THE MAPAL GROUP'S CENTRE OF COMPETENCE FOR SOLID CARBIDE TOOLS IN ALTENSTADT

Efficiency is decisive

Centralized grinding oil cleaning saves costs and energy

The new Hall 2 is used for the production of customer-specific special tools and the regrinding service. In the final stage of expansion, over 100 grinding machines will be installed there.

The MAPAL Group's Centre of Competence for Solid Carbide Tools has expanded its production capacity at the Altenstadt site with the construction of a new hall. In the final stage of expansion, special tools will be manufactured there around the clock on over 100 grinding machines. With regard to the cleaning of grinding oil, a decision was made in favour of a single, large central system from KNOLL Maschinenbau. This system is capable of supplying around 12,000 l/min of grinding oil – in particularly pure quality, uniformly tempered and at lower cost than comparable systems.

Innovative, efficient, growing strongly – this characterizes the Centre of Competence for Solid Carbide Tools in the MAPAL Group. In line with the strong growth from 2015 to 2019, those responsible decided to expand the Altenstadt site with a second production hall.

When Frank Rieber joined the management of the Centre of Competence at the beginning of 2019, the planning for Hall 2 was in place and construction was already underway. However, it was important for the new Managing Director responsible for production to review the plans again and to take corrective action if necessary. After all, Frank Rieber wanted to contribute his experience, which he had gained for more than 13 years in the MAPAL Group, most recently as the Managing Director for Technology of the MAPAL Centre of Competence for Multi-Bladed Reamers in Winterlingen.

First of all, Rieber put the concept of Hall 2 to the test. After minor structural corrections, it was decided that the new building would be used for the production of customer-specific special tools and the regrinding service, while standard tools and semi-finished products would be produced in the existing Hall 1. Then the production manager dedicated himself to the planned cooling lubricant (coolant) technology. It was clear from the start that a central system should supply the grinding machines. This is because it eliminates the need for system components inside the hall, and the chip/oil mixture is transported away through open underfloor channels, so that more space is available for the machines, no energy is needed for the pumps, and the air in the cooling lubricant escapes more quickly. The production facility remains cleaner, and the noise level and heat input into the hall is lower. In addition, the quality and temperature of the grinding oil can be better controlled across machines.

"For our high grinding qualities, it is very important that we have clean and well-tempered oil", Rieber explains. "Other-

Satisfied by the high grinding oil quality, constant temperature and moderate costs, the KNOLL central system is based on the MicroPur® filter technology. In the first expansion stage, up to 6,000 l of cleaned grinding oil per minute is provided. In the final expansion stage, it is 12,000 l/min.

wise, we would get problems in the process, which would result in lower grinding performance and grinding cracks, and the very small tolerances could not be guaranteed in a process-reliable manner". So the requirement was process-reliable filtration with a filter fineness of 3 to 5 µm and uniform temperature control with a maximum fluctuation of ± 0.2 degrees. In addition, the regeneration of the filter media and the separation of the carbide particles were to run automatically.

Cost check for filter concepts

In principle, these requirements can be met by various filter concepts. But Frank Rieber wanted more: "Other decisive criteria are energy efficiency and, in general, the total follow-up costs. That's why it was so important for me to compare the disc filter principle originally considered with other relevant filter processes". In particular, Rieber had his eye on a central filter and treatment system from KNOLL Maschinenbau, Bad Saulgau, Germany. He had already had positive experiences with two such systems based on the MicroPur® filter technology in the course of his earlier activities. The KNOLL MicroPur® filters, which specialize in the ultra-fine cleaning of grinding oils, have a modular design and do not require any filter consumables. Instead, they contain back-flushable filter cartridges, with which they achieve a nominal filter fineness of 1 to 3 µm.

Follow-up costs make the difference

KNOLL offered to install a central system to supply up to 120 machines – in two steps. In Step 1, the system was to be equipped with half of the filter capacity, which corresponds to a maximum filtering efficiency of 6,000 l/min. In Step 2, additional MicroPur® elements and pumps were to be installed, so that 12,000 l/min would then be available. This system concept is geared towards the future. This means that another system of the same size, which is a mirror image, can be installed in the room.

The originally planned alternative consisted of two smaller central systems based on the disc filter principle for an overall similar capacity. The two concepts were compared in detail. In addition to the investment costs, those responsible primarily considered the follow-up costs. "The result was clear", explains Rieber. "In terms of investment costs, the two offers did not differ seriously. But they did in the follow-up costs, which we recorded in the categories of electricity consumption, compressed air, refrigeration capacity, filter material and disposal, as well as personnel costs. In a 5-year view, we would save around 25 percent with the

Fifteen modules of the standard MicroPur® 480 M filter were installed in the first expansion stage. Each module contains four housings, each equipped with two cartridges. These can be changed in just one or two minutes – easily and without dripping.

Maintenance Manager Horst Anger demonstrates how easy it is to replace the filter cartridges.

In the first expansion stage of the KNOLL central cooling lubricant system, the expansion of the process and filter pumps is already prepared for the final expansion. Each pump is equipped with a frequency inverter; this ensures energy-efficient system operation.

KNOLL system, based on the investment amount. As a result, the payback period would be significantly reduced. This is an item that cannot be neglected".

This was also seen as such by the management of the MAPAL Group. As a result, the green light for the installation was given, which began at the end of 2019. A large room was planned for the system in the basement of Hall 2, but this is only accessible via a freight elevator. This meant that the individual parts had to be completely assembled on site. There were minor problems in the process, but these were quickly and competently resolved by KNOLL in close cooperation.

The strengths of the KNOLL system prove themselves

To back up the calculations made before the purchase with real values, the Managing Director has had calculations made regularly since the initial start-up in April 2020. His conclusion: "The values in practice after one year in operation also show that our installed central system is very energy-efficient and cost-saving".

The reasons for the high efficiency lie primarily in the concept of the MicroPur® filter, whose filter cartridges can be individually backflushed with clean medium in a very short period of time (‹ 4 s) without interrupting the filtration process. A dedicated flushing pump increases the backflushing efficiency. Since no energy-intensive compressed air is required for the backflushing process, the energy requirement is significantly lower than for disc filters regenerated with air.

Another savings factor is the installed process or filter pumps, of which only five are required for the KNOLL system in Step 1. They comply with efficiency class IE3 and are frequency-controlled, ensuring a demand-controlled supply to the machines. By comparison, the alternative cooling lubricant solution would have required around 33 pumps. Accordingly, they would require more energy, as well as maintenance, and would cause a higher heat input into the oil, which would then have to be cooled again.

The KNOLL central system concept

In the initial expansion stage, the KNOLL cooling lubricant system consists of fifteen modules of the standard MicroPur® 480 M filter. All the hydraulic, electrical and software provisions have been made for an expansion with an additional twelve modules.

The desludger, with its 85,000 litre capacity, is also already designed for this. Horst Anger, Head of Maintenance and Facility Management, reports on his experience in this regard: "With the KNOLL system, the sludge discharge is a lot drier than with our cooling lubricant system installed in Hall 1. So we recover more oil – also a cost point". The same applies to the installed AK 50 automatic concentrator, which treats the backflushed grinding sludge from the filters in such a way that even these carbide particles with very low residual moisture ‹ 5% can be recycled.

The control system continuously monitors the important system parameters and automatically reports any problems that occur with optical/acoustic warnings or via SMS to the cell phone of a responsible person – even if it is only the reaching of the maximum filling level of the sludge drum.

KNOLL Project Manager Joachim Gruß explains one of the important parameters: "The differential pressure of each filter is

At the MAPAL Centre of Competence for Solid Carbide Tools in Altenstadt, several million solid carbide drills and milling tools are produced annually in standard and special designs.

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KNOLL .It works

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Managing Director Frank Rieber: "Our conclusion after one year: the KNOLL system delivers the expected high oil quality – it is very energy-efficient and cost-saving".

displayed on the respective cover and on the control panel. It can be set individually for regeneration for optimal filtration quality. Larger deviations are quickly detected; often a defective filter cartridge is suspected, which can be directly localized and easily checked". KNOLL can check these values and other parameters through the installed remote maintenance system, which also enables a quick initial analysis for other service calls.

Maintenance Manager Anger is satisfied with the new system: "The MicroPur® filters perform as promised. We check the oil quality regularly. The residual dirt content in the last sample was 2 mg/l – a value similar to that of fresh oil". He is also impressed by the cleanliness, both in production and with the system itself.

There has not yet been any major maintenance work. However, when a filter change becomes necessary after one or two years, it's quick and easy: open the drawer, pull out the old filter and install the new one, close the drawer – done. "It takes a minute or two and is very easy for our employees to do", says Horst Anger.

A compressor cooling system still ensures a constant oil temperature. However, this will soon be replaced by an environmentally friendly, well water cooling system. „The connection to the central system was taken into consideration by KNOLL from the very beginning and worked out very well", reports Managing Director Frank Rieber. "With our own well water cooling system, which we also use for building air conditioning, we will save on costs in the long run and also do good for the environment".

The MAPAL Group places a high priority on its commitment to energy efficiency and environmental protection. This is also documented by the ISO 50001 certification for energy management and the ISO 14001 certification for environmental management.

KNOLL Maschinenbau GmbH

KNOLL Maschinenbau is one of the leading suppliers of conveyor and filter systems for chips and cooling lubricants in metal processing. Highly flexible transport systems supplement KNOLL's product range. With its comprehensive range of products, KNOLL develops complete systems and system solutions with centralised or decentralised functions. Since 1970, KNOLL has stood for innovation, progress and growth.

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MAPAL Group

Founded in Altenstadt/Iller in 1991, the company has been the Centre of Competence for Solid Carbide Tools in the globally active MAPAL Group (around 5000 employees) since 2003. At the site, more than 500 employees develop and produce around several million solid carbide high-performance drills and milling cutters every year. Customers come from the automotive, aerospace, mechanical engineering, power generation, electromobility, medical technology, tool and mould construction, shipbuilding and rail transport industries. In addition to the large, in-stock standard program, the design and manufacture of special tools is the second focus of the Competence Centre.

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