

Lamborghini saves €150K a year with Renishaw tool breakage detection systems

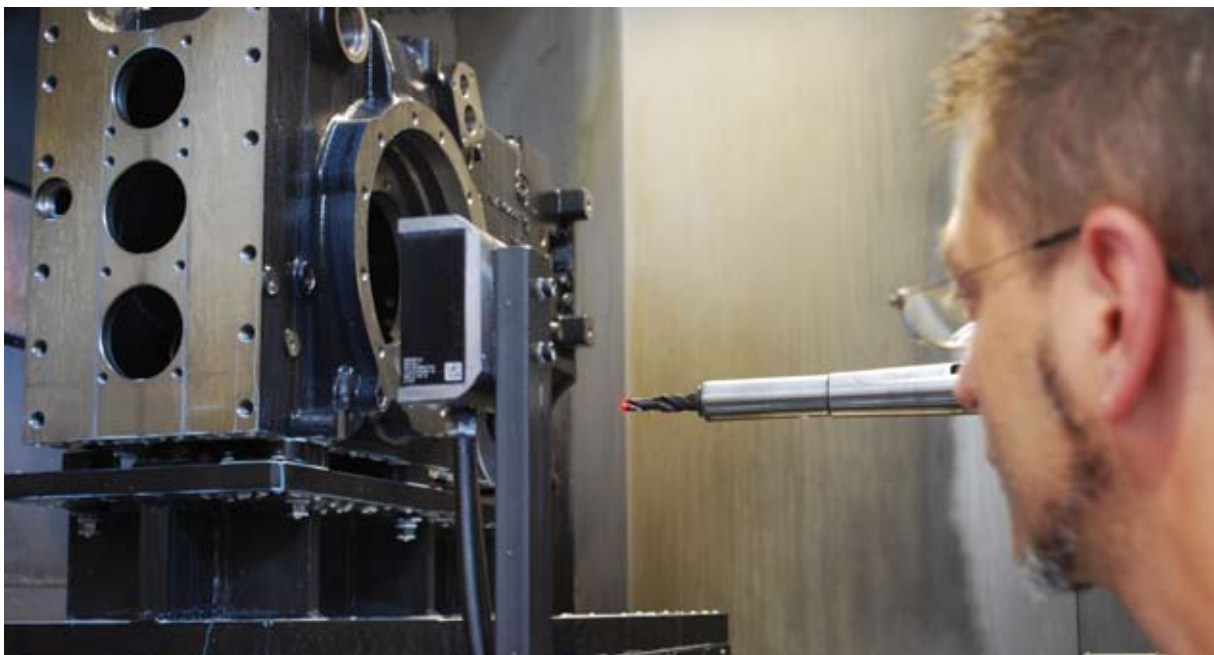
After the retrofit of Renishaw TRS2 tool recognition systems, SAME DEUTZ-FAHR, manufacturer of Lamborghini, SAME and DEUTZ-FAHR tractors, has seen a dramatic reduction in the time for essential but non-productive tool checking on four Mazak FMS cells.

Lamborghini is a brand that symbolises Italian passion in the world of supercars, but it also has a strong following in the agricultural world, with a range of high performance tractors produced by SAME DEUTZ-FAHR. At its headquarters and main factory in Treviglio, near Milan, Italy, visitors are struck by the same passion for producing high quality products in an advanced machining operation. Now the company has improved efficiency further by fitting cost-effective Renishaw probe equipment to multiple Mazak machining centres, giving a spectacular return on investment.

The flexible manufacturing system (FMS) cells produce transmission and gearbox components, all of which require a large number of threaded holes. With some 70% of machining time devoted to drilling and tapping, tools which vary in size from M5 to M18 break frequently - undetected this would lead to scrap and wasted machining time. As Luigi Galimberti, Manufacturing Engineering specialist for machining operations, explains, “We have used tool breakage detection for a long time on the Mazak machines, as machining cycles are fully automated and operators would have no idea if a tap or drill broke.



Lamborghini tractors are produced to high standards of quality



The TRS2 tool recognition system is used to check all tools prone to breakage, with at least 34 checks per machined component



Luigi Galimberti has seen component cycle times fall by 6%



TRS2 tool breakage detection system

Without detection a component could still have a broken tool embedded, subsequent operations would be incomplete and other components could be damaged.”

However, SAME DEUTZ-FAHR were unhappy with the original detection systems, which took more than 21 seconds to check each tool. This led to the decision to retrofit Renishaw TRS2 tool recognition units to multiple machining centres across all four FMS lines. Says Mr Galimberti, “With all the cutting we do we know a lot of tools need checking, so a reduction on that time meant significant time and cost savings. Each component needs at least 34 tool checks, so with the TRS2 check taking less than 7 seconds, the cycle time for every part has been reduced by an average of 7.5 minutes – some 6% of cycle time.”

The TRS2 is a non-contact laser system dedicated to tool breakage detection, which allows the machine tool to monitor tool length fully automatically during a machining cycle. In less than a second it can detect the presence of the tip of a rotating cutting tool so that if it has broken during the previous machining cycle, the system detects this and the machine can take immediate action without damaging more components. The TRS2 tool breakage detection system is also extremely easy to install with both laser transmitter and receiver contained in one unit, which doesn't need the alignment of full tool setting systems that feature two separate units.

If a tool breakage is detected by the Renishaw system an alarm sounds and the machining program is stopped. Any logic could be employed at this stage, for example another identical 'sister tool' could be used instead and machining could continue, but the engineers at SAME DEUTZ-FAHR prefer to stop the process for an operator to check the part and make sure that no more damage occurs.

Clear cost savings and return on investment

Mr Galimberti explains that the decision to invest in the TRS2 tool recognition systems and the subsequent cycle time savings has been extremely successful. “After a detailed analysis, based on the cost to run machines, we know this equates to a saving of more than €150K in the first year. This is because most of the non-productive machine time taken to check tools has now been released to machine components. We have paid back the initial investment in the TRS2s in a matter of just 5 months.”

The project to replace the tool breakage detection units was part of a general cost-reduction exercise. Continues Mr Galimberti, “When we started we had several options for improving machining productivity, but this was by far the best, the others would have taken much longer to pay back.”

The TRS2 tool breakage detection routine

Speed is the key feature of the TRS2, but it is also important that a broken tool is not missed or wrongly identified as good. The tool is moved such that the tip is in the path of the laser beam emitted from the TRS2 and rotated at one of several set speeds. The TRS2 is looking for a pattern of reflected light in its receiver from the cutting surfaces of the tool. During installation the transmitter beam is directed into a convenient position in the machine's working volume, often crossing the path taken by the machine to perform a tool change, to minimise any extra traverse moves.

The length of a good tool is recorded in the machine from a previous tool setting routine, so the machine knows exactly where the TRS2 tool recognition unit should detect the tip. The engineer programming the job chooses how frequently the tool needs checking, depending on their knowledge of how often the tool is likely to break. This could be part way through a machining operation, or often after an operation has finished and the tool is being returned to the tool carousel.

Appropriate automation for efficiency and quality

The philosophy employed in SAME DEUTZ-FAHR's manufacturing is well thought out, to maintain high quality whilst minimising costs, as Massimiliano Tempesta, Manufacturing Engineering Manager, explains, "We have a common platform strategy, not just in our products but also in our engineering principles, with engineering knowledge coordinated here in Italy and shared across all the plants. Stock of component parts is kept low by producing only what we need, according to varying demand for different models. We've done this in the machining operation with these very flexible Mazak FMS cells producing individual machined parts for the transmission and gearboxes. This is then coordinated with other components to come together on the assembly lines in a 'Just-In-Time' style."

Lamborghini, SAME and DEUTZ-FAHR brands

The three types of tractor are all produced on the same production lines with common components. Each brand has a following in different regions, but as with many car manufacturers it makes sense to share a common underlying design across different models.

The three companies came together over a number of years, starting as SAME in 1927 in Treviglio, who pioneered the use of diesel engines on tractors. In 1973 SAME purchased Lamborghini tractors and in 1985 also acquired the German tractor company DEUTZ-FAHR. In 2003 the group became a key shareholder in DEUTZ engines, which now produces all the group's engines.

The SAME DEUTZ-FAHR group has three plants in Europe - Italy, Germany and Croatia. The production at each is according to the size and power of the tractors, which determines the common components involved. In Treviglio the plant produces tractors that vary between 50-140 HP, the German Lauingen plant produces tractors with 140-270 HP (soon to be up to 300 HP), and the Croatian plant produces combine harvesters. In line with the group's geographic expansion, its Indian plant is currently being expanded, in Russia an assembly plant will shortly start its production of tractors of 150 - 270 HP for the Russian market and a new factory is being built in China, but all still retain common engineering principles.

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Lamborghini, SAME and DEUTZ-FAHR branded tractors are all produced at Treviglio