

TROUBLESHOOTING COOLANT SYSTEMS

The problems most commonly attributed to aqueous cutting fluids are:

- **Corrosion**
- **Nonferrous corrosion**
- **Rancidity or objectionable odors**
- **Objectionable residues**
- **Dirt accumulation**
- **Excessive foam**
- **Skin irritation**
- **Eye, nose, or throat irritation**
- **Unsatisfactory surface finish on parts**
- **Unsatisfactory cutting tool or grinding wheel life**

Problems with aqueous cutting fluids ('coolants') generally occur for one or more of the following reasons:

- **Improper fluid selection for the metal type, machining operation, filter media, or water quality**
- **Lack of fluid maintenance or poor overall maintenance.**
- **Incorrect machine setup or operation.**
- **Excessive contamination from external sources.**

Improper fluid selection does occur; but usually, problems stem from tooling, poor maintenance, or excessive fluid contamination. Cutting fluids can seldom overcome incorrect tooling (materials, sharpening, feeds, speeds, or inadequate grinding wheel grades).

Solving problems in a central system is more complex than solving problems in individual machines. It is not only necessary to locate the basic cause of the problem and take measures to correct it, but also to rejuvenate the central system cutting fluid, if possible, so that it will perform satisfactorily.

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CORROSION CONCERNS:

Houghton cutting fluids provide corrosion control of the highest degree. Even with this protection, complaints of rust may occur from time to time. A step-by-step investigation is necessary to resolve the issue.

The corrosion inhibitors in the concentrate can prevent rust only if they are dispersed throughout the mix in adequate concentrations. To ensure proper control, it is imperative to use good premixing practices.

Possible Causes for Corrosion

Concentration of cutting fluid mixture may be too low.

Recommended concentration range of the fluid may be too low for this application or water quality.

Cutting fluid reservoir may be full of chips or grinding swarf.

High biological levels may indicate contamination from the prior fluid, oil leaks, indiscriminate disposal of cleaners, plating compounds, food, tobacco, construction debris, etc.

Corresponding Remedies

Adjust mixture to recommended level. Determine and correct cause (mixing errors, only water added, dirt levels, etc).

Increase in 0.5 to 1.0% increments until optimum concentration is found.

Clean fluid if possible. Otherwise, drain and clean reservoir and piping system according to the OEM manual. Recharge (DCR).

Clean fluid, if possible. Otherwise, DCR. Repair all oil leaks. Eliminate source of reservoir contamination. Aerate the fluid. As last resort, add biocide to treat the system. DCR is preferable.

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Possible Causes for Corrosion

Has the emulsion in the machine destabilized? (unstable emulsions can cause rust).

**Are parts stacked or stored?
(Note: Houghton fluids protect machine components and parts from corrosion but are not intended to provide long term storage protection.)**

Parts that are still wet with the cutting fluid may be placed with other parts, other ferrous metals, or dissimilar metals.

Hot, humid conditions may hasten rust problems by slowing drying action or preventing protective film formation.

Corresponding Remedies

Compare color to fresh emulsion. Soluble oils should be milky, Semi-synthetics should be translucent. If the fluid looks more watery or has separated then a DCR is likely needed.

Rust preventatives should be used when parts are stored. Often, new or “green” wood is used for stacking and will cause rust. Concrete or construction dust can cause rust, and so can chemicals formed in the bottom of dirty tote pans. Papers between parts can also contribute.

Avoid metal-to-metal contact in stacking parts after metal removal operation. Use plastic-coated wire baskets rather than metal totes. Dry parts before long storage. Use vapor-barrier paper between parts during storage and handling.

Increase fluid concentration. Improve plant ventilation. During severe weather conditions, it may be necessary to use a water-displacing rust preventive.

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Possible Causes for Corrosion

How close to open windows and overhead cold-water lines are the parts or machines located?

Fumes from pickling acids may be saturating the area.

Corresponding Remedies

Rainwater or condensation from windows, roof or cold water pipes can settle on newly machined parts and cause rust.

Acid fumes, salts, cleaning products settling on freshly ground or machined parts can penetrate the protection that our products give them. Use fans to direct the fumes out of the plant.

RESIDUE CONCERNS:

All cutting fluids leave a residue of one kind or another during metalworking operations. Residues are classified as:

- **Fluid - oily**
- **Soft**
- **Hard**
- **Gummy**
- **Crystalline**

The more machines a plant operates, the more critical the type of residue left by the aqueous cutting fluids. Fluid residues are necessary to keep moving machine parts from malfunctioning due to “sticking” or “freezing”. On the other hand, surface grinders that have few moving parts can tolerate crystalline films. With fluid residue, it is important to understand the amount of residue, oxidation due to air and heat, and whether it will dissolve when make-up fluid or water is added.

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RESIDUE CONCERNS:

The mineral content of the water is important because it can react with the residue and either increase the amount, or harden into scale. When changing fluid types, often a different residue can be concerning even if it's perfectly normal.

Possible Causes for Residues

Corresponding Remedies

Fluid concentration may be too high.

Adjust to correct level. Correct cause (i.e. makeup too rich, faulty metering devices, or human error).

Has the machine ever been thoroughly cleaned?

If not, do a thorough DCR and keep good maintenance practices.

Machine system may be contaminated from oil leaks, or construction debris.

Thoroughly clean machines before putting them back into service after construction, repair, or retrofit.

Is the machine an "oil leaker"? Excessive leaks cut off air supply to aqueous cutting fluids.

Repair leaks, or at least install skimmers to remove excess oil. Also can air line to aerate the fluid. Very helpful during downtime periods.

Reservoir may be full of chips or grinding swarf, food remnant, or other matter.

Clean fluid, if possible. Otherwise, do a thorough DCR. In conditions of severe rancidity or heavy residue, it may be necessary to do the "clean" step more than once.

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RANCIDITY CONCERNS:

Houghton products do not promote bacterial or fungal growth, which is the main cause of rancidity or foul odor concerns. However, there are a host of outside contaminants which can cause biological growth in an aqueous cutting fluid including lubricating oils, cleaning products, dirt, swarf, and various refuse. Investigation is necessary to find the cause.

Possible Causes for Rancidity

Concentration of cutting fluid mixture may be too low.

Recommended concentration range of fluid may be too low.

Water may be too hard to use with specific product.

Reservoir may be full of chips or grinding swarf, contaminated by oil leakage and food remnants, or contaminated by other matter.

Corresponding Remedies

Adjust to correct level. Determine and correct cause of low concentration (mixing errors, water leakage, hard water, recirculated grit, etc.).

Increase concentration by 0.5% to 2.5% increments, depending on fluid being used, to find optimum concentration.

Have water analyzed. If total hardness is over 200ppm, change to a product more compatible with hard water, or use treated water.

Remove chips by hand, settling tank or mechanical method. Locate and repair oil leaks. Remove extraneous oil by skimmer or centrifuge. Do a thorough DCR.

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DIRT ACCUMULATION CONCERNS:

Possible Causes for Dirt Accum.

Corresponding Remedies

Concentration of cutting fluid mixture may be too low.

Adjust to correct level. Determine and correct cause of low concentration (mixing errors, water leakage, hard water, recirculated grit, etc.)

Water may be too hard to use with specific product.

Have water analyzed. If total hardness is over 200 ppm, change to a product more compatible with hard water, or use treated water.

Reservoir may be full of chips or grinding swarf, contaminated by oil leakage and food remnants, or contaminated by other matter.

Remove chips by hand, settling tank or mechanical method. Locate and repair oil leaks. Remove extraneous oil by skimmer or centrifuge. Keep workplace clean. If needed, do a thorough DCR.

Flow of cutting fluid may not be adequate to flush swarf back to reservoir.

Increase volume of fluid. Re-adjust nozzles so maximum amount of fluid reaches metal removal area. Increase velocity, but not enough to create excess foam.

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FOAM CONCERNS:

Possible Causes for Foam:

Fluid concentration may be too high.

Low fluid reservoir level causing air to be drawn into the pump.

Air entering fluid through cracks in pump housing or intake.

High outlet pressures/ velocities, sharp turns, or return waterfalls may create high agitation.

Water may be too soft to use with this particular product.

Machine or system may be contaminated from external source such as indiscriminate disposal of floor cleaners, cleaning products, dust, debris, etc.

Corresponding Remedies

Adjust to correct level. Correct cause (i.e. makeup too rich, faulty metering devices, or human error).

Check concentration, then add make-up to correct fluid level.

Inspect pump and all piping. Replace/repair defective units.

Reduce or eliminate these conditions where possible.

Have water analyzed. If total hardness is less than 50 ppm, harden water or change to soft water compatible fluid.

Maintain clean workplace. Educate on need to keep other fluids out of system. It may be necessary to add defoamants to temporarily return system to normal. When possible, do a thorough DCR.

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SKIN IRRITATION/EYE/RESPIRATORY CONCERNS:

The OSHA Bulletin on Hygiene and Metalworking Fluids is clear that all types of MW fluids can cause some irritation in different people and that usually the cause is a misuse or mishandling of the fluid.

The usual causes are:

- Use of solvents or aerosols
- Too alkaline - high pH
- Too rich a mixture or handling of concentrate
- Improper cleaning of hands and face
- Improper biocides or other chemicals

Possible Causes for Skin Irritation/Dermatitis

Corresponding Remedies

Regardless of cause, skin irritation is a medical problem and should be treated immediately.

Report it immediately to medical personnel. Whether fluid related or not, the issue should be investigated and treated by trained personnel.

Concentration of cutting fluid mixture may be too high.

Adjust to correct level. Correct cause (i.e. makeup too rich, faulty metering devices, or human error).

Soap in company washrooms may be too harsh and irritating.

Change to a mild but effective cleaning product. No abrasives.

Operator's hands or skin may be immersed exposed to fluid.

Use waterproof creams or gloves (to elbow). Use fluid handling devices. Use mist collectors.

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Possible Causes for Skin Irritation/Dermatitis

Excessive swarf in fluid causing micro cuts in operator's skin.

Operator may be coming in contact with irritating chemicals outside work or elsewhere in the plant.

Operator may be subject to skin irritation because of poor hygienic practices.

Corresponding Remedies

Remove swarf by hand, settling tank, or mechanical method. Don't clean hands with dirty shop towels.

Determine if operator has any activities where they might come in contact with such chemicals (paints, bleach, auto repair products, parts washers). Limit where possible.

Encourage frequent hand washing, wearing freshly laundered work clothes, and use of protective gloves, aprons, boots, etc.

EYE, NOSE, THROAT IRRITATION COMPLAINTS:

Possible Causes for Eye, Nose, Throat Irritation

Regardless of cause, skin irritation is a medical problem and should be treated immediately.

Concentration of cutting fluid mixture may be too high.

Corresponding Remedies

Report it immediately to medical personnel. Whether fluid related or not, the issue should be investigated and treated by trained personnel.

Adjust to correct level. Correct cause (i.e. makeup too rich, faulty metering devices, or human error).

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Possible Causes for Eye, Nose, Throat Irritation

Corresponding Remedies

Handling of concentrate or treatment additives.

Use fluid handling equipment. Wear goggles and respirators when handling and do not directly inhale concentrate or additives.

Irritating fumes may be coming from other plant operations or operations outside the plant.

Investigate ventilation conditions of heat treating or plating areas. Improve unsatisfactory conditions with fans until permanent changes can be made. If outside source, take necessary precautions to avoid

There may be excessive splashing or misting of cutting fluid.

Reposition guards on machines to contain splash or mist. Grind chip breakers into the cutting tools. Encourage use of safety goggles or glasses. Use mist collectors. Ensure correct concentration.

Certain ferrous and non-ferrous chips under certain conditions, can react with some fluids to give off an offensive odor. Operators may be sensitive to those odors or just need time to adjust.

Do a thorough DCR. Remove chips more frequently to avoid build-up. Change to a fluid that is more compatible with the metal machined. Educate operators on different odors of fluids.

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UNSATISFACTORY SURFACE FINISH OR CUTTING TOOL/GRINDING WHEEL LIFE:

Possible Causes

Corresponding Remedies

Fluid concentration too low

Adjust to correct level. Determine and correct cause of low concentration (mixing errors, water leakage, hard water, recirculated grit, etc.)

Fluid concentration too low for this application

Review metal types and operation and adjust concentration. If above 12%, consider different fluid type to resolve finish or tool concern.

Fluid volume/pressure may be inadequate or nozzle design or quantity may not fully cover metal removal area.

Increase volume and adjust nozzles so that maximum amount of fluid reaches metal removal area. Avoid pressure or velocity increases that create excess foam.

EFFECTS OF INSUFFICIENT VOLUME OF FLUID ON TOOL

- **Lack of sufficient lubricant at the point of cut leads to more friction and heat, resulting in poor tool life and finish.**
- **Insufficient heat removal, resulting in poor tool life and finish.**
- **Chipping and cracking of tool due to intermittent fluid, especially with carbide tools.**

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PROPER CUTTING FLUID APPLICATION:

- On drills, reamers, taps, boring tools, etc., whether horizontal or vertical operations, the fluid should be directed into the holes in copious amounts. Never expect full effectiveness when fluid is flowing at right angles across the front of a machined hole.
- On mills, hobs, lathes, etc., the fluid should be in copious amounts on the chip side of the cutter; it should fall in front of the cutter's path. Small droplets on top of a milling cutter is often worse than cutting dry. The cutting fluid should be delivered in sufficient volume and pressure for the operation.
- On grinding applications, the flow of fluid should be in copious amounts at or above the point of contact between wheel and part. Make sure the wheel abrasive is not too hard or too soft for the metal. Change to a different grit or abrasive type if needed.

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TROUBLESHOOTING CHECKLIST

Problem	Possible Cause
Rust	2, 11, 16, 19, 21, 29, 34
Non-ferrous corrosion	2, 3, 11, 16, 29, 30, 34
Staining	3, 11, 19, 21, 29, 30
Machine Rust	2, 16, 21, 29, 32
Pond Scum	11, 17, 21, 22, 27, 29, 30, 34
Residue	3, 11, 16, 17, 19, 21, 22, 25, 34
Rancidity	2, 11, 16, 17, 19, 34
Slime	2, 11, 16, 17, 19
Plugged fluid lines	11, 16, 19, 21, 27, 29
Short fluid life	2, 11, 16, 17
Excessive foam	3, 8, 11, 20
Swarf settles too fast	2, 11
Swarf settles too slow	3, 11, 16, 17, 19
Cutting fluid in oil reservoirs	32
Tramp oil on fluid surface	11, 17, 21, 32
Can't control concentration, pH	11, 16, 17, 19, 21, 29
Can't check concentration	11, 16, 17, 19, 36
Poor tool life	1, 2, 3, 4, 17, 34
Poor grinding wheel life	1, 2, 3, 4, 5, 6, 7, 19, 22
Poor surface finish	1, 2, 4, 5, 6, 7, 16, 19
Poor dimensional tolerance	1, 3, 7, 16
Parts too hot	1, 3, 4, 7, 8, 16
Gauges stick	3, 11, 16, 17, 19, 21, 22, 25, 34
Frozen centerless adjustment screws	3, 11, 25, 26
Excessive blade wear; pick-up	1, 2, 4, 8, 11, 19, 20, 34

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Problem	Possible Cause
Machine ways dry	31
Burning of nose or eyes	3, 9, 10, 11, 12
Dry throat	3, 9, 10, 11, 12
Skin irritation	3, 9, 11, 12, 13, 14, 18
Cuts don't heal	3, 11, 12, 13, 14, 19
Oil boils on skin	11, 13, 14, 18, 19
Smoke	1, 2, 3, 4, 5, 7, 9, 17, 34
Lack of transparency	3, 11, 16, 17, 19
Filters won't work	2, 17, 21, 22, 23, 24
Can't paint parts	3, 11, 28

Troubleshooting Codes:

1. Improper cutting fluid for application
2. Low concentration – Add concentrate
3. High concentration – Add fresh water
4. A heavier duty product is needed
5. Wrong wheel grade
6. Wrong wheel bond
7. Feeds, speeds, etc., wrong for the job
8. High agitation creating too much foam
9. Too much mist - ventilate, change to flood application
10. Operator has illness
11. Outside sources of contamination
12. Direct contact with concentrate - avoid and wash
13. Use of solvents - minimize, see physician, use barrier creams
14. Poor personal hygiene
15. Proper mental attitude
16. Poor filtration - check for dirt in sump or filter
17. Excessive tramp oil - eliminate leaks, centrifuge

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Troubleshooting Codes:

- 18. Operator may be allergic
- 19. Dirty fluid - dump, clean, and recharge (DCR)
- 20. Water too soft
- 21. Water too hard
- 22. Hard water soaps
- 23. Wrong filter media grade - consult filter manufacturer
- 24. Filter index cycle not correctly set - consult filter manufacturer
- 25. Solution product may evaporate leaving salt deposits
 Lower concentration or change to emulsion product
- 26. Use a waterproof grease
- 27. Not enough cleaning action – worn out cleaning products
- 28. Recommend washing procedure
- 29. Bacteria or mold
- 30. Wrong product - recommend another product
- 31. Check lubrication system - recommend waterproof way oil
- 32. Machine seals worn out - replace
- 34. Improper mixing technique – unstable or split emulsion
- 36. Concentration chemicals past shelf life - replace
- 37. Improper dressing techniques

CONCLUSION:

As aqueous cutting fluid technology provides longer and longer fluid life, the need for excellent maintenance practices increases. Use this guide to educate your customers on maintaining their cutting fluid system and correcting concerns that arise.

For prospective customers, use this guide to demonstrate your professionalism and educate the customer on how a Houghton cutting fluid could solve one or more of their concerns. If they need to dump, clean and recharge (DCR) to resolve an issue, that is the perfect time to try a Houghton cutting fluid solution.

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