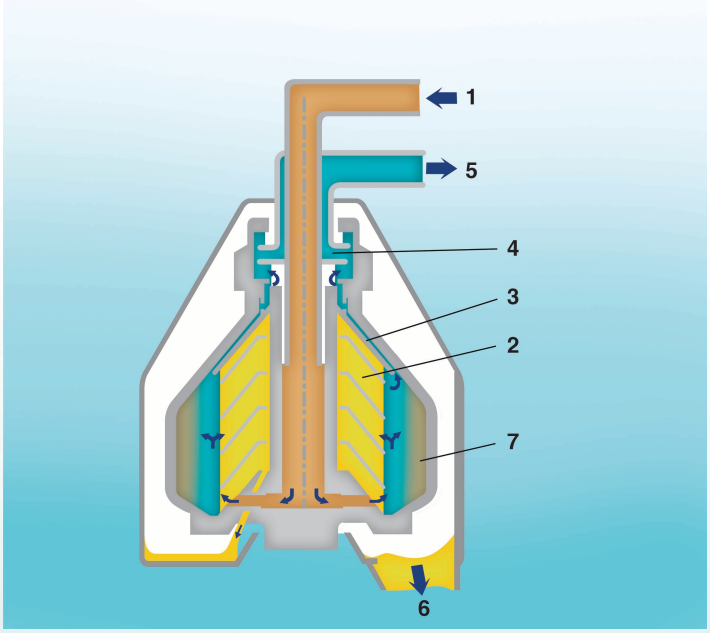
Tramp Oil Removal Device - High-Speed, Disc-Bowl Centrifuge

The high-speed, disc-bowl centrifuge is the preferred tool for removing tramp oil from metalworking fluids and water miscible parts cleaning systems, because it can deal with removal of all types of tramp oil while parts are being made. This ability to function while the machine is working makes it the ideal tool for dealing with the tramp oil in central systems.

Like other gravity-based separation systems, a centrifuge relies on several system conditions:

1. **The materials being separated must be immiscible** (will not mix). If the materials are dissolved, separation by gravity is impossible.
2. **There must be a difference in specific gravity** (weight per unit volume) between the different phases. The bigger the difference, the easier the separation. Typically, tramp oil is lighter than coolant or washing compound.
3. **The feed to the centrifuge needs to be fairly uniform.**



CENTRIFUGE OPERATING PRINCIPLES
1. The dirty coolant feed
2. enters the rotating bowl and is separated in the disc stack.
3. The separated and purified coolant (heavy phase) flows over the separating disc
4. and is pressure-discharged by the centripetal pump
5. from the clean coolant discharge.
6. The tramp oil (light phase) discharges freely from the bowl.
7. Separated solids collect in the holding space and must be removed manually.

Centrifuge function is easiest to understand if you think of it as a very efficient, rotating settling tank that has been tipped on its side so that centrifugal force replaces gravitational force. As the fluid to be cleaned flows through the rapidly rotating bowl, the fluid is subjected to centrifugal force. This centrifugal force causes the fluid to separate into three phases. The lightest phase (tramp oil) is retained near the center of the bowl. It makes its way through a “riser” to the “bowl Tramp Oil Removal Device – High-Speed, Disc-Bowl Centrifuge lid,” then to the storage tank. The heavy phase is the good (tramp oil free) coolant that is held in the central portion of the bowl; from there it travels through a separate riser to the bowl lid, then on to the clean tank. The solid phase (chips and micro fines) are spun to the outside of the bowl where they are held either for the “self-desludging” process, or go to the periphery of the bowl for manual cleaning. How clean the light phase (free of water) and heavy phase (free of tramp oil) is largely a function of how long the material stays in the bowl and the difference in the specific gravity and miscibility of the two fluids. Under optimum conditions, it’s possible to get very “dry” tramp oil and very clean coolant with a centrifuge.

Thirty plus years of using highspeed, disc-bowl centrifuges to manage metalworking fluids has taught us several things about making them effective. These “bits of wisdom” include:

1. **Make the feed as consistent as possible** both mechanically (fluid pressure and volume) and as a fluid “feed stock.”
2. **Removal of tramp oil from a working solution.** While on a practical basis it is nearly impossible to remove all of tramp oil from a working solution, removal to less than 0.5% by volume is common and typically guaranteed.
3. **A centrifuge will not separate material in solution** or very tightly emulsified oil, synthetic and semisynthetic (chemical and semichemical), products of all kinds can be safely centrifuged. However, when dealing with soluble oils or emulsions, if the emulsion is not properly formed and inherently stable, or the emulsifier package has been depleted with hard water minerals or other multi-valiant cations, the centrifuge may “strip out” some of the system oil.
4. **Increasing the flow rate.** If a system becomes particularly contaminated with tramp oil, it is possible that by increasing the flow rate (typically 3 to 5 times the optimum separation rate) and reducing dwell time in the centrifuge bowl, the centrifuge can “skim off” 75% or more of the tramp oil – getting the system relatively clean in a very short period of time. Once this is accomplished the “flow rate” is throttled back to the slower, optimum

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separation rate and the fluid can be polished.

5. **Do not start or stop the centrifuge more often than is necessary.** They work better and have fewer mechanical problems when they are run continuously.
6. **Keep the unit clean.** If possible use a self-cleaning or desludging unit. Use course particle filtration on the system feed to reduce the number of chips and micro fines in the material to be centrifuged.
7. **Do not return desludge material to the system** when working with a “self-cleaning” centrifuge. This desludge will have very high levels of bacteria and other contaminants.
8. **Making adds to a system in conjunction with centrifugation** is a very good way of insuring that the additive is properly added to/or mixed with the working solution.
9. **Care should be taken to understand the effects of “adds”** before deciding whether to add them upstream or downstream from the centrifuge.

Tramp oil is one of the major “killers” of metalworking fluids because it adversely affects fluid performance in so many ways. It reduces the fluid’s ability to assist with the metal removal or forming process, and increases both the severity and frequency of fluid management issues. With its ability to remove tramp oil and micro fines while fluid is in use, a high-speed, disc-bowl centrifuge is the logical choice for removing tramp oil where volumes of fluid or criticality of the operation can justify the cost of the equipment.

NOTES:

1. There are two types of centrifuge commonly found in the metalworking fluid environment: the low speed, solids-from-liquid centrifuge; and the high-speed, liquid-from-liquid centrifuge. Only the high-speed centrifuge works on tramp oil.
2. Within the high-speed centrifuge family there are units that have be optimized to remove oil from water and those that have been optimized to remove water from oil. To remove tramp oil from coolant or washing compounds, you want an oil-from-water machine.

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