

Measurements for ensuring quality and productivity

FAMAT SA is a manufacturer of high-end parts for state-of-the-art aircraft engines. Thanks to laser measuring systems for tool measurement and the systematic use of workpiece touch probes, the machine tools at FAMAT are able to produce for hours without any operator intervention. BLUM's measuring systems detect defects in workpieces early and identify the early-stage wear and tear of tools, making them essential for FAMAT.



In modern production operations, measurement technology is a key factor for excellence in production. "Without the measuring systems integrated into the machines, everything that is achieved today would not be possible," explained Stéphane Maurer, Lead Programmer at the FAMAT plant in Saint-Nazaire. FAMAT, a joint venture between French engine manufacturer Safran Aircraft Engines and its American equivalent General Electric, is the most important centre for the production of structural components for state-of-the-art engines, including LEAP engines primarily intended for the Boeing 737 MAX and Airbus A320 Neo. This new, significantly more energy-efficient generation of engines consists of complex, large-scale, maximum-precision components. It is necessary not only to satisfy the strict requirements of the aviation industry as regards reliability and quality, but also to enable productivity increases in order to meet the heavy growth in demand for these engines.

FAMAT tackles this challenge with a dynamic, progress-centric strategy. Massive investments have been made in powerful production machinery, such as in a new, robot-automated production line for machining exhaust casings of the LEAP 1A and LEAP 1B engines. This complete system encompasses four lathes and six machining centres that are connected to one another by systems that automatically load and unload the workpieces. The loading and transport of workpieces from one machine to the next has been designed for maximum productivity and optimised accordingly. Each of these machine tools has an automated tool changer, and all tool specifications can be reviewed by the operators

from a central station on the machine. "We have set ourselves the goal of eliminating all risks as far as possible and minimising shutdown times," summarised Stéphane Maurer.

To fulfil this task, FAMAT fitted all of its new machine tools with tool and workpiece measuring systems, and BLUM's solutions were chosen for these and all future applications. But nothing was left to chance. Didier Fontaine, who is responsible for the measurement technology on the machine tools, conducted trials under real-world production conditions to confirm that BLUM's solutions were superior in terms of efficiency, stability and speed to competing systems. Using BLUM's workpiece touch probes, measuring speeds of up to 3,000 mm per minute are possible with μm precision. "We are currently operating at 1,500 mm/min, but are considering modifying our programs to a higher speed," explained Stéphane Maurer as he confirmed that the optoelectronic trigger signal generation of the BLUM probes allowed for high-precision results. The non-wear technology of these probes guarantees high measurement precision and direction-agnostic probing with constant deflection forces. These probes also allow acceleration of up to 8 g, ensuring that there is no unwanted triggering during express operation, thus also ensuring that there is no interruption of the measurement process.

Laser measuring system for tool measurement

In addition to workpiece measuring probes, FAMAT's machining centres are also equipped with laser systems for

non-contact tool measurement. BLUM's solutions are also of benefit here. "With the many systems we have used to date, the measurement process was disrupted by the cooling lubricant dripping down from the tool. This happened very frequently, especially in manufacturing processes where tools with interior cooling were used. This doesn't happen with the BLUM systems," found Stéphane Maurer. This is because the systems use "NT" technology – plausibility testing and pulling measurements from the laser beam prevent coolants dripping off the tool or thrown off it during rotation from affecting the measurement.

"Measurement technology for production", the mission statement of Günther Blum, who founded the company in 1968, is no less relevant today. "There's a sense that BLUM products are designed from the ground up to withstand even the most adverse machining conditions." But even if the laser systems have proven their reliability in the machines, they aren't used in all machines yet. Some tools are also measured using the pre-setting device before their installation.

Workpiece touch probe

Measuring systems that use contact methods to measure workpieces in the machines also help to detect errors in the manufacturing process early on. Automated measurements reduce the risk of human error and make operator interventions in the machine unnecessary. "Without touch probes we wouldn't be able to produce any more today. For one thing, the constant interruptions would cause productivity to suffer.

For another, the risk of accidents caused by sharp objects and the slippery floor from the lubrication would be too great," reported Stéphane Maurer.

The standard procedure used to be that the operator would stop the machine to perform test measurements once the first bore had been set. This job is now handled by the touch probe in the tool magazine once it has been switched into the spindle in order to automatically monitor the measurement accuracy of the first and last bores, for example. The touch probe is also used in cutting, where it detects the zero point of the workpiece so that the machining program can use the correct reference point for cutting. "This process, which involves dozens of points on workpieces with diameters of up to 1,800 mm, takes between 5 and 045 minutes," explained Didier Fontaine. This might be considered to be a waste of time from a pure production perspective, but it guarantees that the workpieces will be consistent with the desired specifications. Because the machining process for some parts can take many hours, such a delay is ultimately fairly insignificant.

BLUM's measuring systems are used not only for workpiece measurement but also for simple detection processes. "For instance, they test whether a workpiece is actually present or correctly clamped. In this case the probe is also used as a poka-yoke tool," Stéphane Maurer highlighted.

Each of the company's machine tools has one to three probes integrated. "Depending on the specific requirements of the workpiece to be machined, the measures are performed by the probe best suited for the task at hand," explained Didier Fontaine. "For example, length and diameter of the stylus are adapted to the properties and accessibility of the points to be measured. Some machines are also fitted with a modular measuring probe that can be adapted to complex or specific measurement jobs using extensions or angled attachments. Such measuring systems also allow the general number of probes to be reduced."

The effective use of laser systems for tool measurement combined with the systematic use of workpiece touch probes has had a noticeable effect on FAMAT's machine tools. "Some machines now run for seven hours straight without the need for an operator to intervene even once. That wasn't possible before," Stéphane Maurer assured. BLUM's measuring systems have become indispensable for the early detection of irregularities on workpieces and tools, thus ensuring the quality of high-precision engine components.

Mr Stéphane Maurer, Head of CNC Programming and Tools, along with Mr Didier Fontaine, Project Manager Automation

