# **KNOLLREPORT**User report of KNOLL Maschinenbau GmbH AT GSN MASCHINEN-ANLAGEN-SERVICE GMBH



Contribution to sustainability: At the beginning of 2024, a German car manufacturer had 32 lathes converted from cooling lubricant operation to KNOLL aerosol dry lubrication by GSN Maschinen-Anlagen-Service GmbH. Compared to the previous cooling lubrication system and many other minimum quantity lubrication systems, this ensures high-quality machining results as well as cost and energy savings.

Sustainability is one of the current topics in the automotive industry. Accordingly, many manufacturers are searching through their production chains for ways to save energy, resources and to reduce CO<sub>2</sub> emissions – down to the last detail. One German car manufacturer, for example, came across the possibility of switching the production of ball studs from using the previous wet machining with cooling lubricant (KSS) to using minimum quantity lubrication (MQL). The system of choice: The AerosolMaster<sup>™</sup> 4000 ATS from KNOLL Maschinenbau, Bad Saulgau.

AerosolMaster<sup>™</sup> products have been on the market since 2009. Their inventor Reiner Rother, MQL Development Engineer at KNOLL, explains: "These systems are based on aerosol dry lubrication (ATS), in which the MQL oil is atomized even more finely than during conventional minimum quantity lubrication. There are also significantly fewer restrictions with ATS than with other MQL systems, whether due to unmixing or with regard to metering, regulation, line length and the use of small tools with cooling channel diameters of less than 0.5 mm. Instead, with the AerosolMaster<sup>™</sup> 4000 ATS, the user

achieves significantly better process reliability along with productivity increases of 30 to 70 percent."

### ATS impresses in every way

The conversion of wet-cooled machines is generally unproblematic. This is because with ATS, the aerosol is preferably fed through the channels of tools with an internal coolant supply (ICS), as is usually the case with coolant. "If these are not available, the aerosol can also be fed through special tool holders or external nozzles," mentions Reiner Rother.

The MQL developer points out that, due to the significantly reduced heat generation in the engagement zone, the service life of the tool used is considerably increased. Alternatively, the cutting data can be increased and the productivity of the machining process increased – with the same tool service life specification. Additional cost benefits result from the dry chips (disposal) and workpieces (additional processing).

Reiner Rother mentions additional strengths of the Aerosol-Master™: "As the system only consumes around 3 to 25 ml/h of lubricant, the high supply and disposal costs of cooling lubricants are reduced to almost zero." Machine cleaning, which is always necessary with flood cooling, also becomes almost superfluous with ATS. And in terms of energy efficiency, the AerosolMaster™ systems show great potential: Energy consumption per machine is up to 60 percent lower compared to centralised cooling lubricant systems.



At a German car manufacturer, GSN converted 32 lathes from wet machining to the aerosol dry lubrication offered by KNOLL. The figure shows the space-saving arrangement of the AerosolMaster™ 4000 ATS devices between two machines.



Pre-installation of the AerosolMaster™ 4000 ATS including pressure booster, pneumatic unit and refill unit has already taken place at GSN, as has the first function test.

### Partnership with integrator GSN

KNOLL used numerous arguments to convince the car manufacturers to use the AerosolMaster<sup>TM</sup> 4000 ATS. Tests and demonstrations on-site showed that the desired machines could be converted easily, especially since tools with ICS were already in use.

As KNOLL is a developer, manufacturer and system supplier for ATS, but does not act as an integrator for the AerosolMaster™, the Bad Saulgau-based company brought GSN Maschinen-Anlagen-Service GmbH from Rottenburg into the picture. KNOLL Managing Director Matthias Knoll explains: "GSN is a service provider for all aspects of machine tools. We are familiar with the company from numerous other projects and know that its employees already have extensive experience in retrofitting MQL systems."

The automotive manufacturer's production managers were impressed by GSN's broad expertise. GSN was received the assignment as the general contractor to convert 32 Scherer lathes – 15 WDZ 250 shaft turning centres, 15 VDZ 220 vertical turning centres and two VDZ 120 – to the Aerosol-Master<sup>™</sup> 4000 ATS. For GSN Sales Manager Timo Hartter, this was a great success and a challenge: "Until then, we had only converted individual machines to MQL. The AerosolMaster<sup>™</sup> was also new territory for us. However, as we have been active for over 30 years as a manufacturer-independent service provider in the areas of retrofitting and servicing machine tools, primarily for the automotive and supplier industry, this order was a perfect match for our expertise."

### Pre-installation at GSN, integration on-site

The project was launched in mid-2023. "We first developed a special frame that we were able to equip in-house with the AerosolMaster<sup>™</sup> and the necessary components," explains Timo Hartter. "This allowed us to carry out an internal test run and gave us certainty that the system itself would work."

As the frame is placed between two machines at the customer's premises to save space, it contains an ATS unit on each side as well as an additional pressure booster with an output pressure of 10 bar and a filter-equipped pneumatic unit. There is also a refill unit with a tank capacity of ten litres, which automatically fills the 2.3 litre container in the AerosolMaster<sup>TM</sup>. Thanks to the clear installation, all the maintenance units are freely accessible, much to the delight of the maintenance personnel.

The on-site changeover took place in stages, so that only small groups of machines were taken out of production. "We had two employees on-site to connect the pre-installed Aerosol-Master<sup>™</sup> units to the machines," reports Timo Hartter. To do



#### How the KNOLL AerosolMaster<sup>™</sup> works <sup>™</sup>

The heart of the AerosolMaster<sup>™</sup> system is a pressure vessel containing an MQL oil, for example the lubricating oil ATS Lubricant. With air as the carrier medium, this is transformed via a special Venturi nozzle into a fine aerosol with a droplet size of 0.1  $\mu$ m to 0.4  $\mu$ m (average size 0.25  $\mu$ m). Control and regulation technology patented by KNOLL ensures that the aerosol generation and transport can be adjusted depending on the respective application. This also ensures that the aerosol flow remains constant and is fed to the cutting edge of the tool without loss. Because only optimum lubricant particle application effectively reduces the generation of heat due to friction. Even at high speeds and over long distances, unmixing of the aerosol is hardly to be expected because of the extremely fine particles. Nor is there any risk of film breakage. In addition, the ATS medium blows the dry chips immediately out of the machining zone.

this, they first disconnected the respective machine from the previous coolant supply via a central system. The existing pipework was left in the machine and sealed with plugs. This meant that KSS operation could be reactivated if required.

### Programmable and operable via the machine control system

The GSN fitters then installed the lines required for the single-channel MQL system to the two turrets (WDZ) and to the ball turning and ball roller unit (VDZ), including a switch-on valve. This was followed by the electrical and control connection of the ATS system. "We linked the KNOLL PLC with the machine control system and set up a separate control panel on the HMI. The control panel allows the user to set the required parameters, namely the pressure and aerosol quantity for each tool," explains Hartter. "Because only optimum lubricant particle application effectively reduces the generation of frictional heat. The AerosolMaster<sup>™</sup> 4000 ATS provides 30 different programs for this purpose, which is easily sufficient for the two existing turrets with eight to twelve stations." Displays were also generated for error messages, for example, when level sensors detect a lack of MQL oil. GSN's tasks also included adapting the machine's E-Plan documentation and finally commissioning the system.

After a total of six months, all of the machines had been changed over. "Although we had no previous experience with the KNOLL ATS system, the project went really well," says a delighted Timo Hartter. "And the contact persons at our customer, an OEM that sets the highest standards, are also highly satisfied – with our work and the installed AerosolMaster<sup>™</sup>. They say that neither KNOLL nor we promised too much." Hartter sees the receipt of follow-up orders, such as the conversion of two INDEX lathes to the ATS system, as confirmation of this.



Sales Manager Timo Hartter: "Our contacts at the OEM customer from the automotive industry are highly satisfied - with our work and the installed AerosolMaster™."

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He also has words of praise for the collaboration with KNOLL: "Reiner Rother, who accompanied the project, was a great help. He informed us about all the important details so that the installation was easy for us, both mechanically and electrically and in terms of control technology. Everything worked really well."



Reiner Rother, MQL Development Engineer at KNOLL: "With the AerosolMaster™ 4000 ATS, productivity increases of 30 to 70 percent can be achieved. The high supply and disposal costs of cooling lubricants are reduced to almost zero."



The roller unit for the ball studs is also supplied with the finest aerosol by the KNOLL ATS system.



As the turrets of the turning centres are already equipped with internally cooled tools, the changeover from KSS to ATS was possible without any problems.



GSN installed the connections for the AerosolMaster<sup>™</sup> 4000 ATS using the existing cable carrier and took care of all the electrical and control connections, including documentation in the E-Plan.

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### **AT GSN MASCHINEN-ANLAGEN-SERVICE GMBH**



### GSN Maschinen-Anlagen-Service GmbH

GSN is the market leader for RE. projects (Retool, Retrofit, Remotion, etc.) in the machine tool sector. This service company also has extensive experience in special machine construction, in design, production, assembly, programming and service. It has been closely associated with the automotive industry since its founding in 1992 and has already realized over 4300 machine projects. GSN has been part of Gebr. Heller Maschinenfabrik since 2006, but operates completely independently of manufacturers. Its more than 400 employees generate a turnover of around 40 million Euros per year.

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### KNOLL Maschinenbau GmbH

KNOLL is the leading provider of conveyor systems, filtration units and pumps for metal processing. These transport and separate chips and cooling lubricants. The comprehensive product range offers systems for decentralised or centralised applications. KNOLL'S Automation Division deals with solutions for challenging assembly and logistics tasks. These include stationary transport systems with chain and roller conveyors. The integration of handling units (robots, cobots) and transport robots (AGVs) enables flexible systems to be created from a single source.

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