Examples of application

Milling in hardened tool steel (60 HRC) mould making with a processing time of 3 hours per workpiece. In the case of dry processing, the edge life was not sufficient for one workpiece. 2 MQL nozzles lubricate the milling cutters and double the edge life. Thus, tool replacement during processing operations is no longer necessary.

Milling of a compressor rotor made of alloyed steel with a milling cutter Ø 250 mm. Compared to dry processing, the use of MQL resulted in increased edge life, improved finished surfaces and a reduction in the temperature of the workpiece.

Milling of plastic parts on a machining centre. Because emulsion would attack the plastic, until the introduction of MQL, dry processing had been used. However, this meant that the surface of the finished product was often unsatisfactory. Now the milling process is lubricated using one nozzle. This has improved surface quality, and has even made a gloss effect possible on some types of plastic.

Milling and **drilling** of aluminium on a machining centre. MQL with internal lubrication using internally cooled spindle and machine tool.

Milling of ring T-nuts in surface plates (Ø up to 3,000 mm) of St52 constuction. Because of the size of the parts and the open construction, flood cooling is not possible. Two nozzles lubricate the milling cutters. There was a 100% increase in the edge life compared to dry processing.

Milling of sample gauges of plastic or aluminium on a Zimmermann FZ 40 5-axle portal milling machine. In this process, the oil-air mixture is conducted through a lateral cooling channel of the spindle and sprayed on by a multi-link tube nozzle using an MQL system for the internal feed. In addition, chips are removed from the workplace with the spray air function, if necessary.

Milling of individual pieces of diverse material types on a DMG 50T in the mechanical workshop of an institute. Compared to the previous dry processing, the lifetime of the tools could be decisively improved.

Milling of prototypes and samples of hardened steel. So far, lubrication has been carried out in this case with a hand spray bottle, with which always too much medium has been used contaminating the tool, chips and the surroundings. With MQL not only the area surrounding the machine has become clean and the chips have become dry but also the processed surface has been improved decisively.

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Examples of application

Steidle® Spraysystems & MQL

Milling of 3m long, forged steel ingots made of X4CrNiMo16-5-1. The scale layer is removed and the block is brought to size. With MQL it was possible to increase the edge life of the tool compared to dry processing. Furthermore processing time is reduced by 2 ½ hours per ingot as advance and feeding could be improved.

Milling of toothed wheels made of bronze or steel casting on conventional milling machines. A very high quality of the finished surfaces is required which could not be implemented without lubrication. Thanks to MQL the quality of the finished surfaces was improved by 30% and the machine environment remains clean.

Turning of components for pump systems of high grade steel construction up to Ø 1,200 mm. 2 nozzles lubricate the tool. The heavy pollution of the area around the open machinery, associated with conventional flood cooling, was also largely eradicated. Furthermore, in relation to intricate materials, there was also an improvement in the edge life and surface finish.

Turning of grooved rolls Ø 1,500 mm made of forged steel. The diamond edges of the lathe tools were lubricated using one nozzle to prevent them becoming too hot and consequently coming loose.

Turning in a tool and jig making shop. In this department, an employee became ill and suffered from skin rashes due to contact with the lubricoolants. For this reason an alternative for the flood cooling was investigated. After changeover to MQL, the employee is now free of complaints.

Turning of aluminium screw connections with subsequent thread rolling. The process was lubricated with emulsions, which however damaged the loading robot. Trials of dry processing failed due to the built-up edge formation. Production could be changed with MQL.

Turning on a Gildemeister Graziano CTX 310 of an educational establishment for training and test purposes. Since the machine is not regularly used, it has never been filled with lubricoolants. Problems with bad tool lifetimes were faced, which can be removed with MQL.

Turning of internal threads in pressure measuring elements made of 1.4305. Compared with the former lubrication, the oil consumption has been cut down significantly by using MQL, without having any problems with increased temperatures of the work piece or the tools.

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Examples of application

Tapping M4 x 9 in zinc die casting with prior drilling of the cored blind hole. A single droplet of lubricant is fired onto the tool with a very high degree of accuracy, prior to its use. 20 litres of MQL lubricant is sufficient for an annual output of 1.2 million threads.

Tapping in zinc die casting for the automobile industry. Compared with the presently used basic MQL equipment, it was possible to dose a significantly more exact quantity and avoid nebulosity with a product made by Steidle.

Tapping M8 in die cast and stainless steel for the manufacture of door lokking systems. Up to present, oil has been applied with a brush. Since this procedure required too much efforts and costs and was not uniform, alternatives were looked for. Thanks to the fogfree MQL, the lubrication is now processsafe, saves time and an unnecessary displacement of oil is excluded.

Thread moulding of two internal threads with a TIN-coated M10 thread former in sanitary installation products made of galvanized sheet steel. It was necessary to avoid the flood cooling so that first the dry processing was tested, through which the lifetime of the tool only amounted to approx. 200 threads. With the Steidle MQL, good lifetimes of 7,000 threads have been achieved.

Thread moulding in zinc die cast parts with a Maxion drill in the company of a subcontractor. Up to present, lubrication by brush has been used, which resulted in an oiling of insufficient quantity or too much quantity. Through the refitting of an MQL airless system the productivity could be increased by 10 % and the lifetime of the tool by approx. 30%.

Thread moulding M5 x 5 of aluminium sections for plant engineering. First of all the tap holes are punched out. The thread former is briefly sprayed by a nozzle prior to use. There was a drastic reduction in the quantity of lubricant required compared to the drip feed lubricators previously used.

Thread moulding of M8 and M6 threads in assembly plates made of V2A. The specified edge life of the tool could be exceeded by 33% with the system directly planned with MQL.

Thread moulding M36 in rotor rings for wind power stations. Rings with a diameter of up to 6m are made of high-grade forged steel. As a high dimensional accuracy is demanded, the workpiece must not heat up too much. More oil as common for MQL is used here deliberately to reach the necessary cooling effect.

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Examples of application

Steidle® Spraysystems & MQL

Deep hole drilling of aluminium pump cases at a drilling depth of 260 mm. Switching to MQL internal lubrication trebled the edge life in comparison to internal cooling using emulsion.

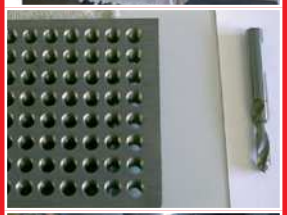
Deep hole drilling of hydraulic shafts using single-lip drills. When MQL is used, the lifespan of the drills exceeds the manufacturer's specifications by approx. 50%. The MQL spray air also has the useful function of blowing any chips out of the drill hole.

Deep hole drilling of Ø13mm with a drilling depth of 400mm. Chips can be easier removed out of the hole thanks to a good chip break and the lower own weight with MQL. As a result, the workpieces with a diameter of only 70mm remain cool.

Drilling of rectangular steel tubes. Flood cooling was used previously. Switching to MQL resulted in a reduction in pollution and improved workplace safety. In addition, the lifespan of the drills trebled.

Drilling Ø 11.5 of a hole notch for a plasma cutting machine in X2CrNiMo22, 80 mm thick. Dry boring was the method used previously. Using a drill with internal MQL cooling resulted in a 20 fold increase in the edge life and a reduction in the processing time from 20 to 6 minutes, as tool replacement was no longer necessary.

Drilling and **thread cutting** on a machine centre to the specifications of a particular customer. The work was to be carried out using MQL with internal lubrication. In the comparative test, 4,000 holes were drilled using flood cooling; using MQL, the required edge life of 8,000 drill holes was achieved.



Drilling Ø 4 mm of aluminium rollers (Ø 250 mm) on a machine centre. The holes must be dry as taper pins are to be subsequently affixed into them. When using flood cooling, the emulsion therefore had to be specially centrifuged out using a lathe. However, with MQL, the drill is lubricated using a nozzle. The drill holes stay dry and centrifuging is no longer necessary.

Drilling with the internal lubrication on a complete processing system provided with three spindles for structural design parts, such as for e.g. double Tcarriers up to 9 m length of St37. Due to the missing closed housing a flood cooling is not possible. Drill holes of up to Ø 40mm are provided. The integrated saw unit has also been equipped with MQL.

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Examples of application

Band sawing of aluminium tubing. Two nozzleblocks provide lubrication both before and after the tubing has been cut. When flood cooling was used, the emulsion ran into the tubes and had to be removed, and this also impaired the safety of working conditions.

Band sawing of steel pipes for drilling systems for the construction of deep wells and streets on a forte. Through the length of the pipes, it always led to a considerable discharge of emulsion in the surroundings of the machine. Thanks to the use of the MQL system, the surroundings of the machine were “made dry“.

Band sawing of diverse solid materials up to a diameter of 600 mm with MQL on an Amada H-600 with band height of 55. The customer appreciated the surroundings of the machine, which is now clean. Furthermore, the waste disposal costs of the emulsions are saved. Also the emulsion cannot freeze in winter any more.

Band sawing for a large steel business on Kasto twinA4 saw equipment. In case of saws of solid material Ø 100 mm in pairs, lifetime problems occurred with the old spraying device, which did not produce the required volume. With a Steidle system, the rods are now sawed without any failure and at normal lifetime.

Cold circular saws for the series manufacture of sanitary tapware. The salient brass casting is separated by the sawing equipment. A flood cooling was out of question, because it was not desirable to have any residues when remelting the gates. Dry processing and MQL were compared in a test series. Due to the longer lifetimes, an amortisation period for the MQL system of 13 days resulted.

Cold circular saws of steel rolls Ø 400 mm. Because the saw was rarely used, the costs of maintaining and removing the emulsion bore far outweighed the saw‘s productivity. Switching to MQL means that emulsion is no longer required.

Cold circular saws of aluminium profiles at a job order production company on a Kaltenbach SKL450NA. The old spraying device did not provide satisfying performance. With a new MQL device and medium of Steidle, very good results were achieved immediately. The consumption could be reduced from 4 to 1.5 litre per day. The lifetime could be increased by even up to 1,000%, avoidingbuilt-up edges.

Hack sawing in a tool shop. The Kasto HBS1 was operated with a flood cooling system. However, as this unit is not used frequently, the emulsion always spoiled completely during the warm time of the year. With the MQL system, which has been installed in the meantime, this problem does not arise any more.

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Examples of application

Steidle® Spraysystems & MQL

Engraving coated aluminium sheets. Because one nozzle lubricates the process, the workpiece remains so clean that it can be painted directly without the need for the components to be cleaned. Prior to the use of MQL, flood cooling was used and all the workpieces had to be washed.

Engraving of text elements in plastic plates with HSS cutter. As a consequence of the high speed (up to 60,000 min-1), the plastic glues at the tool which results in a low edge life. Gluing is successfully prevented with a MQL system.

Countersinking (90°) of door furniture constructed of St37 (cold rolled) with coated HSS (high-performance speed cutting steel) countersinks. The lifespan of the machinery rose to 40,000 countersinks compared to 10,000 for dry processing.

Countersinking of sheet steel 8 mm thick using Ø 20 mm carbide countersinks, hardened subsequently. Emulsion residues in the hardening furnace resulted in poor flue gas values and sooting of the furnace. With MLS, the countersink is lubricated using one nozzle, resulting in an edge life of 10,000 drill holes.

Reaming of slots for ball-heads made of aluminium die casting with PKD reamers of diameters between Ø 22 R 6 and Ø 40 R 6. In former times, this machine was operated with a flood cooling. With MQL a perfect surface and high lifetimes of the reamers are obtained.

Grinding and polishing of knife blades with a double belt grinding machine, which is normally operated in dry condition. In order to prevent the tarnishing of the blades, grinding oil was sprayed in lowest quantities onto the band preventing the glazing of the grinding belts. With MQL, the surfaces have an even grinding pattern and the belts have a higher lifetime.

Grinding of HSS drills with CBN grinding wheels, sprayed by 3 nozzles. Compared to flood cooling, the method used previously, the finished surface is now greatly improved and the work environment remains cleaner.

Grinding of motor saw chains through a grinding service. Up to present, the grinding has been done in completely dry condition, which sometimes led to a wearing-out of the cutting edged through increased temperature, as a result of which the chain had to be ground again. With MQL, the smallest quantities of lubricating material are sufficient to achieve a very good micro-section with an essentially clean cutting edge and to avoid the wearing-out.

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Examples of application

Punching of connecting rods. The top side and underside are sprayed. Compared with manual lubrication, the method used previously, the application of the lubricant is now much more even and the tool life greater.

Punching of rivets, buttons and eyes for the garment industry, made of various types of metals (high grade steel, steel, brass). Each band conveyor is sprayed on both sides by two nozzles.

Punching of back-up strips made of a compound of zinced steel and a white steel band. When punching the ends small pieces of waste are produced that may be pulled into the tool. A fine adhesion-preventing coating is applied with an MQL system.

Bending of copper closed circular pipelines. The rolls are sprayed during the bending process. Consequently, the copper no longer sticks to the roll coils and the finished products do not have to be reworked.

Forming of blanks (Ø 15 mm, height 40 mm) of lead construction for automobile industry components in one operating cycle. One droplet of forming oil is fired onto each blank prior to the operating cycle.

Remodelling of pipes made of St37 and V4A for the manufacturing of lightning conductors. Up to present, the very viscous forming-oil was applied manually with a brush. The complete process has now been automated, so that only an MQL system sprays on the end of the pipe.

Remodelling of sealing cap made of stainless steel, which has been moistened with a kind of drop-feed lubricator up to present. However, the quantity was so high that the manufactured parts had to be collected in draining reservoirs and cleaned. With the present MQL system, the consumption was reduced from 10 to 3 litres oil per layer. In addition, the lifetime of the cleaning bath has increased, since the oil injection is lower.

Beading of high grade steel elements in washing machine drum production. Four nozzles lubricate the forming rollers and protect them against overheating and wearing out

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Examples of application

Steidle® Spraysystems & MQL

Calibration of cylindrical gears made of forged steel for automatic transmission cars. The trapezoidal section is calibrated on a hydraulic press using a mould made of hardened tool steel. Prior to the switch to MQL, the calibration oil was applied manually, whereas now the workpiece is sprayed by 6 nozzles. This has meant a considerable reduction in oil consumption and processing time.

Calibration in a production department of motor operated valves. In this process, a calibration ball of ø 5 mm must be pressed through a transit drill hole of ø 4.95 mm. The process should actually take place in dry state, but the internal wall of the drill hole was too raw after pushing the ball through. Now a spraying system moistens the drill hole and the ball.

Broaching of coupling supports for lifts made of aluminium alloy. The uncoated round broach needle is sprayed by 4 nozzles. Compared to flood cooling, the tool life has increased by approx. 20% and pollution of the work environment is a thing of the past.

Broaching for the manufacture of steel truck axles. A large amount of oil was shot on the needle with an oil dispenser beforehand resulting in a consumption of oil of approx. 3 litres per day and in a contamination of the surroundings of the machine by oil residues. Now only 0.3 litres are consumed per day and the parts, the chips and the area surrounding the machine are clean.

Broaching of locating bushes which are provided approx. 300mm inside a trailer axle. Four nozzles provide for a spraying onto the broach during the insert stroke; other air nozzles remove possible pasting chips from the broach during the extension stroke.

Cooling of compound springs for trucks, made of spring steel. After forming at 900°C, a fixing hole is punched out. 2 nozzles spray an emulsion onto the punch (Ø 12 – 16 mm) to keep it cool. This prevents material build-up and so has trebled the tool life.

Application of release agents in moulds for zinc die casting. Prior to the casting process, a carrier with 6 nozzles travels between the moulds and sprays them for 5 seconds. The even application successfully prevents the finished die cast components from sticking to the mould and this has resulted in a greatly improved surface quality.

Application of anti-corrosion agents on channel sections made of flat steel. After forming, the workpieces of 2m length shall be provided with a rust protection for transport. One flat jet nozzle each sprays onto the material from the top and the bottom.

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If you have decided for a system of Steidle, you can choose the components individually and submit your RfQ with the order code or place the order. In the following you will find some instructions for the configuration:

1. Basic addition

The basic addition determines the number of the feed pipes and thus the number of nozzles or nozzle blocks connected. By default, all nozzles of a system work simultaneously. If you wish to have the indivi dual nozzles (groups) work separately, a “separate drive” has to be selected.

Frequently asked questions to this topic:

- *How many nozzles do I need?*
  Normally, 1 nozzle per cutting tool to be lubricated is sufficient. At least 2 nozzles are to be recommended for milling in view of the multi-dimensional traversing directions. For smaller saws, one nozzle block with one feed pipe is sufficient; larger saws require several.

- *Can I connect two or more nozzles to one feed pipe?*
  No. Since this could never guarantee a uniform distribution, a nozzle could be undersupplied. In view of the already low minimum quantities a failure of the lubrication system could result.

- *Can I increase the number of nozzles later?*
  This is not possible for most of the devices without a larger modification. Therefore the number of the nozzles required should be selected right from the beginning.

2. Reservoir

The medium to be sprayed is stored in the reservoir. Different sizes are available. As option, you can select float switch, stirrer and several fixation options depending on the system.

Frequently asked questions to this topic:

- *How large should the reservoir be selected?*
  Normally 20-50 ml is sprayed per nozzle and spraying hour with the MQL. If this value is multipli ed with the effective spraying time per day, you receive the medium consumption of the system per day. Select the size of the reservoir so that you do not have to refill too many times.
  Consumption in ml per day = 20 – 50 ml x number of nozzles x spraying time per day

- *When do I need a float switch?*
  A float switch is reasonable, if the system with the reservoir is not located in the field of view of the user or if a heavy contamination of the reservoir or the filling level display has to be expected due to the working environment; in addition, if a serious damage would quickly occur due to a failure of the lubrication system.

- *Shall I take the float switch as NC (=opener) or NO (=closer)?*
  In most cases, both can be used for the control which monitors the contact signal of the float switch. However, the NC offers the advantage that a possible parting of a cable in the line is monitored at the same time.

3. Drive

Through the drive you switch the system on and off. This drive can be carried out by an electrical or pneumatic control signal or through manual actuation by means of a switch. In this case, the systems work as long as the signal is alive and/or the switch is on the position “open”. (Exception: Pulsomat, which carries out only one stroke per signal.)

Frequently asked questions to this topic:

- *Do I need current to operate the systems?*
  No. All Steidle systems work exclusively with compressed air. Current is only necessary to open the compressed air supply, if you have selected an electric drive control.

- *How much compressed air do I need for the system?*
  Except for Pulsomat, all Steidle systems use compressed air as spray air. Normally approx. 50 Nl/min per nozzle are consumed

- *Can I also use the compressed air of my machine (instead of the compressed air from the network)?*
  Yes, but in most cases only as control air. If it is used as working air, the air pressure and the compressed air flow rate must be adapted to the system requirements.

4. Feed tube

Feed tubes are the connection between the basic device (housing or reservoir) and the nozzle. They conduct the medium and the spray air and can be designed coaxially (“hose in hose“) or parallel. Depending on the system, the tubes are provided with a metal sleeve.

Frequently asked questions to this topic:

- *Which length do I need?*
  Please consider where you wish to install the basic device and the nozzles and how you wish to lay the feed tubes between them. Measure this distance generously. Please note the maximum tube lengths depending on the system (see technical data).

- *Can I shorten or lengthen a tube on my own?*
  This is possible only in the system Centermat.

- *Can I install the tubes in a cable drag chain?*
  Yes, in this case, please select always the PUN synthetic tube version (presently on demand), since the danger of rubbing against other cables is too large for the tubes with metal sleeve.

5. Nozzles

In most cases, nozzles can be delivered in copper tube design (for rigid arrangement) and multilink tube design (flexible arrangement). For the fixing of the nozzles, connection blocks, round magnet systems or clamp mounting are available. Apart from the full jet nozzles, also flat jet nozzles can be offered for some systems. Saws can be provided with nozzle blocks.

Frequently asked questions to this topic:

- *Which nozzle length do I need?*
  By default, nozzles are 300mmm long. Other lengths are possible on demand.
  Please note that for larger lengths a decrease of the position stability has to be expected.

- *Can I shorten a nozzle myself?*
  No. The nozzles have a coaxial design and therefore, cannot be shortened.

6. Option

Depending on the system, fixing for the basic device, additional filling reservoirs or a drip shut of (S700) are available as option.