point. Today, using the GOM 3D scanner, we’re able to obtain an overall mapping of over 90% of a part,” explains Didier Simon. In fact, unlike conventional CMM systems which will only scan individual points, optical 3D measuring systems like the ATOS Triple Scan 3D digitizer are able to capture the entire surface of all parts inspected by Moules et Outillages de Bourgogne. The ATOS Professional software includes all GOM Inspect Professional functionalities, making it a complete parametric and traceable measuring and evaluation software for dimensional analyses. Didier Simon adds: “The free GOM Inspect software is everything we’ve been looking for, especially in terms of reverse engineering. We offer inspection services to our customers who are also using the free GOM Inspect software.



Semi-automatic measurement: GOM ROT 640 (Image: MOB)

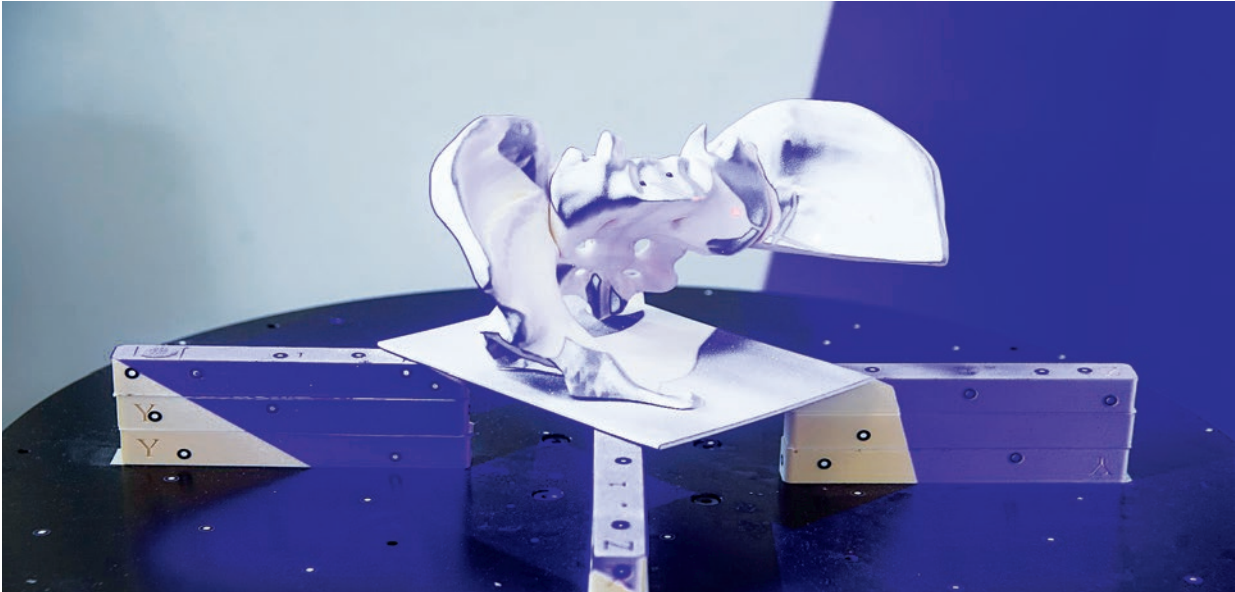


Inspecting a blade (Image: GOM)

The ability to obtain a complete mapping has opened many doors to new customers. We produce mappings of different-sized metal parts and then provide our customers with the meshes. They can then take advantage of their free software package to develop their design further. Some of them are even keen to buy their own scanner.”

The measuring data can be analyzed immediately and compared directly with the CAD data. Deviations to the CAD are highlighted in color. Problem areas are therefore easy to identify, greatly improving the precision of the manufacturing process. Mr. Simon also points out how easy it is to use the scanner and software, a key feature for MOB. “It’s an extremely clever system that requires hardly any adjusting.





Scanning an anatomy part of a pelvis (Image: MOB)

The risk of error is reduced and it's fast at taking measurements so we get our results back quicker. In addition to this, GOM's aftercare service is extremely professional as is the training it provides. This support helped us to get to grips with the equipment, including the software, really quickly. This collaboration is a really important part for us."

#### **Optical 3D measurement enables MOB to grow their business model**

The company Moules et Outillages de Bourgogne now uses the ATOS II Triple Scan 3D digitizer to scan metal parts (for geometrical characterization) as well as to create 3D files from existing pieces so it can reverse engineer all of its parts. Purchasing this 3D scanner has helped the company to widen the scope of its business model by offering novel services to its customers. In 2018, MOB launched into 3D printing and has since

used the GOM sensor to scan printed parts and more specifically to identify the 3D reference point markers of the design. MOB has created the "Opti-Mob" service for its customers. This involves optimizing development projects intended for parts used in the investment casting process. MOB prints the parts in 3D which have been sent to them electronically by their customers. Customers then send the metal parts to MOB so that the company can compare these metal parts against the printed components to determine the scaling factors (different shrinkage coefficients). The parts are then reprinted with the scaling factors included. The customer is then able to recast a part, such as parts involving a cavity or with thin walls. Operating in France and on a global scale, the company currently has close to thirty employees. MOB has now positioned itself as the leader of such a niche market.

### **Moules et Outillages de Bourgogne**

Established in 2004, Moules et Outillages de Bourgogne is a moldmaking company that specializes in designing and creating molds and tooling for the investment casting process. A technique that is predominantly used to make intricately designed pieces, such as parts involving a cavity or with thin walls. Operating in France and on a global scale, the company currently has close to thirty employees. MOB has now positioned itself as the leader of such a niche market.

### **GOM GmbH**

GOM develops, produces and distributes software, machines and systems for 3D coordinate measuring technology and 3D testing based on latest research results and innovative technologies. With more than 60 sites and over 1,000 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.