

Safety is paramount – in the air and on the production line

To fully meet the exact production engineering demands of aero engine manufacture, the machining centres of aerospace manufacturer MTU rely on non-contact laser measuring systems supplied by Blum-Novotest.

“When your car develops engine problems, you simply pull over and wait for a mechanic. But when jet engines fail in an aircraft, the lives of several hundred people are potentially at risk. That is why we at MTU attach the highest priority to quality! All our components must satisfy the close tolerances we specify – often to within just a few hundredths of a millimetre,” explains Walter Strohmeir, user support representative for NC engineering with MTU Aero Engines in Munich.

In addition to supporting machine operators with virtually every aspect of NC machining, his responsibilities include the programming of CNC routines and procuring machines and the peripherals to go with them.

In simplest terms, the Blum LaserControl NT is an optical measuring system for tool setting and tool monitoring. As well as providing basic tool breakage detection, LaserControl NT systems capture data such as tool length, radius, wear, cutting edge bursts and spindle and tool carrier accuracy at nominal spindle speed. The systems also compensates for spindle displacement at high speed, and can detect and correct tool clamping errors.

“Way back in the mid-nineties, LaserControl NT won out against strong competitors in the selection process at MTU Aero Engines as being the system with the most know-how. MTU subsequently purchased the first laser system, and its existing machines were gradually upgraded, while new machines were acquired with LaserControl NT already installed,” says Daniel Czujek from the Technical Sales Department of Blum-Novotest and MTU support engineer.

Today, MTU Aero Engines in Munich has over 100 Blum laser systems in use across the company. Around 300 to 350 MTU employees work with LaserControl NT in three-shift operation. A number of machines are also equipped with contact touch probes supplied by Blum. In terms of quality assurance, the Blum systems make a major contribution to the manufacture of all MTU engines. These engines include the new GP7000 family of aero engines that the Munich firm produces together with industry partners, with MTU taking responsibility for the low-pressure turbine, the intermediate turbine casing and the high-pressure turbine components. The GP7000 family of aero engines has been used in the long-haul sector, including scheduled services of the Airbus A380 since August 2008. In its class, this jet engine is a benchmark in terms of reliability, fuel consumption and noise emissions.

A major role in aero engine manufacture is played by ‘blisk machining’. The process involves integral rotor construction in which disk and blade form a one-piece component, rendering blade roots and disk grooves superfluous. “The chief advantages of blisks are their substantial weight saving, increased service life, decrease in the number of components through higher stage loading and the reduction in the amount of maintenance that is required. Most parts are made from titanium. For tool setting and monitoring, we deploy LaserControl NT throughout the

entire blisk production line," explains Heinz Baumgartner, blisk production team leader for the medium-pressure compressor for the TP400 engine programme at MTU. He supervises virtually all of the machining operations that include blisk production. Almost half of his team of 19 work with Blum systems.

Blisk facts and figures are impressive: It takes between 15 and 60 hours to make one component of the blisk, depending on the size of the part and the type of machining required. The parts that are produced are worth between €30,000 and €60,000 Euro. This makes the constant monitoring of the tools that are used to machine them so vital. If there is a problem in the production process because of a faulty, worn or incorrectly fitted tool, the work is scrapped and things can quickly get very expensive. Each component can require the use of about 10 different tools – from the humble twist drill to expensive special-purpose tools.

At MTU in Munich, there was the odd occasion when the wrong tool was fitted in error, resulting in substantial losses. With the Blum laser they can now be confident that such mistakes cannot happen again. The laser systems also help maximise the utilisation of the machines. After all, in modern production facilities of the kind found at MTU where manning levels are low, there is not an operator on every machine all of the time. One operator is often responsible for several machining centres, so without a reliable monitoring system, it can take a long time for the fault to be found if there is a problem with a tool.

The tool may be broken or it may be worn or its cutting edge may have chipped or shattered, ruining the surface of the component. This is particularly true on weekends when running the machines unmanned. Running unmanned on Saturdays and Sundays is essential because of the manufacturing costs of the products. "Our ultimate goal – to achieve the greatest possible machine utilisation and this means working toward the industry standard of 5,000 hours per annum. The longer the machines run, the more we can keep costs down. This can only be achieved by working unmanned weekends with the support of LaserControl NT," explains Heinz Baumgartner.

The excellent process stability the laser systems offer provides benefits for other areas as well. Most of the machines that are equipped with LaserControl, no longer require devices for tool presetting. Some machining centres are operated in parallel, but MTU's objective is to dispense with tool pre-setters altogether in future, so when the machines are fitted with new tools, the laser will capture the tool data to the nearest micron directly on the machine. This will eliminate human error when operators manually enter tool data that has first been logged on the pre-setter, such as keying errors and transposed numbers. Measuring directly on the machine is in any case much more accurate, as the data is recorded in the actual clamping situation and at working speed. All kinds of tools are measured with the laser measuring systems at MTU. The smallest has a diameter of just 1.2mm, while the largest cutter head is currently 250mm diameter.

MTU sees significant benefits from the NT technology introduced by Blum in 2003. The NT technology has completely eliminated occasional problems previously caused by coolant. "On this basis we can now theoretically move to the laser with the tool dripping with coolant and it still works perfectly. Together with the tool cleaning

jets that were installed a few years ago, this solution represents a real quantum leap in process reliability. The good direct contact that we have established over the years with Blum is a major contributing factor. The same goes for the custom cycle that Blum has written to allow special-purpose tools with their non-standard profiles to be measured," says Walter Strohmeir.

"For us, it is the process reliability the LaserControl NT offers that is its most important feature. The excellent co-operation with Blum is another vital factor for our business because they understand what we want and can deliver it quickly. And they always give us useful suggestions, like how we can measure the tools even faster. Above all, however, the laser measuring systems give us the reliability and confidence we need for our machining processes," Walter Strohmeir sums up with evident satisfaction. Passengers should enjoy the peace of mind, too, thanks to the high quality standards set by MTU Aero Engines, at least whenever their flights are powered by engines from MTU.

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