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# Maintaining Coolant in a Stable State

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## High-Tech Companies Lead the Way

Coolant management has become one of the most important functional aspects of metalworking. Everyone wants to use less coolant, make it last longer and thereby reduce cost. But by actively "managing" coolant (*Figure 1*), the metalworking industry is moving beyond the traditional renewing and recycling of fluids.

***Figure 1. Management of fluid concentration is an integral part of coolant management. In this photo, coolant is measured with a Master Master Chemical Refractometer.***

Following the lead of aerospace companies, where process variation is relentlessly pursued and eliminated, other high-tech metalworking firms are focusing on maintaining stable fluids. In these high-tech environments, production errors and unscheduled interruptions are extremely expensive, making long-lived, predictable coolant essential.

But high-tech firms are not the only metalworking operations in which cost control, high quality and tight tolerances are critical. The benefits of running a stable fluid add value in every metalworking operation.

Identifying and controlling the variables that affect coolant result in cost reductions in coolant consumption and disposal, machine downtime and product variation. In addition, the work environment is improved greatly by eliminating rancid coolant and messy cleanups. And, as long as the variables identified as key drivers within a system are kept within spec, the fluid can run indefinitely.

Maintaining coolant in a stable state can also help identify process problems because fluid has been virtually eliminated as a source of problems.

## Not New, But Improved

The concept of coolant management first surfaced in the 1980s as a means of reducing new coolant purchases and disposal costs of spent coolants. However, as fluid recycling equipment improved, management of the process did not. The hard lesson has been that periodic fluid processing through a recycling system is not enough.

Constant preventive maintenance is required for fluid and process stability. As the idea developed, managers realized that managing the coolant better could minimize a broad range of coolant problems.

There are only a few contaminants responsible for coolant problems:
minerals in the water supply, tramp oils from the machines and bacteria from the machine coolant system. Particulates produced in the material removal process can further complicate the situation because they tend to settle in inaccessible areas of the coolant sump (*Figure 2*), providing a shelter and breeding ground for bacteria.


***Figure 2. Dirty fluid (collected with a yellow-bellied sump sucker) is pumped into a XYBEX 1000 coolant recycling system.***

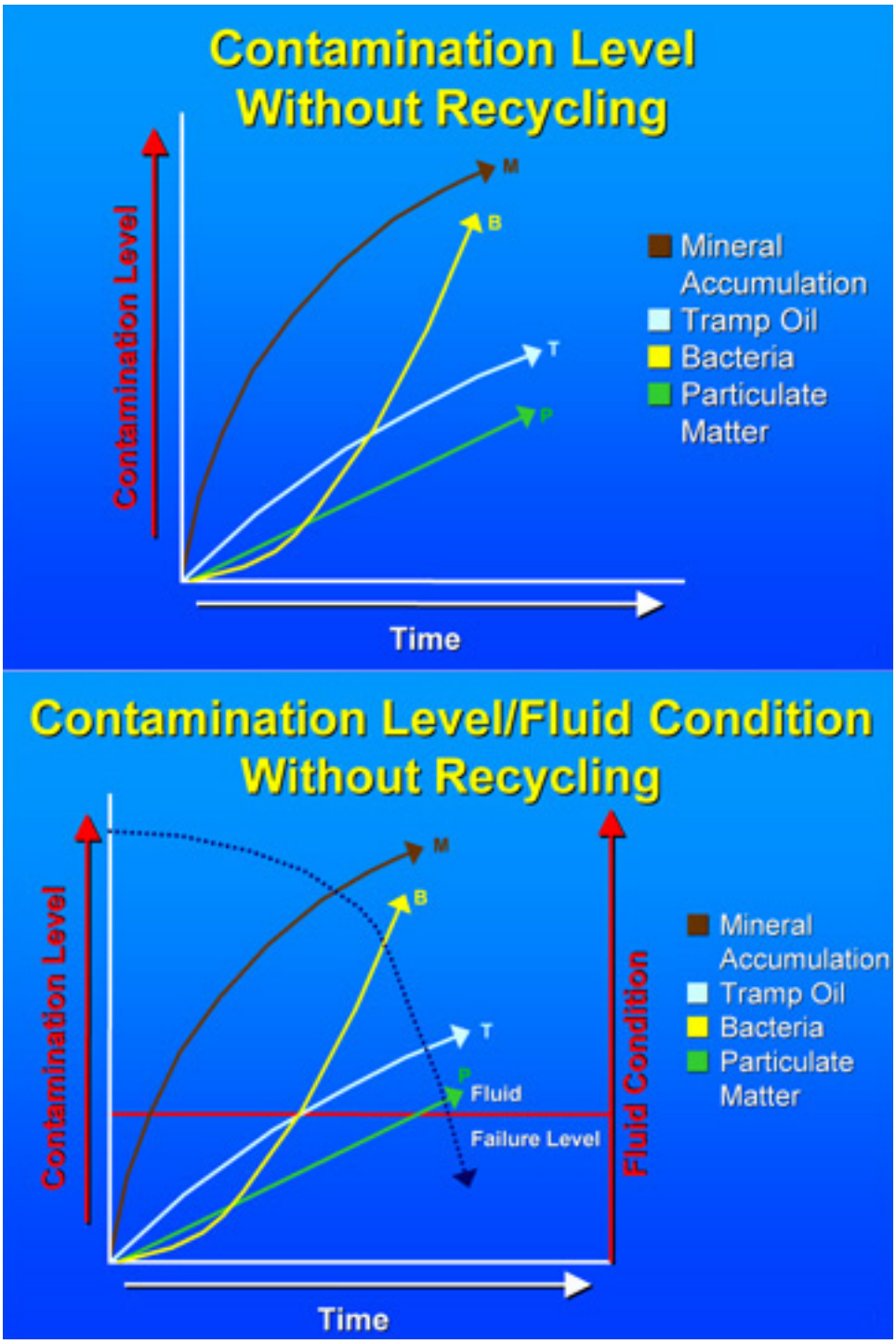
An ongoing, comprehensive fluid management program involves: maintaining correct and constant fluid concentration; cleaning machine tool sumps periodically; recycling coolant regularly, before it fails and requires disposal; and educating plant personnel in the proper use and maintenance of coolants.

## In-House Management or Contract Service

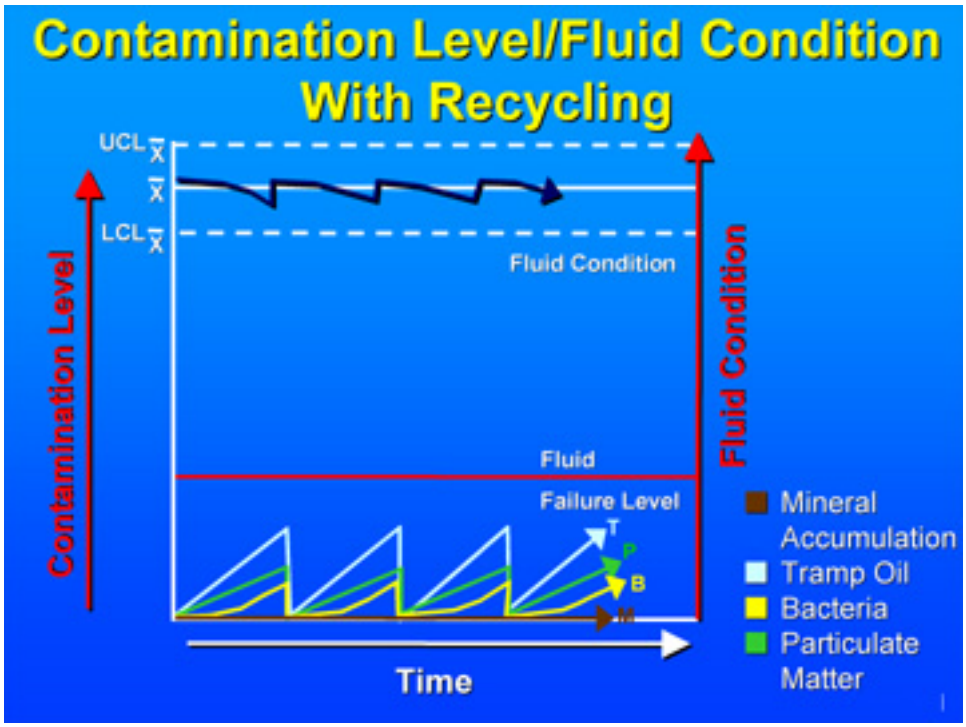
Most metalworking firms do not have the time or resources to devote to data collation and analysis. Yet the costs of poor or ineffective fluid management mount daily (lost productivity, product quality, tool wear and so on). Contract services often have a single focus, such as supplying demineralized water or pumping soured sumps. A fluid supplier will provide guidance on concentration, and equipment suppliers can size systems to handle a metalworking process.

Establishing an effective management process—ideally available from one source—should include the following:

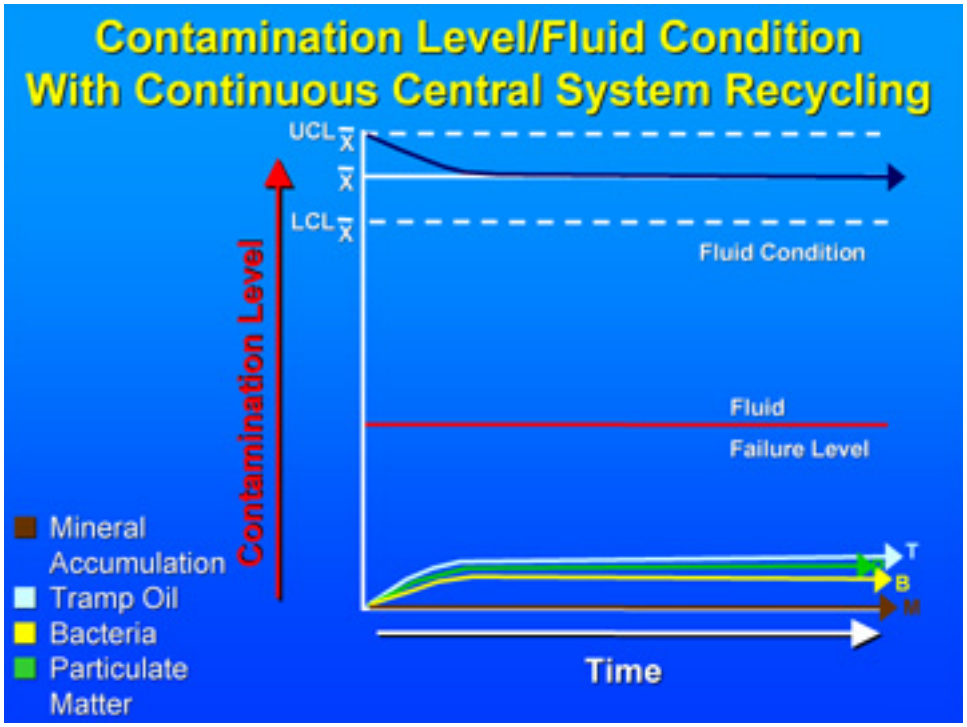
- understanding the benefits and value of stable fluids;
- training in data collection and monitoring;
- setting up a quality control lab for monitoring;
- collecting and analyzing data (as shown in *Graphs 1-3*);
- establishing the range for each variable;
- monitoring and maintaining variables within spec;
- measuring the results in improved productivity, quality and environment; and
- documenting the savings in fluid and disposal expense.




***Graph 1. Contamination level without recycling.***




***Graph 2. Contamination level with recycling.***




***Graph 3. Contamination level with continuous central system recycling.***

## Fluid Management

Master Chemical Corporation, a QS9000-certified coolant manufacturer, partnered with an aerospace customer on a six sigma analysis of coolant in an effort to improve the long-term stability of its manufacturing process. Control is central to aerospace industry culture and manufacturing processes, where consistency, predictability and precision performance are critical to ensuring safety and containing costs. Aerospace materials are expensive, and the parts intricate and time consuming to machine, resulting in low output.

What both firms learned and documented after monitoring, measuring, analyzing and adjusting in a controlled manner was that key variables, common in every metalworking process, affect the coolant. Once the variables in a process are identified, they can be managed or controlled within set parameters.

With the variables controlled, the coolant is stabilized and the system optimized, providing better dimensional control, better surface finish, longer tool life and sustained production, while also reducing downtime, fluid use and costs. The same results are reproducible in every metalworking facility (*Figure 3*).

***Figure 3. A TRIM® C320 being used to surface grind. Coolant management is especially important in grinding, where the fluid is quickly contaminated with the grinding swarf.***

Master Chemical manufactures a full line of cutting and grinding fluids. Following are three representative fluids from the soluble oils, semi-synthetic and synthetic fluid technology categories:

**TRIM® E206** is a soluble oil or chemical emulsion coolant concentrate designed as a general-purpose multi-metal coolant for general machining of ferrous and nonferrous materials.

**TRIM® SC235** is a low oil, semi-synthetic coolant that meets the needs of the most modern and demanding manufacturers.

**TRIM® C275** is a synthetic coolant designed for shops where the primary operations are high-speed turning and milling on ferrous metals.