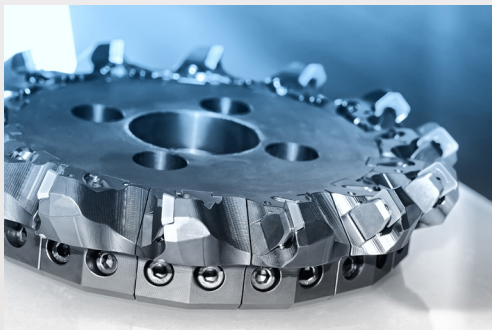


# 9 Traits of a Good Metal Cleaning Fluid

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- **Industries:** Electronics, Manufacturing, Medical Device, Aerospace & Defense, Automotive
- **Published:** American Machinist



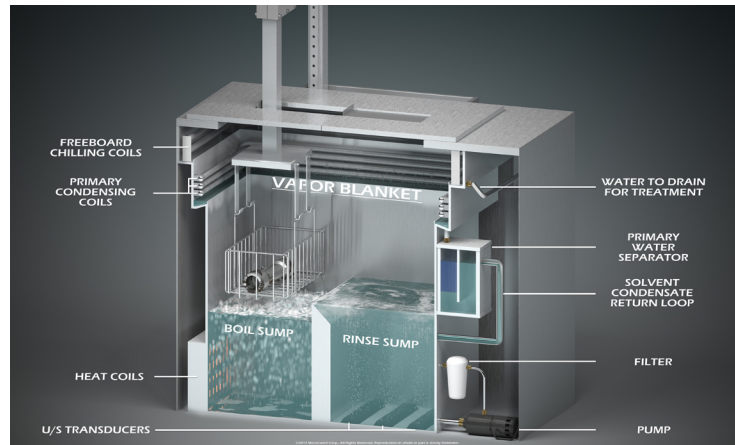
Complex geometries and awkward shapes are becoming commonplace.

It is important to choose the best metal cleaning fluid. Today's demanding product performance requires machined parts adhere to very tight specifications. Parts with complex geometries, awkward shapes, and internal blind holes are now common. While at the same time, customer quality requirements on finished parts remains high.

Cleaning these challenging parts can sometimes prove difficult. Production debris like machining, stamping or cooling oils, dust, metal filings, marking inks, fingerprints and other soils must be removed prior to processing or assembly. It is essential that parts are clean and dry before commencing finishing operations like anodizing, plating, painting or welding.

Many finished metal parts have high cleanliness standards. They are often tested with black light inspection, particle count, water break or other analysis to ensure they meet the customer requirements. However, as the parts get smaller and more complex, it is trickier to clean them quickly, efficiently and without damaging the substrate.

## Vapor Degreasing for Successful Cleaning



*Vapor degreasing is an effective, reliable and repeatable method for successful parts cleaning.*

Parts cleaning inside a vapor degreasing machine is a common method. It provides consistent cleaning and is highly effective at removing lubricants, silicones and greases. Vapor degreasing is fast, efficient, has a high throughput and is easily automated into standard production lines. Parts come out of the vapor degreaser cool, dry and ready for processing or packaging. It uses no water and little electricity so it is a sustainable way to get parts clean.

Most modern cleaning fluids are a mixture of compounds that can include hydrocarbons like mineral spirits, isopropanol and ethanol. Depending on how the compounds combine determines the cleaning fluid's effectiveness and its material compatibility. The vapor degreaser uses just one type of cleaning fluid. Or it uses a mixed, blended or custom formulation to remove a specific soil from a specific substrate. This maximizes cleaning effectiveness.

Soiled parts are immersed in the continuously filtered and distilled cleaning fluid inside the vapor degreaser. The fluid dissolves or lifts the soils from the parts surface. In some instances, ultrasonic agitation adds additional cleaning muscle. As the parts lift from the cleaning fluid, they undergo a brief vapor rinse and drying process. The cleaning fluid condenses and drips back into the vapor



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Modern cleaning fluids replace outdated solvents like TCE and nPB.

degreaser. The vapor degreaser recycles and reuses the cleaning fluid for hundreds of times before it needs to be refreshed or replaced. This helps reduce the cost of hazardous waste removal. After a typical cleaning cycle of about 6-20 minutes, the parts come out clean, rinsed, dried and ready for the next stage of production.

## Top 9 Traits of a Good Metal Cleaning Fluid

Today, there are a number of good cleaning fluids on the market for cleaning metal parts inside a vapor degreaser. They all have their unique strengths, weaknesses and subtle nuances. However, there are nine characteristics that typically make up a good cleaning fluid. They are:

**Nonflammable:** Nonflammable cleaning fluids are safer for handling and storage. Plus, they do not require specialty fire or explosion-proof equipment. Most vapor degreasers are engineered to use nonflammable cleaning fluids.

**Maintenance-free:** Cleaning fluids should remain stable when exposed to moisture or water. In addition, they should not require acid acceptance testing, stabilizer maintenance or lab analysis.

**Low boiling:** Low boiling cleaning fluids (below 100°C) still thoroughly clean parts but allow the vapor degreaser to run more efficiently, saving energy costs. Plus, using the lowest boiling temperature possible allows cleaning of plastic or delicate parts without damage.

**Low surface tension:** Low surface tension of the cleaning fluid allows it to wet all parts surfaces and work its way into small clearances.

**Low Viscosity:** Low viscosity cleaning fluids get into, and even more importantly, out of tight crevices inside parts. Most metal cleaning fluids are more viscous than water to better permeate complex shapes and tiny parts.

## 4 More Benefits

**High Density:** Modern cleaning fluids are typically 20-30% heavier than water, and over 50% heavier than alcohol. High density cleaning fluids are good for use on particulates such as metal shavings or polishing pastes that cannot be dissolved. Instead, the particulate displaces or lifts off the components. The high-density fluid then pushes the particulate off the surface.

**Correct solvency or strength:** Cleaning fluid strengths are typically indicated by a Kb value. Kb values typically range from very mild (10) to very strong (greater than 125). The cleaning fluid should have a high enough Kb value and solubility parameter to hold and dissolve a high concentration of the soils yet not damage any of the parts materials.

**Low toxicity:** To protect workers and the environment, the cleaning fluid should not contain n-propyl bromide (nPB), methyl pyrrolidone, perchloroethylene (Perc) or trichloroethylene (TCE) which all carry health and or environmental baggage.

Users should refer to the fluid's SDS to check the cleaning fluids exposure PEL,



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Tergo™ Performance Fluids combined with a vapor degreaser are a sustainable parts cleaning choice.

or Permissible Exposure Limits. Outlined by the EPA, higher PEL ratings are better. For instance, nPB rates at just 0.1 parts per million while TCE rates at 100 parts per million. However, modern metal cleaning fluids have typical PEL ratings of 200-250, making them significantly better for the safety of exposed workers.

**Environmentally Sustainable:** Many of the new metal cleaning fluids feature new formulations that offer excellent performance along with improved environmental properties. Unlike older cleaners that caused air and groundwater quality concerns, the new cleaning fluids have a very low GWP (Global Warming Potential) which helps reduce greenhouse gas effects and low ODP (Ozone Depleting Potential) content to meet strict regional air quality regulations.

## Choosing the Right Metal Cleaning Fluid for the Job

Many metal fabricators and machine shops are evolving with innovative parts designs and advanced manufacturing processes. However, even state-of-the-art companies can benefit from upgrades to their cleaning methodology.

A vapor degreasing machine is an effective, reliable and repeatable method for successful metal parts cleaning. Parts are cleaned, rinsed and dried in a single machine using modern cleaning fluids that are replacing the older, environmentally questionable legacy solvents. These next-generation cleaning fluids offer many benefits including better cleaning outcomes and lower toxicity profiles.

For companies looking for help in selecting and using a sustainable metal cleaning fluid, it is essential to work with a partner that has metal parts cleaning fluid and vapor degreasing expertise. A cleaning partner can help conduct on-site audits or perform in-lab tests with sample parts to ensure cleaning success. Based on specific parts make-up and the contamination encountered, they can recommend, or formulate, the fluids and metal cleaning methods that will work best.

### Kb Values

Kb values help gauge a fluid's strength. Fluids with lower Kb values are gentler on substrates but may not have enough strength to clean or debind effectively. Fluids with higher Kb values may be speedy and effective but may attack delicate components. The key is to find the right balance between strength and materials compatibility.

Fluid	Kb Value
Vertrel™ XF	11
Vertrel™ MCA	20
CFC-113	31
Vertrel™ SMT	38
Mineral Spirits	39
MicroCare Heavy Duty Degreaser	48
Vertrel™ SFR	101
Tergo™ MCF	108
1,1,1-Trichloroethane	124
Bromothane™ S	125
Trichloroethylene	130

### About the Author:

Venesia Hurtubise is a Technical Chemist at MicroCare which offers precision cleaning solutions. She has been in the industry more than 6 years and holds a MS in Green Chemistry from Imperial College. Hurtubise researches, develops and tests cleaning-related products that are used on a daily basis in precision cleaning and medical applications.

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