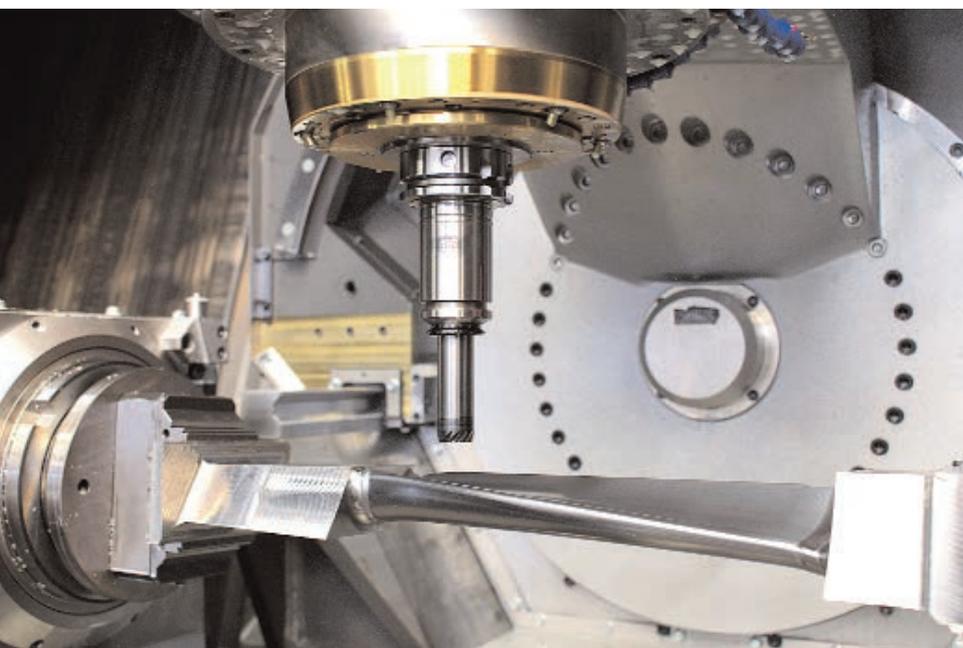


PowRgrip reduces tool wear

Machining at the limits of what's possible

At the machining solutions manufacturer Liechti Engineering, process reliability has top priority. And because a constant clamping force is indispensable here, the tool holding system used is considered very important.



1 At Liechti Engineering the cutting programs run at the limit. If a toolholding system is used, it must operate problem-free in accordance with the specifications designed for high efficiency

BY THEO DRECHSEL

→ Liechti Engineering AG is the worldwide qualitative market leader for programming and machining solutions for manufacturing flow surfaces on turbine components. The Swiss offer complete solutions and specialise in the construction of machines directed at producing complex flow profiles. Liechti milling machines reduce the machining time by up to 30 per cent due to their specific profile

machining technology. This high performance is primarily based on development expertise and know-how for machining materials such as titanium, Inconel, Nimonic and high-alloy steels.

Every application needs its own special toolholding system

The customer applications which are primarily realised at the machine tool manufacturer's test centre in Langnau are steam and gas fan blades for the energy generation sector; a second customer sector is the

aircraft construction. The materials for producing the workpieces are extremely demanding, as aircraft engine manufacturers often machine Inconel and titanium aluminide. Like the machining of CFRP, the new alloys are still in their infancy.

CFRP technology is usually used for the first step in aircraft construction, the fan

i USER

As an internationally operating family-owned company, Liechti Engineering develops and produces highly dynamic milling and machining centres and CAM software for machining complex curved flow profiles, such as fan blades, impellers and blisks. Liechti is the technology leader for the complete machining of fan blades and blisks in a single working chucking device. Chucking errors are avoided and set-up costs are reduced with highly dynamic roughing and finishing in a single chucking device. This in turn enables the manufacturing accuracy and the production efficiency to be decisively increased. With its product range, Liechti Engineering especially addresses companies of the energy generation and aerospace sectors, which place demanding requirements on precision, quality and productivity. The company's reference customers include Alstom, General Electric, Pratt&Whitney, Rolls-Royce and Siemens.

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2 Simon Trummer and Andreas Finger (from left to right) have saved a great deal of money when purchasing cutting tools since changing over to the powRgrip system

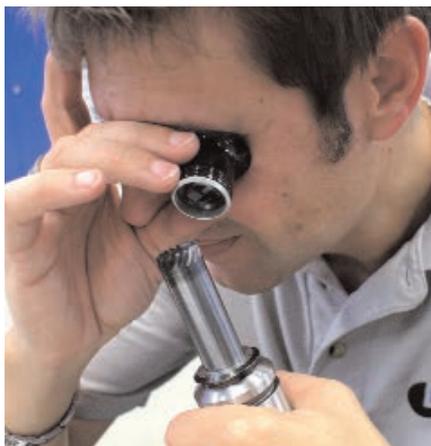
blade. To prevent it from being damaged in a collision with a bird, et cetera, the fan blade must be protected with a leading edge made of titanium. This edge is milled on Liechti machines from solid material or from forged blanks and then glued on to the CFRP fan blade. This production process has definitely proven itself for the fan blades. »The industry will continue to deal very intensively with CFRP and new titanium alloys in future,« predicted Andreas Finger, Director of the Customer Centre at Liechti Engineering. »The development of the programs for machining these kinds of materials is still in its infancy. The potential for machining more quickly and efficiently or for producing lighter components is still far from being exhausted.«

A very important aspect for Liechti Engineering AG and its customers is process reliability – reproducibility must be ensured. A constant clamping force on the tool is indispensable for this. In addition, everything runs on 5 axes in the test centre, and the cutting programs move the machine at the limit. If a tool chucking system is used, it must run in accordance with these specifications designed for high efficiency. »We use a system in each case which is best suited for manufacturing a workpiece. For this reason, we don't cooperate with just one partner, however we can recommend powRgrip from the chucking tool manufacturer Rego-Fix in most cases with excellent results,« reported Simon Trummer, Senior CAM Application Engineer at Liechti Engineering. »As a result, all finish machining on the fan blades is carried out by us in-house, preferably

with the powRgrip tool chucking system. The damping properties provide for a high surface quality here.«

High vibration dampening for broad range of applications

Liechti Engineering has already relied both regularly and successfully on powRgrip for many years. When using the system, the collet is chucked by the automatic chucking device under hydraulic pressure – with up to nine tonnes – in the toolholder up to the stop. This causes the holder to expand and a high clamping force is produced via the material elasticity. When clamping, the tool is inserted in the col- >>>



3 Finger checks the visual change in the tool cutting edges. Changes are barely noticeable after running for 35 minutes with the powRgrip

» let and this in turn in the tool holder. The holder is laid in the powRgrip device, carry out and you're done.

The advantages the powRgrip system offers the user are diverse. First the savings of time should be mentioned, as the tool change is carried out in less than ten seconds – without heating up. In addition, the high-performance system represents a combination of three-micrometer concentricity and a clamping force of up to 1,000 Nm. A major aspect is also the high degree of vibration dampening which results from the two interfaces holder/collet and collet/tool. In addition, powRgrip knows no wearing – the holding force and concentric accuracy are the same after 20,000 tool changes as on the first day. The high flexibility of the system, which results from clamping diameters of 0.2 to 25.4 mm and the option of clamping all shank shapes and materials, is of major importance in everyday practice. The length presetting with a repetition accuracy of less than ten micrometers should also be mentioned here. »Before using the powRgrip system, we had problems with heavy vibrations together with high tool wear, so that we were searching for a possibility for improvement,« said Trummer in retrospect. »Then Rego-Fix came to mind, as we were familiar with the high precision of the ER collets from the past.«

PowRgrip helps save money

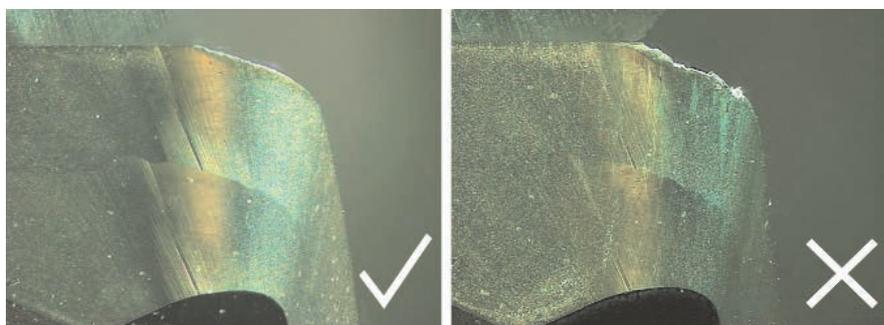
The several cutting programs run at Liechti Engineering at the limit. A test run is carried out with a constant path feed rate of

7,146 mm/min. Machining is 5-axis – all five axes are simultaneously in motion. If a tool chucking system is used, it must operate problem-free in accordance with these specifications designed for high efficiency. During testing on the 5-axis milling machine, the finish machining of a fan blade made of X20CR3 1.4021 stainless steel was carried out under these conditions. The test was allowed to run in two cycles for 59 minutes and 30 seconds. Cooling was carried out through the tool and peripherally. The tool length from the shoulder of the tool holder to the tool tip was 158.33 mm in both cases.

A look in the microscope proves it: Wear is considerably reduced with powRgrip compared to competitive products (Figure 4). In turbine production the tools must be changed before the wear mark is reached, as otherwise the quality of the fan blade is no longer guaranteed. The efficiency of the turbine depends to a significant degree on the proper surface condition.

Predestined for finishing

PowRgrip has definitely proven itself at Liechti Engineering. The system is especially predestined for finishing. However, it is also frequently used for light rough-



4 When using the powRgrip system, the free-form surface wear on the milling cutter is considerably less (on left) than with a comparably dimensioned shrink-fit holder (on right)

i MANUFACTURER

Rego-Fix produces and sells high-precision toolholding systems as an internationally operating family-owned company. Founded in 1950 with headquarters in the Swiss city of Tenniken, today the company is one of the leading tool manufacturers and has an outstanding reputation worldwide in the metalworking industry. Thanks to a global network of sales partners and its three mainstays in Switzerland, the US and Asia, Rego-Fix is well positioned and present the world over. With pioneering inventions, Rego-Fix has developed from a small company to a global supplier of solutions for holding systems. Each product is designed under the aspect of increasing productivity. Its customers come in particular from the vehicle and aircraft construction, mould construction and mechanical engineering, medical technology and watch-making sectors.

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ing applications in which it results in less tool wear and greater vibration damping as well. The fact that the tool is clamped without heating, and is therefore available for use in the machine directly following the clamping process, is time and again another strong argument for the powRgrip system. Conclusion: The advantages of the powRgrip system, which have been highlighted in the test, correspond to the results reported regularly from other sectors. »The tool wear is significantly less than with other systems we use. The tool is protected by the powRgrip system and can remain in use longer,« said Finger in summary. »With the microscope we can exactly determine how the wear on the tool develops in the course of the machining cycles. By changing over to the powRgrip system, we save a considerable amount of money when purchasing the cutting tools.« ■

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