

Lubrication

Water-Mix
Metalworking
Fluids
Fact Sheet

Lubrication

*An important message
for buyers and users*

CORRECT LUBRICATION -

- MAXIMISES PRODUCTION RATES
- MINIMISES OPERATING COSTS
- REDUCES MAINTAINANCE EXTENDS MACHINE AND TOOL LIFE

The purpose of this leaflet is to help you select the correct lubricant for your application

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CHOICE OF FLUID TYPE

Because of their comparatively high cost, the use of neat oils is confined to the more severe cutting operations or in situations where a particularly high surface finish is required. Water-mix fluids, the subject of this Fact Sheet, are widely used on account of their low cost and cooling capability.

MWF HISTORY



The use of Metal-working Fluids escalated at the beginning of the 20th century due to the creation of new industries, e.g. the automotive industry, and also due to the increased mechanisation of military equipment.

The birth of the modern watermix fluid came about as a result of the need to simultaneously meet the high machining performance and production rates attainable with neat oils with the cooling capability of water.

The properties of the early simple emulsions were progressively enhanced over many years by the incorporation of additives of increasing variety and sophistication.

SELECTING THE RIGHT FLUID

The following questions are key to selecting the right fluid for the operation.

What type of material is being machined?

What machining operation is involved?

What is the quality (hardness) of the dilution water?

What other specific requirements e.g. surface finish, freedom from staining, are there?



The above diagram gives an indication of the relative difficulty of each machining operation. At the bottom of the chart is the grinding operation which, in the majority of its variants, requires cooling with little or no lubrication. Sawing, turning, milling and drilling all require some lubrication as well as cooling, and may benefit from the presence of lubricity and/or extreme pressure additives especially with tough materials or when long tool life is required. The other operations will all generally require lubricity and/or extreme pressure additives to a greater or lesser extent dependent on material type.

A whole range of factors influence the selection of the correct metalworking fluid. However, the four key points described above would be common to any selection process and a good understanding of these will help achieve the correct fluid selection.

The 3 main types of fluid available are:

Conventional 'milky' emulsions

High oil content (60-80%) products that can be relatively cheap in price and may contain biocide for bacterial protection. The opaque appearance is due to the comparatively large size of the emulsion droplets that prevent the transmission of light.

Semi-synthetic translucent emulsions

Generally these products contain between 5 to 60% oil and are translucent in appearance due to the smaller droplet size. These products may have a relatively long sump life because of the presence of additives that limit bacterial growth.

Fully synthetic solutions

This type of solution is completely water-miscible giving a true solution which is clear in appearance. As the name suggests this product is completely free of oil and is often to be found in grinding operations. With the addition of performance additives, these products can be used for a wide spectrum of operations. A wide variety of factors influence the specific fluid selection. For tough materials (e.g. Inconel, titanium, etc.), or for tough machining operations such as deep hole drilling, a fluid with some form of extreme pressure additive is necessary.

METALS TO BE MACHINED

Steel

Low tensile steels can be readily machined, unlike the higher tensile steels which are more difficult to machine.

The higher tensile steels, such as stainless, tool and alloy steels require the use of some form of extreme pressure additive.

Staining is not a problem when machining steels.

Cast iron

Cast iron is easily machinable due to the presence of graphite, except for white cast iron which is strong and hard and difficult to machine.

Fluids with a low oil content must be used. For normal cast irons to minimise 'drag out' of oil by the fine swarf particles.

Staining is not a problem when machining cast iron.

Aluminium

Aluminium is a soft 'draggy' material, which can make it difficult to achieve a good surface finish.

Lubricity additives, normally in the form of a fatty material, are necessary.

Additives containing chlorine or sulphur must be avoided as these will result in staining.

Staining can be reduced by the incorporation of a passivator.