master chemical

Technical Bulletin

Coolant Concentration *Facts & Terminology*

Because words can have multiple meanings, we need to be sure we're using the same vocabulary and terminology. Here's a glossary of terms related to *coolant concentrate,* charging, and maintaining your sump:

Coolant Concentrate

Coolant concentrate is undiluted water-soluble fluid straight from the pail or drum that will be mixed with water to make what's known as a *working solution*. All Master Chemical concentrates are sold at full, 100% strength and they do not contain any unnecessary ingredients. Concentrates are blended from chemicals, water, and other liquids and surfactants, but every Master Chemical water-soluble fluid is distributed at 100% potency. So if your target *working solution* is 10%, you'll want to blend 90% water with 10% *coolant concentrate* to make the initial *working solution* for your sump.

Types of Coolant Concentrates

Master Chemical manufactures four types of *coolant concentrates:*

- Emulsions or Soluble Oils (40% or more oil content)
- Microemulsions or High Oil Semisynthetics (20% to 50% oil content)
- Low Oil Semisynthetics (0% to 20% mineral oil content)
- Synthetics (no mineral oil content) or (0% to 10% oil content)

Sump

The sump is the reservoir in the machine tool from which the *working solution* is circulated to the point-of-cut and where the returning fluid flushes chips and grinding swarf.

Working Solutions

Blending *coolant concentrate* with water forms the *working solution*. In general, the target *working solution* is between 5% and 10% *coolant concentrate* mixed with between 95% and 90% water.

Target Working Solution

The target *working solution*, also called *coolant concentration*, for any specific machine will depend on variables including the manufacturer's recommended working range, the materials being used, the operation being performed, and the amount of lubrication and cooling needed. *Working solutions* are adjustable: if less lubricity is needed, a lower concentration may be appropriate; if more lubricity is needed, a higher concentration may be required. Once a target *working solution* is determined, it is important to monitor its fluid concentration level and make adjustments to keep it as close to target as possible. In order to check the concentration of your *working solution* after the initial sump fill, you use *Brix* factors and your *refractometer reading*.

A typical Master Chemical microemulsion concentrate is comprised of 18 ingredients and though it is clearly a very complex formula, it does not contain any unnecessary ingredients.

A typical Master Chemical emulsion concentrate is comprised of 8 ingredients.

Coolant Concentration

BRIX Factors and Refractive Readings

Every *coolant concentrate* has its own unique *Brix* factor (also known as its *refractive index* factor or *RI* factor) which is a multiplier utilized in conjunction with a digital or optical *refractometer reading*. *Brix* factors range from 0.9 for emulsions, to 3.4 for synthetics. A *Brix* factor is meaningful only as a multiplier; it does not indicate anything about a product's efficacy or water content. A *refractometer reading* is meaningful only as a number to be multiplied by the *Brix* factor, not as an indicator in itself.

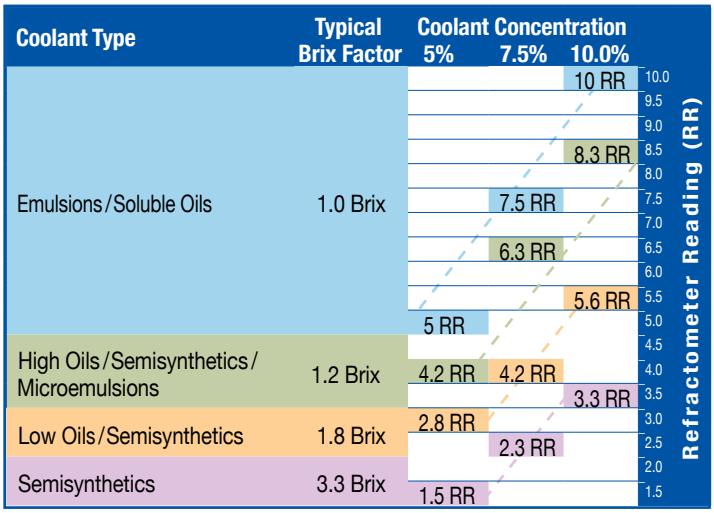
Operators who have formerly employed only emulsions or soluble oils may not understand why they need to go through the computation of multiplying the *working solution's Brix* factor by its *refractometer reading*. This is because the *Brix* factor for many emulsions is 1.0…so what you read on the refractometer is the actual *coolant concentration* in the sump. However, as the table above demonstrates, when using microemulsions, semisynthetics, and synthetics (which have *Brix* factors as high as 3.4) it is critical to make this calculation to determine the actual *coolant concentration* in the sump.

Makeup Coolant or Makeup Solution

Over time, sump levels decrease due to evaporation and use: some of the *working solution* will be carried out on parts and chips; some will be splashed outside the machine. Operators need to compensate by "topping off" the sump with *makeup coolant*: ie, adding a mixture of additional *coolant concentrate* and water to the sump. "Topping off" should be performed at the beginning of each shift and as needed.

To determine how much *coolant concentrate* and water are needed in the *makeup solution*, the operator needs to know the current and target *working solution* concentration, and the current and full sump volume. Then the operator is able to calculate an accurately balanced *makeup solution*.

Calculating Coolant Concentration



Coolant Concentration = Refractometer Reading x Brix Factor

The easiest way to determine this is to use the Master Chemical online *makeup calculator* application at http://apps.masterchemical.com/makeup/.

If you need help with this application, ask your authorized Master Chemical representative or call our ***Tech Line at 800-537-3365*** for details.

Proper Coolant Mixing Procedure (O-I-L)

To prepare your initial *working solution* or your *makeup solution*, always add water to the sump or mixing container first, followed by the determined amount of *coolant concentrate* while mixing or agitating. ***Never add water directly to coolant concentrate, which can form an inverse emulsion.***

Master Chemical Corporation
501 West Boundary
Perrysburg, OH 43551-1200 USA
Tel: 419-874-7902
www.masterchemical.com

TECH SERVICE HOT LINE: 1-800-537-3365
info@masterchemical.com

April 28, 2016