MQL - What does this mean in detail?

MQL technology is becoming increasingly important in the machining world. At the same time, there are many company specific designs. For this reason only a few people are familiar with them and know the differences. This is the reason for the colleague's frustration.

Historically speaking, coolant supply via the machine through the chuck was the result of the cooling of the area being worked on by a supply of coolant from the outside. This was then named **IC** = **I**nternal **C**oolant. The coolant consists mainly of water with a small part of lubricant which is channelled through with a pressure of 50 up to 80 bar.

Studies at large volume manufacturers show that working with IC means a cost factor of up to 15% of the manufacturing costs (supply, treatment, costs of the coolant lubricants).

Better not to use any of this at all! In the initial euphoria, it was believed that everything could be done by dry processing which however was not possible. Then the idea came up to reduce the „normal" consumption of the coolant dramatically by up to several 100 liter/h by leaving out the water and supplying only lubricants in small quantities.

This was the birth of MQL technology. You only use lubricant (e.g. oil) instead of coolant, which is then sprayed as a fine „fog" (Aerosol) at a pressure of 6 to 10 bar.

Today's MQL systems need less than 100 ml/h., in an extreme case even less than

10 ml/h.

However, the reduction of the coolant by a factor 1000 (!) suddenly caused problems which had not been taken into consideration before:

1) Cooling: the omission of water means that the area being worked on is no longer cooled down

2) Chip transport: the chips are no longer being „swept off" by the coolant, but remain in the machine, on the workpiece and on the tool.

3) Supply of the Aerosol via the machine, the chuck and the tool

just to mention the most important ones.

This means that everybody has to adapt all components to MQL processing:

1) Machines: new technique for chip transport and Aerosol supply

2) Operating programs: cutting parameters to avoid overheating

3) Tools: see 2) as well as altering the cooling channels

4) chuck: secure transport of Aerosol

5) MQL units: secure supply of Aerosol

The list could be extended much further.

For us as a chuck manufacturer it means that the interface to the machine as well as to the tool have to be considered, depending on the MQL-System being used.

These few (main) criteria show the diversity of requirements which result in today's confusion and sometimes also in frustration.

We mainly distinguish between 1- and 2-channel MQL systems:

MQL-system	**1-channel (MQL-1)**	**2-channel(MQL-2)**
Typ of supply	Aerosol in 1 channel	Oil and air in 2 ch. separately
Mixture oil-air	supplied by the MQL-unit	in the transfer tube of the HSK
Length of the tube	several metres	150 up to 300 mm (chuck + tool)
Response time	long	short

Fairs 2015
Date/place of current fairs
more »

Newsletter
Registration Email Newsletter
subscribe »

Aerosol characteristics	fine sprayed droplets	coarser sprayed droplets
Handling	simple	difficult
Diversity in design	little	large
Costs	low	high

With the exception of the response time (time between switching on the MQL unit and the Aerosol leaving the tool) the 2-channel-system (MQL-2) has more disadvantages.

Historically speaking, the MQL-1 units had a problem with getting the Aerosol in the same mixture up to the tool, as the Aerosol separated itself during stop times. This meant that the pressure in the (long) tube had to be built up after each switching on and the separated oil began to “spit” out of the tool.

Therefore the idea came up to carry out the mixing directly in front of the area to be worked on (or more precisely, in the transfer tube in the HSK of the chuck) and to supply oil and air separately in 2 channels (= MQL-2). The idea was good, but the realisation also meant more different solutions, depending on the tool type and the geometric conditions in the chuck. In particular the spraying of the oil in the mixing chamber (in the transfer tube) was anything but ideal. Therefore the mixture (droplet size) is worse than that of the MQL-1. The bigger droplets separate faster, particularly at higher speeds and this has the effect that an oil film instead of an Aerosol film condenses at the tube walls and moves forward by the air.

So the advantage of spraying as late as possible was cancelled out. On the contrary, practice has shown that MQL-2 only works at all under ideal flow conditions.

For a current order for example, up to 3 different transfer tubes with suitable settings screws are needed, depending on the type of the chuck in the tool. This is very difficult for the operator to understand.

Later generations of MQL-1-systems have brought clear improvements concerning Aerosol supply and response time. The Aerosol is sprayed so finely that it no longer separates. So the longer feed lines and the „corners“ are no longer a problem. With a valve directly in front of the entry to the chuck, the response time of the pressurized Aerosols is also comparable with an MQL-2 system. Furthermore the simple handling and the low costs have brought forward MQL-1 technology once more.

Still to be clarified is the question, what makes MQL so difficult?

1) Guaranteeing a laminar flow by

a. continuously tapering feed line cross sections

b. „smooth“ transitions with altering cross sections

c. a „smooth“ wall surface (Rz <= 6,3)

2) No stalling between the MQL unit and the exit at the tool; there should be no leakage of Aerosol (no loss of pressure). Through practical application at an automotive manufacturer, we could learn how important this point is when the consumption was reduced by a „unsealed“ SCK-chuck from 120 ml/h up to under 50 ml/h, since our chuck is “absolutely leak-proof”.

<- Back to: News