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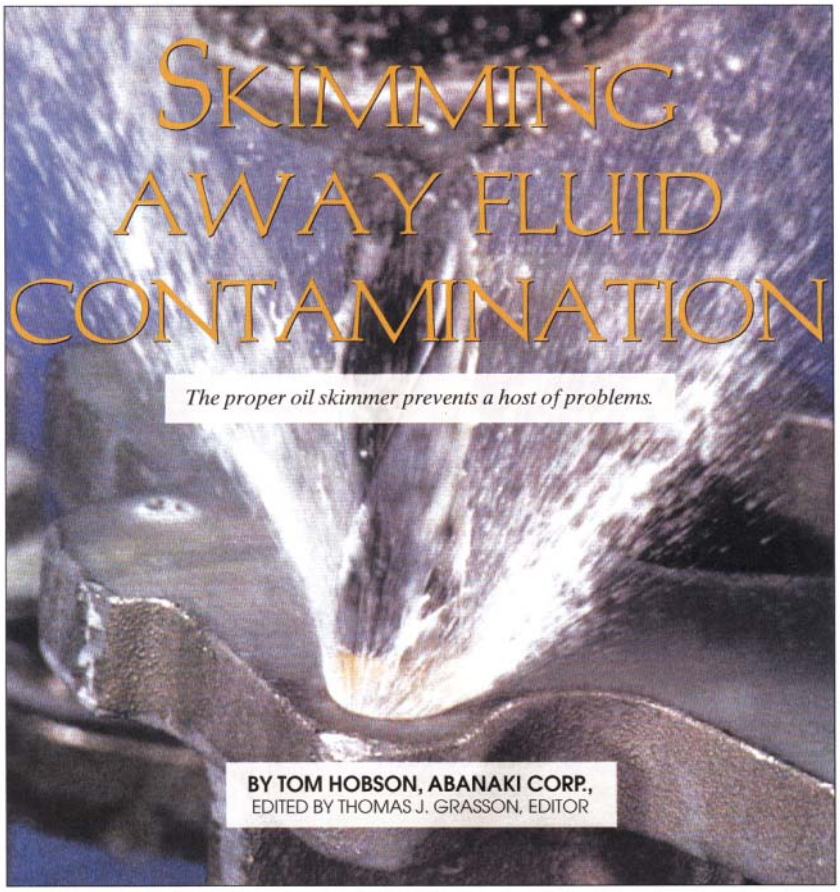
AMERICAN MACHINIST'S CUTTING TECHNOLOGY

November/December 2003

SKIMMING AWAY FLUID CONTAMINATION

The proper oil skimmer prevents a host of problems.



BY TOM HOBSON, ABANAKI CORP.,
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Machine coolant or cutting fluid contaminated with tramp oil causes major problems. For instance, contamination reduces fluid life and deteriorates the quality of machined parts. As the problem worsens, the tramp oil accelerates bacterial growth, and the cutting fluid eventually produces a rotten-egg odor. But more detrimental is bacteria-contaminated coolant causing dermatitis.

However, there is a solution. Oil skimmers remove contamination. They are inexpensive, highly dependable, and typically pay for themselves within a few months. Although designs vary, most use moving media and rely on differences in specific gravity and surface tension between oil, water , and the skimmer medium.

Skimmer media comes in various shapes, and the most common are belts, disks, or tubes. As the medium

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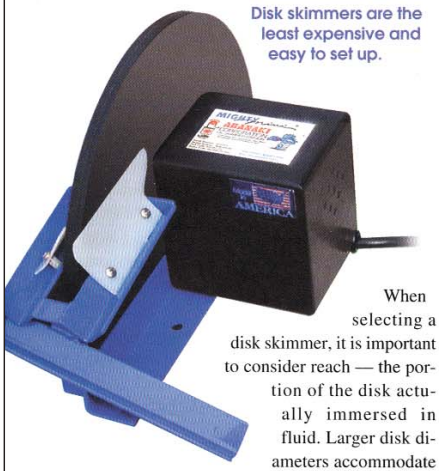
moves through the cutting fluid, it picks up non-emulsified oil, which subsequently enters a removal section of the skimmer. Wiper blades or pinch rollers remove oil from the medium and routes it into a container for reclamation or disposal.

Skimmer selection

Typically, there are four basic skimmer types: (from least to most expensive) disk, belt, mini-tube, and coalescing.

Disk skimmers are frequently used in cutting fluid tanks and range in cost from about $170 to $250. They are easy to set up, and their mechanics are simple. Made of plastic or metal, the disks slowly rotate through the cutting fluid, as a pair of wiper blades scrape off tramp oil.



Disk skimmers are the least expensive and easy to set up.

When selecting a disk skimmer, it is important to consider reach — the portion of the disk actually immersed in fluid. Larger disk diameters accommodate greater fluctuations in fluid depth and provide more surface area for oil collection. Since the skimmer mounting and disk diameter are fixed, the system collects progressively less oil as the fluid level drops.

The most common disk sizes are 12 and 18-in. diameters. A 24-in. diameter is available, but generally it is too large for most cutting-fluid tanks. Because of their required installation methods, disk skimmers cannot elevate skimmed oil more than an inch or so above the top of the tank.

The usable disk area is generally ⅓ of its diameter. As a rule of thumb, the fluid level should not drop below the rim of the tank by more than 3 in. for a 12-in. disk and 6 in. for an 18-in. disk. If level fluctuations are greater than these, it is best not to use a disk skimmer. These dimensional limitations also restrict the size of the waste-oil container. For instance, it is quite common to see a disk skimmer discharging oil into a container the size of a coffee can.

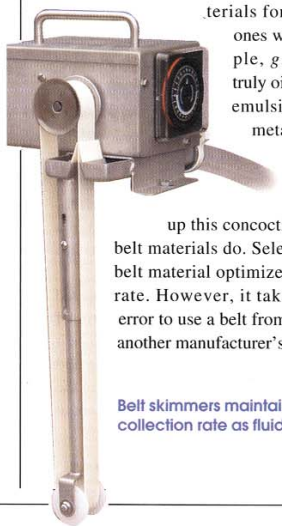
Wiper blades should contact as much of the disk as possible. For example, if wipers only extend 2 in. from the disk edge, disk immersion into the fluid beyond this dimension is useless. As a result, removal capacities for disks are low as compared to the amount of real estate they occupy. Typical removal rates are from 1.0 to 1.5 gph, regardless of disk diameter.

In addition, when considering a disk, thicker is better. Disks that are less than ½-in. thick tend to warp easily and become ineffective because of mechanical-alignment problems, leading to frequent maintenance and high disk-replacement costs. The typical overall life expectancy of a disk skimmer is one to two years.

Belt skimmers come in a wide range of sizes, but smaller ones costing from $250 to $350 are popular choices for cutting-fluid applications. They usually include a continuous 1 or 2-in.-wide belt made of plastic or steel that runs over top and bottom pulleys. Wiper blades scrape the oil off the belt and into a discharge channel.

Belt skimmers maintain a steady collection rate as fluid levels fluctuate. They install well above the rim of the coolant tank and elevate oil to substantial heights without a decreasing removal rate.

Some skimmer manufacturers offer various belt materials for when conventional ones won't work. For example, *gray* tramp oil is not truly oil but a combination of emulsified oil, coolant, and metal particles. A typical belt, or for that matter, disk or tube, won't pickup up this concoction. However, certain belt materials do. Selecting the appropriate belt material optimizes a system's removal rate. However, it takes a lot of trial-and-error to use a belt from one manufacturer on another manufacturer's skimmer.



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Another consideration is the construction and design of the belt skimmer itself. Before selecting a specific brand of belt skimmer, shops should check if belt lengths are available for the depth of their tank. Ideally, the bottom pulley should remain in the liquid for all practical fluid levels.

Also if the skimmer's belt mechanism swivels, it usually requires a swivel-stabilizer bar with extra guide pulleys that may strip off the oil before it is wiped into the discharge trough. This type of design takes up a lot of space and makes installation difficult. The swivel feature is for access through the side of a machine. If this is necessary, a small tube skimmer may be a better choice.

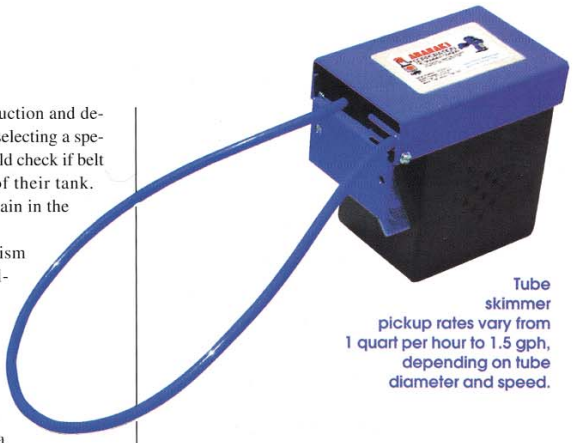
Shops should consider belt design. Cogged belts (similar to automotive timing belts) ensure minimal slippage, but the free-riding tail pulley must be inside the belt for it to function properly. And cogged belts pick up oil on only one side.

On the other hand, flat belt skimmers have a spring-loaded stabilizer bar that prevents slippage and make moving the unit easy. There is no loose tail pulley to flop around, and since the belts are flat on both sides, their oil-collection area is doubled as compared to a cogged belt of the same width.

Tube skimmers usually sport a continuous $^{3}/_{16}$ or $^{5}/_{16}$-in.-diameter plastic tube that snakes out over the liquid surface in a coolant tank. A drive unit pulls the floating tube through the skimmer's housing, which strips off oil. Pickup rates for tube skimmers vary from 1 quart/hr to 1.5 gph, depending on tube diameter and speed.

These units are fairly compact and skim effectively. Their tubes fit through slots in the side of a machine or where overhead room is tight (such as in a coolant drawer).

A good tube-skimmer design has its motor mounted underneath, requiring virtually no room over the rim of the tank. A $^{5}/_{16}$-in.- diameter tube is preferable since it has enough stiffness not to drag on the housing and prematurely wipe off oil before being drawn into the unit. Small tube skimmers range in price from about $280 to $340.



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More advice

Selecting the proper style skimmer not only controls coolant contamination but also provides a clean, safe work environment. While it's important to make a purchasing decision based on budget constraints, keep in mind skimmers have come down dramatically in price within the past few years, partially due to low-cost motors. However, make sure the skimmer motor is robust enough to handle the intended application.

Skimmer motor housings, no matter what type of skimmer, should completely enclose the wiring and be tightly secured. Loose fitting housings with weak fastening may come off unintentionally, exposing wiring and increasing the risk of electrical shock. The housing should also be well ventilated so the motor does not overheat.

Shops also need to check motor specs, making sure the system is rated for continuous service. To shave costs, some manufacturers opt for intermittent-duty motors. Using this type of motor for more than two or three hours a day generally causes overheating.

Additionally, keep in mind that skimmed oil and water inevitably get on the motor shaft. So, it is important that the motor's seals effectively prevent unwanted fluids from migrating along the shaft and contaminating the bearings. CT