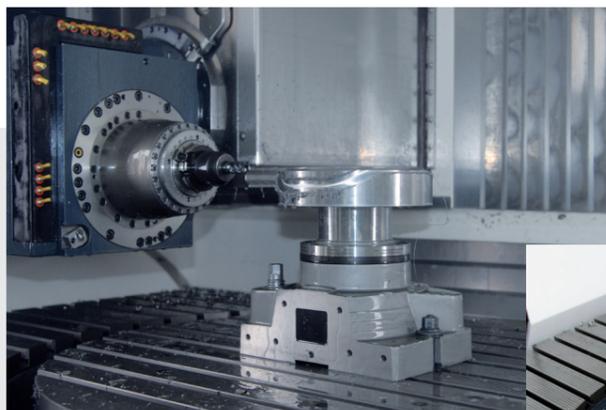


Manufacturing technology: A clever clamping solution improves the process in many respects

Around the curve at full speed

Only through the use of our clamping systems was it possible for the machine tool manufacturer, Pfuderer, to cut the processing time of its rotary cams in half. The stable, secure clamping system also extended tool life by as much as ten times their previous method, and ensured reliable processes and short change-over times.



High clamping forces, precision, and short set-up times – the combination of stationary vice product, MANOK Plus, and mandrel MANDO Adapt made all this possible.



The new clamping technology in addition to the new machine tool technology made it possible to reduce their machining time per rotary cam by more than 90% in some cases.



Peter Leonberger (L), Director Mechanical Manufacturing at Pfuderer in Ludwigsburg, and Jörg Tittel, Regional Sales Director at Hainbuch.

The cutting depth increased from 3 mm to 10 mm over the course of the testing. The new clamping devices withstood the loads and the machining time for the rotary cams was cut in half.

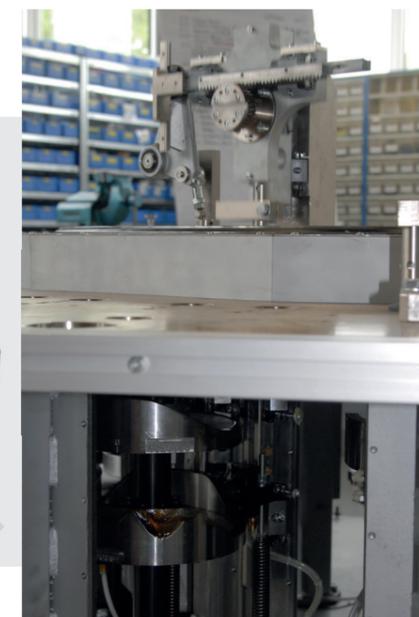
„These cams are the heart of our systems. Our entire knowhow is in these cams“, states Leonberger. They are manufactured of 16MnCr5 and the blanks weigh approximately 20 kg before they are turned. The Ludwigsburg company specializes in rotary transfer machines, which provide high productivity in a small-required workspace. „To the extent possible, we construct our machines in a modular system design. The design of the base consists of standard products. Only the individual assembly stations are specialized solutions.“ The modular system also includes our rotary cams. The rotary cam mechanically transfers all movement to

Raw material, unturned blank, and finished rotary cam.



The rotary cams are assembled under the system table and transmit the motion of the drive to the assembly stations noted above.

chatter have also been eliminated. Previously, profiles and grooves required in the design of certain rotary cams, were particularly challenging for the manufacturing process. The load initiated to the clamping system is exceptionally high for this task. „Previously it was extremely difficult to manufacture these parts, which resulted in a high scrap rate. Today this is a non issue“, reports Leonberger. Because the lot production sizes in Pfuderer’s rotary cam manufacturing are manageable – they are in the range of 20 and 60 parts between change-over – the set-up time when changing between cams is also crucial. „With our previous fixturing system, the operator needed up to one hour for change-overs“, said Leonberger, „with the HAINBUCH solution, today he completes the task in five minutes.“ This provides a significant



Joerg Tittel sees his responsibility as more than just selling a product. He advises customers on a broad basis, he also looks at other manufacturing areas and makes recommendations for process improvement. „For example, to fully exploit the potential in production, the engineers in our facility must have information regarding the effects of certain specifications.“ If the axial bores could be redesigned to a few specified standards, the number of mandrels required for production could be minimized, this feature would also provide reduced number of change-overs. Since Pfuderer has been part of the Teamtechnik Group, headquartered in Freiberg, Germany, the proportion of turning work in mechanical manufacturing has seen a massive increase. Consequently the Ludwigsburg company purchased three new turning centers that are now also equipped with clamping



The rotary cams look entirely different depending on the requirements and machine concept. Left - two variants with forced control.

The next generation is inspiring. Peter Leonberger also had this experience, when his son, Marcel, came home one evening and handed him a HAINBUCH brochure. „We’re making it with this system and it works great“, said Leonberger Jr. That was in the summer of 2010.

Peter Leonberger - Mechanical Manufacturing Manager at Pfuderer Maschinenbau GmbH in Ludwigsburg – explains: „At the time we had problems milling our rotary cams for our automated assembly machines.“ The Swabian company had previously built their own internal clamping fixtures. „However, we could not safely and repeatedly clamp the work pieces. Consequently, we had to reduce our feeds and speeds to produce these components.“ Previous tests with other systems had not provided the anticipated results. „In the best case, this solution enabled

led us to increase the speeds by ten percent.“ During this period, Leonberger Junior was in his apprenticeship with workholding technology specialist, HAINBUCH GMBH in Marbach, Germany. Among the products described in the brochure was the manual stationary workholding system, called MANOK plus. The system reported to be able to enable manual clamping and holding forces of up to 105 kN, as well as provide a pull-back effect on the work piece. Even at short clamping lengths the brochure promised secure fixation and repeatability under 0.01 mm. Moreover, 5-sided machining was possible. The MANDO Adapt mandrel fits onto the stationary actuating system, which can be changed over in a few minutes without disassembly. Vulcanized independent segment clamping bushings provide vibration dampening effects, as well as

enable a large clamping stroke range, which ensures high clamping forces even on small diameters. Leonberger Sr. quickly scheduled an appointment with the Marbach firm’s Regional Sales Director. Joerg Tittel visited Pfuderer Maschinebau GmbH, evaluated the situation and was confident that HAINBUCH could help them solve their issue. The combination of MANOK plus and MANDO Adapt was assembled onto the machine table and the tests were initiated. Looking back, Leonberger admits: „We really did not feel very good, when Mr. Tittel wanted to increase our process parameters by 20% for the first test!“ After the first test was successfully completed without problems, the HAINBUCH Salesman was able to convince Leonberger and his team to have more courage. „We increased our process parameters until the machining center reached its capacity limits.“

each independent assembly station. After a few months of experience with the new clamping technology, the machinists at Pfuderer were as confident as Joerg Tittel that additional improvements could be realized. The Ludwigsburg company replaced their 1998 4-axis Deckel-Maho machining center with a current type DMU 80 monoBlock machining center from the same manufacturer. A new series of tests showed that the machining time could now be reduced by another 70 % – depending on the rotary cam profile. Peter Leonberger cites that it’s not only the incredibly reduced machining time as a technical advantage, but today the service life of the tools can be extended many times over. In the past the tools had to be replaced after three or four cams. Today they produce between 30 and 40 cams prior to tool changes. Tool breakage and part

advantage, particularly for repeat orders, for example when a customer changes his assembly process and needs a modified rotary cam. „In addition to the pure time savings, the short set-up time also increases flexibility. Today we can react on short notice without extensive interruption to our current processes.“ The reliability of the new process also has a positive effect. „Previously we could only manufacture many parts in manned operations with constant operator attention required. Today we produce on off shifts with reduced manpower“, explains Leonberger. Currently three machines in this area are running in three-shift operation. Due to the stability of the process, they plan to now develop additional capacity by equipping the existing machines with zero-point clamping systems. This provides the ability for the night employees to manage nine machines.

technology from HAINBUCH, Marbach. For example, the turning center that was acquired for machining aluminum parts, is now equipped with a new carbon fiber chuck, which only weighs one third of what a conventional steel chuck weighs. This technology permits significant increases in their manufacturing processes.