

# Coolant Management Guide







# LUBRICANTS. TECHNOLOGY. PEOPLE.

We focus consistently on high-quality lubricants and related specialties.

We develop innovative and holistic solutions for a wide variety of applications.

We value the high level of commitment of our employees and their trusting interaction with one another.

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## Facts and figures

### COMPANY:

FUCHS LUBRICANTS COMPANY, Harvey, IL, USA

FUCHS LUBRICANTS CANADA LTD., Langley BC and Cambridge ON, Canada

LUBRICANTES FUCHS DE MEXICO SA DE CV

Querétaro, Qro., Mexico

### NORTH AMERICAN PLANT LOCATIONS:

Harvey, IL; Kansas City, KS; Huntington, WV;

Langley, BC; Cambridge, ON; Querétaro, Qro., MX

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FUCHS has developed, produced and sold lubricants and related specialties for more than 80 years – for virtually all areas of application and sectors. With over 100,000 customers and 57 companies worldwide, the FUCHS Group is the leading independent supplier of lubricants.

Our knowledgeable North American team works to ensure the needs of our customers are met. We link inter-disciplinary expertise between chemists and application specialists to deliver innovative lubricant solutions to meet the current and future demands, **every single day.**

## ECOCOOL Water-Miscible Cutting Fluids

### Safe, economical and sustainable in use

FUCHS water-miscible cutting fluids meet all regulatory requirements and offer reliable performance and optimum service life. Sustainability and workplace environment is designed into the products.

ECOCOOL cutting fluids are:

- Free of nitrosamine-forming secondary amines
- Free of nitrites
- Free of hard complexing agents
- Skin compatible
- Free of heavy metals
- Sustainable
- Economical

This means more than just reliability and worker safety. ECOCOOL fluids operate with low operating, maintenance, disposal costs and excellent overall cost of ownership.

### Optimum technical properties

FUCHS cutting fluids fulfill the technical requirements and make machining operations more efficient.

ECOCOOL products provide:

- Optimum cooling and flushing
- Outstanding lubricity
- Excellent wear protection
- Effective corrosion protection
- Low foaming
- Good material compatibility
- Excellent EP properties
- Increased productivity

### Available throughout the world

Our fluids are available to our customers on a global basis. This means that all raw materials must be registered and comply with chemical regulations in the respective countries. FUCHS offers water-miscible cutting fluids under the name ECOCOOL GLOBAL which can be manufactured anywhere in the world with the same formulation. This allows users to pursue globally harmonized manufacturing processes with the same fluids.





## Coolant Management - Making an Emulsion

Oil and water do not mix. That's a very true statement and is the reason for metalworking fluid formulations to contain emulsifiers. Emulsifiers are attracted to both oil and water and allow for oil droplets to be suspended in water. The amount and type of emulsifier, type of oil, water quality, and especially how the fluid concentrate is mixed with water determine the size of emulsion droplets as well as the initial stability.

"OIL" is the best way to remember "Oil In Last." The addition of water to a metalworking fluid concentrate can lead to an inverted emulsion that is thick and usually unstable, not to mention an artificially high particle size that decreases the fluid's ability to wet on metal and provide lubricity. This is especially true in high oil water-miscible fluids, but can also occur in lower oil semi-synthetic fluids. Since synthetic fluids form a true solution, less precision is needed when mixing concentrate into water.

Best practice is to premix the concentrate into water prior to introduction into a machine reservoir or tank. This is true for both the initial fill of a system and also for make-up fluid. Generally, since fluid loss is mostly evaporation of water, it is best to proportion a much lower concentration for make-up to avoid increasing system concentration to higher than recommended levels.

If the concentrate is added directly to machine reservoirs, it is best to add slowly to an area of high agitation as close to the return line from the machining interface.

### Types of Proportioners

There are two main types of proportioning systems:

- Positive displacement mixers, driven by water pressure, mix coolant concentrate and water to the desired concentration to a high degree of accuracy.
- Drum proportioners are less costly, and also mix less precisely than positive displacement systems.



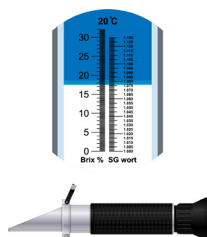
With any of these units, it is important to maintain a consistent water pressure and to verify the resultant concentration on a routine basis.



## Coolant Management - Fluid Monitoring

Concentration control is critical for the overall performance of water-miscible metalworking fluids. Low concentrations can result in poor machinability, increased corrosion and poor product stability. High concentrations can lead to foaming, misting, smoking and increased dermal and respiratory irritation.

Please consult the Product Information Sheet or contact your FUCHS representative for recommended concentration ranges.



### Refractometers

Handheld or digital refractometers are the most commonly used method for checking fluid concentration. Perform the following for proper use:

- Clean the lens properly
- Routine calibration
- Only place emulsion on the lens (no free oil)
- Consult the refractometer index or factor to find the accurate concentration



### Titration

Fluid contaminants, especially tramp oils, can make the use of refractometers inaccurate due to the blurring of the indicator line. Titration can sometimes add accuracy to concentration determination. Titration kits and instructions can be obtained through your FUCHS representative.



### pH Measurement

Routine measurement of the pH (acidity / alkalinity) of the fluid can often identify the presence of contaminants and provide an indication of emulsion stability as well as presence of biological activity in the fluid. The pH measurement can be performed on-site with pH paper or with a portable meter. Meters should be calibrated weekly for accuracy.



### Biological Monitoring

Any fluid that contains water may contain bacteria and fungus that can degrade the fluid causing poor performance, odors and high fluid usage. Microbial dip slide tests can detect early activity and allow for proactive treatment to increase the fluid life, working conditions and overall product performance.

## Coolant Management - Health and Safety

Machining fluids contain a complex mixture of several potentially hazardous chemicals. The Safety Data Sheet (SDS) details risks associated with machining fluids, but it is important to remember that these risks are identified for the fluid concentrate. Many of these risks are greatly minimized when the fluids are diluted with water for use and properly maintained. Most regulations require exposure to metalworking fluids to be adequately controlled and reduced to a minimum with all non-essential exposure minimized.

Employers are recommended to:

- Assess the risks to workers and decide what precautions are required
- Prevent exposure to metalworking fluids or at least ensure exposure is controlled and minimized
- Monitor exposure and conduct necessary health surveillance
- Refer anyone suspected of a work-related illness to an occupational health professional to ensure safety and control measures are evaluated and maintained, and that all procedures are observed
- Provide workers with sufficient information, training and instructions for the use of control measures and PPE equipment required

Employees are recommended to:

- Cooperate with employers and follow all of the training and instructions provided
- Utilize control measures and PPE
- Report defective equipment
- Attend and participate in all necessary health surveillance programs
- Maintain fluid management procedures and contamination control measures

### Reducing Inhalation

Oil mists and vapors can be generated by fast moving equipment and high fluid flow. Mist, vapor, smoke and fumes can remain in the air for lengthy periods of time before sticking to surfaces or dissipating. These airborne substances may contain substances that can trigger irritation or other symptoms. These airborne substances may contain substances that can trigger irritation or other symptoms.



**Proper coolant control** – minimize flow rates and pressures

**Splash guards and enclosures** – minimize introduction of fluid into the air

**Ventilation** – adequate extraction and air filtration systems reduce airborne contaminants

**Compressed Air** – when used to remove coolant and chips from workpieces and machines, it can create unnecessary additional mist



## Coolant Management - Protection for Skin



### Effective Fluid Management

Machining fluids come into contact with skin throughout all stages of the manufacturing process, especially the hands and forearms. These fluids can cause skin irritation and other fluid contaminants can increase the risk of dermal irritation. This is why it is critical to have effective fluid management controls in place. The edges of metal swarf, fines and chips as well as other foreign matter can cause skin abrasions that lead to increased dermal irritation.



### Personal Protective Equipment

PPE is designed to minimize fluid contact with the skin. All PPE should be used in accordance with risk assessments and regularly examined for tears and holes, cleaned and tested, and replaced. It is important to wear PPE over dry skin and avoid contamination when clothing is added or removed.



### Hygiene

Good personal hygiene is vital to reduce the risk of dermal irritation. Barrier creams should be used in conjunction with proper PPE and only applied to clean, dry skin. Wash exposed areas frequently and consider applying a moisturizing lotion or barrier cream afterwards.

## Coolant Management - Contaminants

Compared to other types of lubricants, water-miscible fluids need extra care and attention to insure they're kept in good condition. There are many types of contaminants that can have detrimental effects on these fluids with regard to machining performance, housekeeping, and Health Safety and Environment (HS&E) considerations.

### Bacteria and Fungus

One of the most significant causes of reduced fluid quality and effectiveness is microbial contamination. Due to water content and quality, airborne compounds, tramp oils and metal fines, microbials can enter into these fluids and cause degradation of the fluid, product instability, odors, corrosion and residues.

There is no way of preventing microbials from entering these fluids, but they can be controlled. Selection of an optimum fluid, keeping correct concentrations, removal of contaminants, tank side additives and preventative system clean outs can all be effective.

FUCHS personnel can advise on the safe use of more effective products and/or tank-side additives when other control measures have failed.



### Water Quality

A water-miscible fluid usually contains 85-98% water, therefore water quality greatly impacts fluid performance and life. Very soft water (0-20 ppm) can cause foaming, while very hard water (>400 ppm) can contribute to residues, staining and poor emulsion stability. Many water sources are high in chlorides that can lead to rust and corrosion issues. Deionization systems and reverse osmosis systems can be used to achieve higher water quality. Water sources should be checked for the presence of undue amounts of microbial contamination and low (<6.5) or high (>8.0) pH conditions.



### Tramp Oil

Tramp oil is unwanted machine lubricants that have leaked into the coolant system. This is the most common type of contamination. It can contribute significant "bacteria food," float on the surface and deprive oxygen to encourage anaerobic biological growth that releases hydrogen sulfide odors, and cause emulsion instability. Tramp oils can be reduced by fixing leaks and using removal devices such as skimmers, weir systems, centrifuges, coalescing units, filters and other means.

### Metal Fines, Chips, and Swarf

Metal debris should be removed from the fluid on a constant basis when possible. Removal of metal fines maintains sump capacity for the fluid to cool the tools and workpiece. Chip or swarf accumulation can increase biological activity and the formation of insoluble soaps that cause residue and emulsion instability, dermal irritation, and can be reintroduced into the cutting zone resulting in tool damage and poor part quality. There are many forms of metal removal including magnetic filters, cartridge, metal, paper or other filters, centrifuges, chip drags and just simple settling.



## Coolant Management - Removing Contaminants

There are many forms and types of contaminants that can be introduced into a machining fluid system. Leaking machine oils (tramp oils), metal chips and fines, hard water residues, pre-process metal coating fluids, bacteria and fungus, and general debris from the work environment. Removal of these contaminants is critical to prolong the life of the machine fluid as well as to insure the stability of the fluid and its additives for optimum performance.

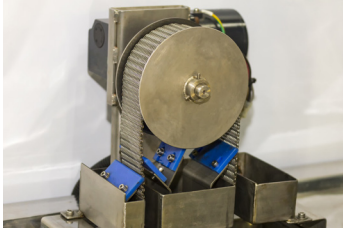
Removal methods range greatly with regard to design, cost and maintenance required.

### Tramp Oil Removal

- Belt Skimmer
- Disk Skimmer
- Decanting Tanks
- Coalescers

### Filtration and Metals Removal

- Indexing Paper / Cloth / Fiber
- Centrifuges
- Magnetic
- Cartridge



Belt Skimmer



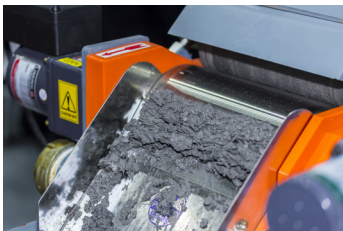
Disk Skimmer



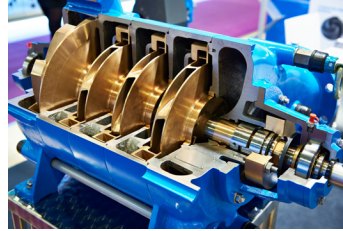
Decanting Tanks



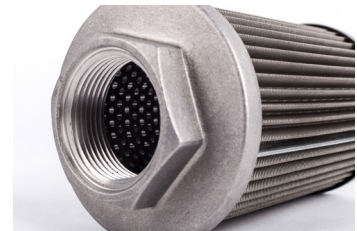
Coalescers



Magnetic



Centrifuges



Cartridge

## Complete Solutions for all of your Manufacturing Processes

FUCHS is the world's largest independent manufacturer of lubricants with the most extensive program of metalworking fluids. Our comprehensive portfolio is supported by years of application engineering experience and customized solutions to benefit your manufacturing processes.



### ECOCOOL

#### MACHINING

- High performance
- Economical
- Outstanding lubricity



### ECOCUT

#### MACHINING: NEAT

- Increased reliability
- Economical
- Low misting and low evaporation



### THERMISOL

#### QUENCHING

- Low distortion
- Low consumption
- Good compatibility



### RENOCLEAN

#### CLEANING

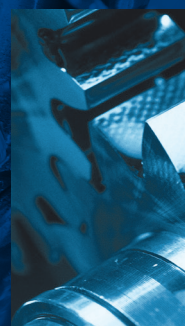
- Highly effective
- Unproblematic processes
- Outstanding emulsification and demulsification



### RENOLIT

#### LUBRICATION: GREASES

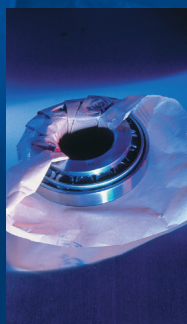
- Compatible
- Long-term and life-long lubrication



### RENOLIN

#### LUBRICATION: OILS

- Compatible
- Excellent corrosion protection
- Optimum wear protection



### ANTICORIT

#### PROTECTION

- Optimum protection
- Clean application



### RENOFORM

#### METAL FORMING

- Cold forming lubricants for all forming applications
- Compatible with RENOCLEAN metal cleaners



### PLANTOCUT

#### MACHINING: NEAT

- Non-mineral oil
- Low emission
- MQL

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