

December 2016

Swiss Rotary Table Technology

NEWSLETTER

Highly productive thanks to auxiliary equipment

EA-520



The pL LEHMANN CNC rotary table with counterbearing makes the three-axis BLOHM PROFIMAT MT profile grinding machine into a four-axis grinding center that is ideally suited for producing demanding thread-rolling dies. Images: Blohm Jung

Profile grinding machine with CNC rotary table produces high-precision thread rolling dies

When producing parts in large quantities, it is especially important that the right production equipment is being used. This means that for rolled threads the thread-rolling dies must be manufactured precisely from the beginning. For this reason, the Taiwanese tool manufacturer Jieng Beeing (JP Metal Group) invested in the profile grinding machine PROFIMAT MT from BLOHM, and equipped it with an additional CNC rotary table from pL LEHMANN. Working with a special software solution developed by BLOHM, JP can produce the rolling dies precisely and economically, even for complicated threads.

Screws can be produced in two different ways. Either the threads are machined by turning or whirling, or they are cold-



pL LEHMANN continually refines its CNC rotary tables: The latest generation is the Product line 500 edition 3, which features a preloaded and backlash-free gear unit.



Upper and lower thread-rolling die for producing MAThread® screws.

formed. Thread rolling, for instance, falls into the latter category; here, the screw blank is rolled between two dies. The applied pressure forms the screw material into the desired final state and strengthens it at the same time. This produces a high-quality screw which is preferred especially by customers in the automotive as well as the aircraft and aerospace industries.

For the finished screws to meet the highest standards, the thread-rolling dies must be produced with high precision and high quality from the very beginning. One of the world's most successful manufacturers of such thread-rolling dies is JP Jieng Beeing Enterprise Co. Ltd., which has its headquarters in Tainan (Taiwan). In the course of searching for an especially productive profile grinding machine for manufacturing challenging rolling tools, Poyuan Chen, Head Chief of Technical Management Department, came across the PROFIMAT MT from Blohm Jung GmbH, Hamburg. Its massive cast bed and the preloaded roller guides in all machine axes ensure high machine stiffness. With its high power output, the machine can achieve high-quality machining results in a highly economical manner.

The production professional is quite impressed with the performance data of the PROFIMAT MT: «Thanks to its especially rigid overall construction and high power output, this grinding machine is especially well-suited for our machining tasks. Furthermore, additional performance features such as the fourth



Poyuan Chen (left, with Torsten Schulz from BLOHM) from the end customer JP is convinced: «With the new PROFIMAT MT we will be able to increase productivity in the manufacture of thread-rolling dies further.»

axis and the special software tipped the balance for our investment. It is only with these components that economical grinding of complex screw shapes even becomes possible.»



The BLOHM PROFIMAT MT offers high-quality grinding technology for profile grinding.

Precision dressing

The PROFIMAT MT ordered by JP can be equipped for various grinding wheel dressing methods. The first method uses a hardened steel dressing roll that finds frequent use for small threads or small lot sizes. Torsten Schulz, Regional Sales Manager Asia at BLOHM, points out that this method is also commonly used on other machines at his customer JP. He is also glad to see that the company is taking new approaches with the new PROFIMAT MT: «For the first time, JP has also started to use precision profile rollers for dressing, which is also possible on our machine.»

While the grinding wheel is pressed into the desired shape during crushing, the profile roller cuts the desired profile into the wheel. However, because of the manufacturing process for profile rollers, the latter is possible only with larger threads, but also incomparably faster. Compared to a steel roll, profile rollers can also be used for a considerably higher number of dressing cycles, which in turn translates into considerably greater economy and justifies the significantly higher price of the dressing roll.

CNC rotary axis positions the workpiece with high precision

To ensure reliable screw production, many rolling dies are tapered or radiused at the inlet and outlet to facilitate introduction of the screw blank into the die and as a precaution against damage. The taper at the outlet prevents abrupt pressure drop on the screw after the forming process, which benefits its quality.

To create these tapers in the workpiece, there is an additional, controlled rotary axis mounted on the machine table. For such requirements, BLOHM equips the PROFIMAT MT with a CNC rotary axis from the Swiss manufacturer pL LEHMANN.



Grinding a thread-rolling die with inlet and outlet tapers.

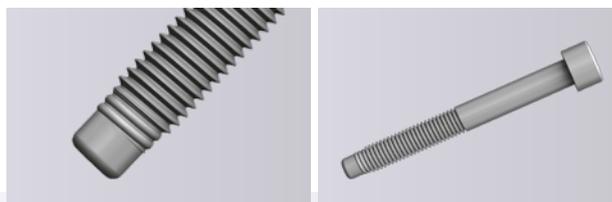
Torsten Schulz explains: «With this capability, it is possible to manufacture the transitions from the inlet and outlet of the rolling die to the forming region vertically with respect to the workpiece edge. The simpler alternative from a production standpoint would be to manufacture these transitions vertically with respect to the profile, but the consequence would be reduced screw quality.»

A controllable rotary axis is essential for creating the transition vertically with respect to the workpiece edge. The angle of the rotary axis must change continually during grinding of the inlet and outlet regions, depending on the position of the workpiece in relation to the grinding wheel. That BLOHM uses a LEHMANN rotary table is not without reason. The partnership between the two companies has existed already for many years and is not restricted only to the PROFIMAT machines. Torsten Schulz explains: «LEHMANN products offer the performance and long-term quality we need. Furthermore, the Swiss enjoy an outstanding reputation and are very well-liked in Asian countries.»

In addition to the mandatory controllability, the rotary table is required to have a highly accurate measuring system. With an indexing accuracy of $P_a = \pm 1$ arcsec, the LEHMANN rotary table moves so accurately that it meets all of the customer's requirements. Moreover, it is compact in size and needs only a few interfaces for connection. The patented pneumo-hydraulic spindle clamping system from LEHMANN with the integrated «Braky» pressure intensifier completely eliminates the need for additional hydraulic units without having to accept lower clamping and holding forces. «This is a truly plug & play solution that not every manufacturer can offer», states Torsten Schulz. Not a minor aspect for BLOHM, since the machine manufacturer is responsible for complete integration of rotary table and as system supplier assumes responsibility for the grinding results. Torsten Schulz adds: «We maintain close contact with pL LEHMANN and use the consulting capabilities of the Swiss staff. The outstanding service support from pL LEHMANN is also important to us.»

Special requirements for grinding thread-rolling dies for MATHread® screws

The profiles of «normal metric screws» have a V-shape with transition radii and a specific pitch angle. The pitch and depth of the profile depend on the thread size.



Self-centering MATHread® screws with their two different thread profiles that merge are especially challenging.

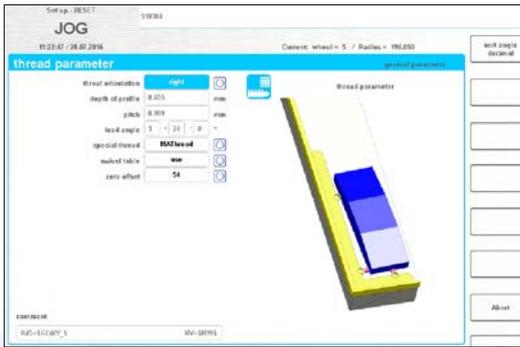
The profile to be created becomes that much more complicated when special screws must be produced with the rolling die being manufactured. JP intends to use the PROFIMAT MT to manufacture rolling dies for so-called MATHread® screws, which have two different thread profiles. Thanks to this feature, the screws can center and align themselves when inserted at an angle of up to 15 degrees. An essential requirement in the automotive industry above all, since this prevents many problems during automatic assembly operations. The MATHread® technology is patented and requires a license, which JP has.

BLOHM has had to deal with requirements for special thread-rolling dies for years and is able to equip the PROFIMAT MT accordingly. Since the first few turns of the profile on MATHread® screws have a reduced profile depth with larger transition radii, after which there is a change to the usual DIN profile shape, this geometry must also be replicated in the rolling die.

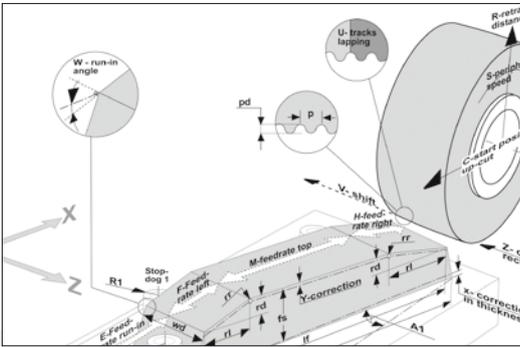
Special software simplifies programming

The extremely powerful BLOHM software for grinding thread-rolling dies provides exact interpolation in the three linear axes and the additional rotary axis, and thus for the high quality of the workpieces. It is thanks primarily to this software that the quite complicated process of grinding thread-rolling dies with two different thread profiles for MATHreads® is possible with a single grinding wheel – which saves time and money.

The BLOHM user interface allows the operator to create the grinding program with dialog assistance. During this step, all design data for the desired thread-rolling die are requested together with the technology parameters for grinding and dressing. Since the variety of screws threads is almost endless, BLOHM offers a special service, as Torsten Schulz explains: «Our software already offers a very large number of different thread-rolling die variations, but for customers who approach us with individual needs we check the feasibility on the basis of the additional requirements.»



BLOHM special software for grinding thread-rolling dies ensures exact interpolation in the three linear machine axes and the additional rotary axis. In addition, the dialog-assisted guidance simplifies programming.



Depending on the desired tool, different parameters must be specified.

JP is very satisfied with the PROFIMAT MT equipped with the LEHMANN CNC rotary table and BLOHM special software. The thread specialists have tested it with various test dies for normal and MATHread® screws – and received the following compliments from Poyuan Chen: «With this investment, we will increase productivity in the manufacture of thread-rolling dies further.»

Grinding competence in surface and profile grinding

BLOHM machines have been used around the world for decades when productivity, performance and precision matter. They are developed in Hamburg and manufactured to high quality standards in a modern facility. Over 15 000 delivered machines reflect international acceptance in the market. The collective experience and continuous cooperation with universities and European research projects form the basis for special competence in the areas of surface and profile grinding. As a member of the UNITED GRINDING Group with its own subsidiaries in India, China, Russia, Mexico and the USA, BLOHM is represented internationally. An additional 40 agencies guarantee a worldwide presence and closeness to the customer.

CNC rotary tables for economical production

pL LEHMANN is a medium-sized family-owned Swiss company with its headquarters in Bärau that for almost 40 years has specialized in CNC rotary tables that meet the many different requirements of various high-end industries. Their compact size keeps the space required low so that an additional vise or the like can also be mounted on the machine table. The high rotating speeds of the LEHMANN axes, which translate into short cycle times, are important as well. The low vertical height and large swivel circle diameter play a further important role. Thanks to their modular constructions and standard interfaces, LEHMANN products can be retrofitted quickly. Furthermore, clamping yokes and zero-point systems, rotary units and hollow clamping cylinders make the one- or two-axis rotary tables highly suitable for automation.

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