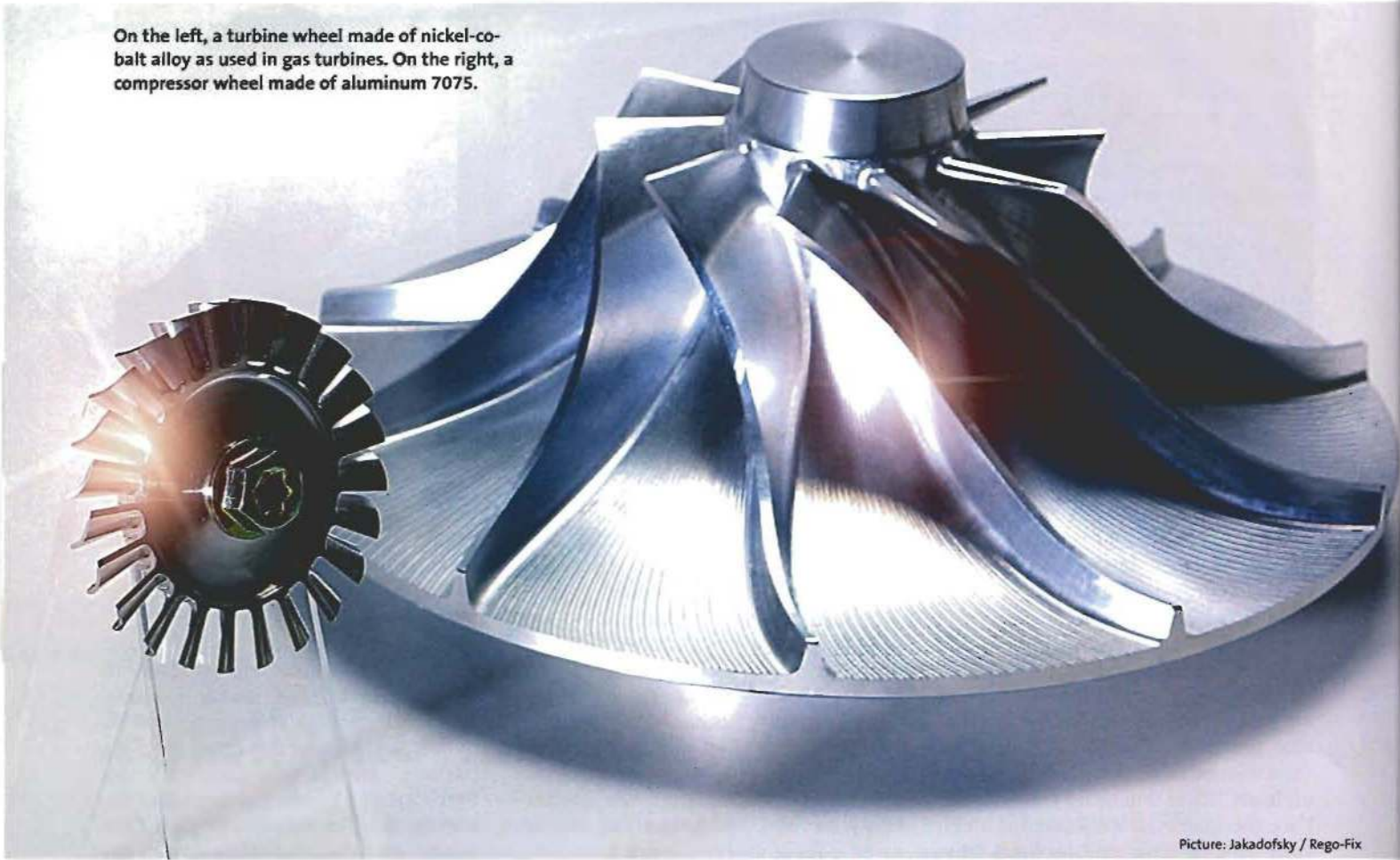


On the left, a turbine wheel made of nickel-cobalt alloy as used in gas turbines. On the right, a compressor wheel made of aluminum 7075.



Picture: Jakadofsky / Rego-Fix

“The system paid for itself in just six months”

When it came to using small tools to machine super alloys, Austrian turboshaft and gas turbine manufacturer Jakadofsky JetEngines was looking for a tool holding system that would guarantee precise concentricity, smooth function and is very quick and easy to use. In the process, the company tested the features of various systems.

Finally Jakadofsky decided to invest into the so-called powRgrip tool clamping system by Swiss tool manufacturer Rego-Fix. Now production runs smoothly and the results lie well within the specified close tolerances. As Jakadofsky points out, the tools last much longer than with other holding systems on the market. As a result, Jakadofsky is making considerable savings in annual tool costs and has already recouped its investment in the

powRgrip system twice over within the last 12 months.

Company CEO Peter Jakadofsky is an old hand in the aviation industry: He spent 17 years leading up to 2003 as an airline pilot with Austrian Airlines. Much of his expertise in the field of turbine technology was gained during this time. After inventing his patented gas turbine with integrated gear box, he set up his own business in Kottlingbrunn maintaining French helicopter

models such as the Eurocopter during the 1990s.

Peter Jakadofsky also set about establishing his own manufacturing operation for aircraft, helicopter and aviation components. Today, Jakadofsky-JetEngines is a world leader in the production of turboshaft engines, whose special feature is the integration of the patented Jakadofsky reduction gear system in the turbine casing. Jakadofsky specializes in the development and pro-

duction of turbine wheels. Using modern 5-axis/6-axis HSC technology, the company can produce prototype and production standard blade wheels using materials ranging from aviation aluminum or titanium to high-temperature nickel-cobalt alloys within a short space of time. These materials, suitable for extreme conditions in their respective applications, are not easy to machine. These products are difficult to machine due to the blade wheels made from these special materials rotate at speeds of up to 100,000 rpm and temperature of 700 celcius degrees.

Peter Jakadofsky explains: "Since the performance of the turbines improves at ever increasing speeds, we are forced to compromise between the maximum service life of the blade wheels and allowing for the highest possible machining speed. Only by using high-quality components such as tools, tool holders, production machinery and materials it is possible to achieve greater efficiency and performance at the same turbine size."

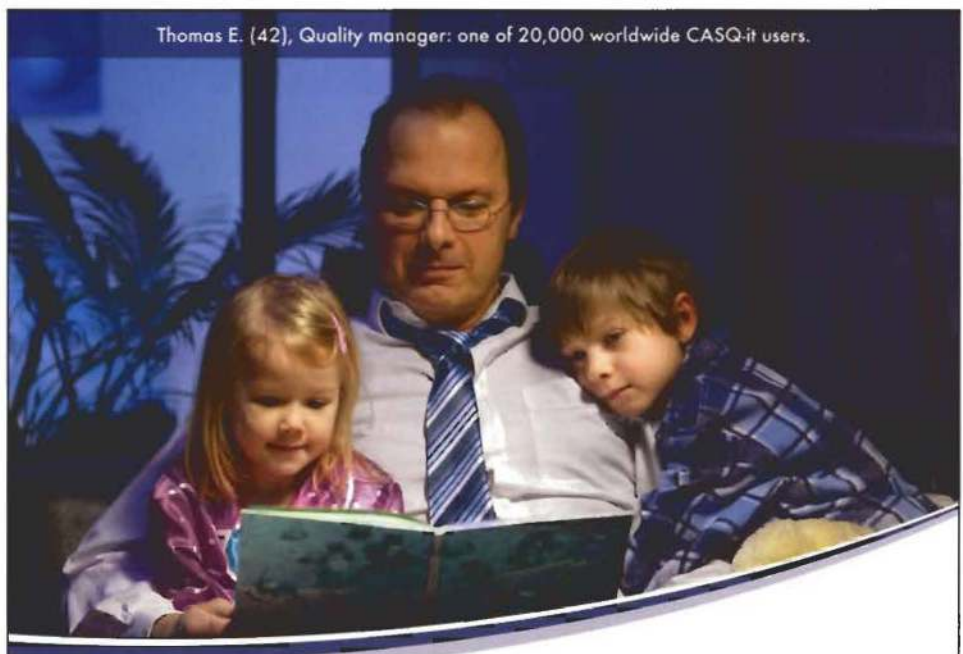
It's the tool holder that plays a key role during production

When it came to using small tools to machine super alloys, Jakadofsky was looking for a tool holding system that would guarantee precise concentricity, smooth function and is very quick and easy to use. In the process, the company tested the features of various systems. Company CEO Peter Jakadofsky elucidates: "In addition to good CNC production equipment and tools, it's the tool holder that plays a key role during production of these blade wheels. We work with a variety of tools that includes extremely small four-edged ball-nose end mills with diameters of 3 to 4 mm, dictated by the spacing of the blades on the turbine wheel."

It takes an average of 4 to 7 hours to manufacture a turbine wheel. The most important factors in the production process are high concentricity and 100



Peter Jakadofsky on a test flight in the Alouette II helicopter: "In addition to good CNC production equipment and tools, it's the tool holder that plays a key role during production of these blade wheels." (German story see www.aerotec-online.com/aero0111jaka)



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TOOL CLAMPING



Turbine wheel production: The company uses super alloys with relatively high nickel and cobalt content, which are extremely difficult to machine. Pictures: Jakadofsky / Rego-Fix



Production rooms at JakadofskyJetEngines GmbH in Kottlingbrunn, Austria. From right: Peter Jakadofsky, Managing Director, Rene Dusl, Technician, Istvan Domokos, Development.

per cent guidance stability for the tools to ensure uniform machining of the materials and absolutely outstanding surface quality.

Rene Dusl, a technician at Jakadofsky, explains: "Particularly when using small tools with these types of materials that are so difficult to machine, powRgrip really showed its strengths in terms of vibration center and high precision during the test phases."

The reasons for this include the functional contact surfaces between the tool and collet as well as between the collet and tool holder. These contribute to the almost total elimination of vibrations. Added to this is the high rigidity due to the absence of any mechanical parts, which means that the full wall thickness is available to absorb the radial forces.

Rene Dusl continues: "We were also very impressed with the high clamping force, balancing precision and ease of use. In view of the very high requirements involved here, conventional tool holder systems such as heat-shrink chucks simply couldn't compete during the comparative tests. So we concluded that the powRgrip system offers the most accurate concentricity of probably all available systems." This highly accurate concentricity becomes apparent

German Summary

Werkzeugspannen im Turbinenbau als Effizienzbringer: Der österreichische Triebwerks- und Gasturbinenhersteller JakadofskyJetEngines stützt die Prozesssicherheit seiner Fertigung wesentlich auf das eingesetzte Werkzeugspannsystem. Nebeneffekt: Die eingesetzten Werkzeuge halten deutlich länger als mit Haltesystemen aus dem Marktumfeld. Aufgrund der hohen Standzeitverlängerung durch powRgrip spart Jakadofsky nach eigenen Angaben Werkzeugkosten von rund 15 000 Euro im Jahr ein und hat bereits innerhalb von 12 Monaten die Investitionskosten für das Spannsystem vom Typ powRgrip doppelt wieder eingefahren. Der deutschsprachige Beitrag ist nachzulesen auf: www.aerotec-online.com/aero0111jaka

in relation to tool lives: Thanks to the powRgrip system, Jakadofsky has achieved a 50 per cent extension in tool life. This allows roughing and finishing stages to be performed in a single step without the need for tool replacement. This is particularly important during the spiral procedure from outside in, when the entire turbine wheel must be machined without any interruption or tool

changes as otherwise slight notching of the material can occur. The high material stress resulting from the centrifugal force generated at 100,000 rpm would then lead to a fracture at this point after an operating time of 500 to 1,000 hours.

Peter Jakadofsky continues: "Personally, I think the Swiss system is simply ingenious. It's extremely fast and always delivers excellent results. We've been using the system for some time now and haven't noticed any wear whatsoever on the powRgrip holders and powRgrip collets. Our concentricity measurements are within the tolerance of 3 µm specified by Rego-Fix. We also tested other systems where our measurements were considerably outside the manufacturer's specifications. From our perspective, this is simply unacceptable."

Jakadofsky estimates that the significant extension in service life due to powRgrip generates annual savings of around €15,000 in tools costs. Time is also saved using the pre-setting device for length measurements, even if long milling tools are used. Peter Jakadofsky sums up: "The bottom line for us is that the powRgrip system paid for itself in just six months. I like simple solutions that work reliably." ←