



Metalworking

## 19 Hacks to Avert Metalworking Fluid Foul-ups and Freakouts

Kip Hanson | Jun 27, 2023

When machine shops and manufacturing facilities don't pay attention to metalworking fluids, the consequences range from poor tool life to reduced metal removal and *higher operating costs*, Castrol application engineer Brent Morgan says.

In extreme cases, adds John Treese, director of global training for Master Fluid Solutions, machine damage can occur.

"Metalworking fluids are often the last thing shops think about," Morgan explains. "But those who choose a good coolant and take care of it properly will enjoy much greater machining performance."

Following are tips from the two experts on getting maximum results from cutting fluids and avoiding problems that can hurt performance and lower your bottom line.

### Brent Morgan, Castrol

**Use refractometers correctly:** "One of the most common issues I encounter in shops is the misuse of refractometers to track concentration. Many people don't realize that a refractometer factor is needed to calculate the true concentration. As a result, users will think they're running 6% concentration, but if the factor is two, they're actually operating at 12%."

**Adjust spray-off nozzle valves:** "Some CNC machines with conveyor systems come with baskets to collect floating chips, which have a spray-off nozzle on the back side that uses coolant to flush these chips away. However, the factory often leaves the nozzle wide open, which can cause foaming issues. You can avoid this by adjusting the valve to be about a third open."

**Check compatibility with galvanized steel:** "Certain machine tool OEMs have introduced machines with galvanized way covers. However, it's important to note that many synthetic chemicals don't interact well with these materials, resulting in corrosion. So if you're purchasing one of these machines, make certain your machining fluid is compatible with galvanized steel."

**Check compatibility of way lube:** "Be sure to look at your way lube and coolant compatibility. There are cheaper versions of way lubes on the market, often produced by smaller operations, that can emulsify

when mixed with water. This is not ideal for your coolant system and can quickly damage your machinery. That's why I always advise using a premium lubricant made by Castrol, Mobil, Shell and others that pay meticulous attention to ensuring their products protect your machine."

**Reduce dermatitis risk:** "Another crucial consideration is dermatitis. If an operator develops this condition, the first thing to check is the coolant concentration. Smaller shops often allow their machines to operate at higher levels, which in 90% to 95% of cases, is the leading cause of these issues."

**Avoid household bleach:** "A less frequent yet potentially disastrous issue occurs when people clean and sanitize their machines using household bleach. While it might seem like a good idea, they often overlook how aggressive this substance is. I've received many calls on this, and to rectify it, you have to use a powerful cleaner to remove the bleach and chlorine residue, as it doesn't naturally rinse off. Always use a cleaner designed for machine tool maintenance."

**Skim tramp oil:** "Many believe tramp oil comes from the machine ways, or hydraulic and spindle fluids. However, the main source is often the rust inhibitors found on sawed part blanks. While these help to protect parts, they can also lead to bacterial growth when exposed to the atmosphere. This is why it's important to regularly skim this oil to prevent its accumulation."

**Don't overfill:** "I often see shops with chip blasters filling them and the machine sump to their full capacities. However, these devices don't call for coolant until about 25% empty. Consequently, all the extra coolant is dumped into the regular machine sump, leaving insufficient headspace for the foam to break properly, resulting in overflow. The correct procedure is to completely fill the chip blaster, which typically has around a 30-gallon sump, and then fill the machine sump three-fourths full."

**Consider adding part-time coolant monitors:** "Over the last few years, labor shortages have resulted in shops paying even less attention to coolant monitoring. Many don't want to hire dedicated staff for this task, even though it's essential for optimal output. I recommend hiring from the company's pool of retired or semi-retired workers. Some might be looking for part-time work, where they could come in for a couple of hours, perform all the coolant checks, and handle related tasks. This could be an efficient solution, particularly as these individuals are already familiar with the facility."

## John Treese, Master Fluid Solutions

**Consider using a bucket top vacuum:** "Some companies sell a 'bucket top vac,' a device that snaps onto an empty 5-gallon pail, transforming it into a mini shop vacuum. By holding it about half an inch above the coolant, it can effectively suck up the tramp oil, which is lighter, leaving behind the coolant and water. The collected oil is then easily transported to the disposal area. For shops that don't have skimmers, the bucket top vac is a practical solution for managing tramp oil."

**Avoid softened water:** "We generally advise against using what's known as 'softened water' like that from your home water-softener system. This process exchanges sodium and chloride for magnesium, calcium and other minerals. If the system doesn't flush properly, you could introduce salt water into your machines. This can cause steel parts to rust and is also harsh on coolant, leading to multiple issues."

**Watch out for mineral residue:** "Have your local water supply checked. It might be necessary to install a reverse osmosis or deionization system, which provides water low in minerals such as calcium, magnesium, copper and the like. This type of water tends to produce fewer residues, extends the life span of your coolant, and reduces the amount of coolant used. Depending on the coolant you use, you'll need about a quarter to 1% less chemical concentrate for every grain of hardness you eliminate, saving money."

**Pay attention to coolant concentration:** "Every coolant has a recommended concentration range.

Keeping it as close to the target as possible ensures optimal cutting results, the longest life span, and less staining and rusting. In fact, properly maintaining the coolant's concentration and pH levels can help alleviate most issues people encounter with tool life."

**Use specialized pH adjustment chemicals:** "We strongly recommend using pH adjustment chemicals specifically designed for the metalworking industry. Other substances, like baking soda, may contain additional components that could create other problems, such as residue in the machine sump. We also advise against using pool chemicals. These can be quite harmful, and when used in larger quantities, substances like potassium hydroxide (KOH) and sodium hydroxide (NaOH) can cause severe burns and even blindness if they get into your eyes."

**Monitor pH:** "Low pH can increase fluid usage, so it's important to keep it where it's supposed to be. The simplest way to achieve this is by maintaining the proper coolant concentration—don't let it get too high or too low. Most coolant manufacturers ensure that their products stay at the target pH when fluids are properly maintained, but check it periodically with a pH test strip just to be sure."

**Be careful with biocides:** "Biocide use is generally unnecessary and indicates a pH or concentration issue due to poor maintenance. But if you do need one, be sure it's formaldehyde-free, and be careful handling it. Biocides are nasty stuff and can burn your skin or cause other health problems."

**Top off machines regularly:** "Top off the machine with fluid daily or whenever the coolant level drops by 10%. This makeup concentration is probably much lower than what you aim to maintain in the sump. When machining materials that generate significant heat, like stainless steel and Inconel, you're likely to have a lot of water evaporating, thus needing to add a 2% concentration of coolant to maintain it at the desired level. However, when machining materials like aluminum, which typically produces a higher volume of chips, more coolant gets carried off. In this case, you might need to add a 3% concentration of coolant to compensate for the greater loss."

**Keep sumps clean:** "It's essential to *keep sumps clean*. We often joke about it, but it's surprisingly common for workers to spit sunflower seeds and chewing tobacco into their machine, or even dump their soda or coffee into it at the end of the day. Doing so introduces sugar and other substances that feed bacteria, leading to many problems, including Monday morning stink."

**Replenish daily:** "A daily replenishment strategy ensures the effective components of the coolant—the bio package, pH adjuster, buffer and corrosion inhibitors—are regularly refreshed, maintaining a strong defense against bacterial growth in your coolant system. This practice is perhaps the most significant hack for maintaining your machining operations."

## General Recommendations

There's more. Don't blow off parts with shop air (a thin film of coolant will help protect against corrosion). Install a tramp oil skimmer. *Clean the sump regularly*. Always use a proportioner when mixing coolant, especially on the makeup fluid.

Following each of these recommendations can mean huge cost savings and significant performance improvements.

If you'd like to learn more, reach out to one of these cutting fluid specialists or your MSC representative.

**Which tricks have you found most helpful in getting the most out of your metalworking fluids?**