Troubleshooting Aqueous Cleaning Processes

By David Geis

Cleaning parts using aqueous solutions can be only one part of a much larger manufacturing process. When a problem arises in the process, technicians and engineers need to trace the source of the problem and determine the best solution. Sometimes a problem will appear immediately after the step causing it. In those cases, troubleshooting can be simple and straightforward. Other times, problems will only appear after several more processing steps. In these cases, tracing back the root causes can be difficult.

Here are some general guidelines for investigating a new process problem:

1. Identify the step in the process where the problem first becomes apparent. Closely observe that step to find out what makes the problem visible.

2. Starting with the previous step and working backwards through the process, closely observe each step to identify the source of the problem.

3. When the step causing the problem is found, monitor that step to find out if the problem is transient, if it is periodic, or if it is inherent in the processing step.

4. If the problem is transient, identify whether any materials or conditions have changed. Sometimes a simple change in material can introduce unforeseen problems.

5. If the problem is periodic, observe the environment and nearby process steps. Sometimes seemingly unrelated operations can have an effect on each other.

6. If the problem appears to be inherent in the process step, collect as much information as possible. Evaluate whether the problem can be eliminated by changing the step where the problem originates, or by changing the step where the problem becomes apparent. Determine whether subsequent process steps would be affected.

7. Based on the information you have, implement the best solution to the problem.

To assist technicians and engineers in troubleshooting, we have compiled a list of some common problems seen when using aqueous cleaning. If you have concerns or troubles with your process that are not covered in this list, please take the opportunity to contact Magnaflux®, and our engineers will assist you with finding the solution to your cleaning problems, and how Daraclean® formulations can work for you.

Problem	Possible Cause	Solution
• Part is not clean (general)	Cleaner concentration is too low	Check cleaner concentration and adjust if necessary
	Cleaner temperature is too low	Check temperature controller and adjust if necessary
	Parts are not processed long enough	Increase the time that the part is processed
	Cleaning solution is loaded with too much soil	Check soil levels. If necessary, dump cleaning solution and clean out reservoir to remove soil sediment. Refill with fresh cleaning solution
	Parts are not rinsed enough	Increase rinsing time. Increase flow of rinse water. Check rinse water for contamination.
	Cleaner solution is not aggressive enough	Switch to a higher pH, higher alkalinity cleaner. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Part is not clean (hand scrubbing)	Parts are not scrubbed enough	Increase scrubbing action on part
• Part is not clean (soak tank, agitated tank, ultrasonic tank)	Dirt is not being lifted off surface because ultrasonic power is too low	Adjust ultrasonic power setting
	Large particles not removed because ultrasonic frequency is too high	Adjust ultrasonic frequency setting
	Small particles not removed because ultrasonic frequency is too low	Adjust ultrasonic frequency setting
	Too many parts loaded in bath at one time	Decrease number of parts processed at one time
• Part is not clean (spray washing)	Spray pattern is not sufficient	Adjust positioning of spray nozzles
	Spray volume is not sufficient	Check flow regulator and adjust if necessary
	Spray pressure is not sufficient	Check pressure regulator and adjust if necessary
	Spray nozzles are clogged	Clean or replace spray nozzles

Problem	Possible Cause	Solution
• Part is not clean (spray washing)	Too many parts being processed at one time Parts are arranged so that spray is inconsistent	Decrease number of parts processed at one time Rearrange parts in basket
• Part surfaces are dark after cleaning	Cleaner concentration is too high Bath temperature is too high Metal surface is being attacked by aggressive chemisty	Check bath concentration and dilute if necessary Check bath temperature controller and adjust if necessary Switch to lower pH, lower alkalinity cleaner solution. Or switch to a solution with more corrosion inhibitors. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution.
• Parts have a rainbow pattern similar to heat burn	Bath temperature is too high Dryer temperature is too high	Check bath temperature controller and adjust if necessary Check dryer temperature controller and adjust if necessary
• Part surfaces show pitting, but part surface is otherwise clean	Metal surface is being attacked by aggressive chemistry	Switch to lower pH, lower alkalinity cleaner solution. Switch to cleaner solution containing more corrosion inhibitors Contact Magnaflux® for assistance in selecting the proper Daraclean® solution Add low-concentration corrosion inhibitor to rinse water Use a protective coat of machine oil for long-term parts storage
• Part surfaces have starburst pattern	Part surface being damaged by ultrasonics	Decrease ultrasonic power. Increase ultrasonic frequency.
• Cleaning solution turns yellow or brown	Bath temperature too high Cleaner concentration too high	Check bath temperature controller and adjust as necessary Check cleaner concentration and adjust as necessary

Problem	Possible Cause	Solution
• Cleaning solution turns yellow or brown	Cleaning solution oxidized over time	Ambient air can cause certain cleaner formulations to oxidize and darken over time. This does not affect the usefulness or cleaning ability of the solution.
	Cleaning solution loaded with too much emulsified oil	Check soil levels. If necessary, dump cleaning solution and clean out reservoir to remove soil sediment. Refill with fresh cleaning solution
• A film of oil develops on top of the cleaning solution	Cleaner concentration too low	Check cleaner concentration and adjust as necessary
	Bath temperature too low	Check bath temperature controller and adjust as necessary
	Oil-phase de-foaming agent added	If an oil-based de-foaming agent is in use, the film of oil on top of the solution is there to prevent the formation of foam
	Oil loading in cleaner tank too high	Check soil levels. If necessary, dump cleaning solution and clean out reservoir to remove soil sediment. Refill with fresh cleaning solution
	Cleaner chemistry not compatible with soils being cleaned	Switch to a different cleaner that is chemically compatible with the base material and soils being cleaned. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Excessive foam	Too much agitation	Decrease agitation until foaming stops
	Spray pressure and volume too high	Check pressure and flow regulators and adjust if necessary
	Recirculation pump cavitating	Check condition of pump and check for flow blockage
	Cleaner concentration too high	Check cleaner concentration and adjust as necessary
	Bath temperature too low	Check bath temperature controller and adjust as necessary

Problem	Possible Cause	Solution
• Excessive foam	Cleaner de-foaming agents used up	Replenish de-foaming agents
	Foaming soil introduced to bath	If soil is naturally foaming, a different cleaner formulation may be required, or additional de-foaming agents may need to be used. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Parts have a film of oil when removed from the cleaning solution	Parts not completely cleaned	See above recommendations
	Oil loading of cleaner bath too high	Check soil levels. If necessary, dump cleaning solution and clean out reservoir to remove soil sediment. Refill with fresh cleaning solution
	Oil contamination of rinse water	Check rinse water to make sure only clean water is used for parts rinsing
	Parts have excessive grease or heavy oils before cleaning	Add pre-cleaning step to remove excessive grease and heavy oil from parts
	Cleaner chemistry not compatible with soils being cleaned	Switch to a different cleaner that is chemically compatible with the base material and soils being cleaned. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Parts have a white film or powdery residue	Parts not sufficiently rinsed after cleaning	Check rinse water to make sure only clean water is used for rinsing. Increase rinsing time. Increase rinse water flow or agitation in rinse tank.
	Hard water scale forming on parts	Install water conditioners on the processing line. Or switch to a different cleaner that has better hard water tolerance. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
	Silicates precipitating on parts	Switch to a different cleaner that does not use silicates. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution

Problem	Possible Cause	Solution
• Excessive scale buildup on tank fixtures or heater	Hard water scale	Install water conditioners on the processing line. Or switch to a different cleaner that has better hard water tolerance. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
	Silicates precipitating on parts	Increase maintenance routines to clean scale off more frequently. Switch to a different cleaner that does not use silicates. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Part surfaces appear grainy after cleaning	Part is being etched by galvanic action between dissimilar metals	Verify that all equipment and cleaning tanks are properly grounded. Verify that part baskets or fixturing are properly grounded.
	Part is being attacked by aggressive cleaner chemistry	Switch to a cleaner that is compatible with the base metal of the parts. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Color of alloy changes after cleaning	Part is being anodized by galvanic action between dissimilar metals	Verify that all equipment and cleaning tanks are properly grounded. Verify that part baskets or fixturing are properly grounded.
	Part is being attacked by aggressive cleaner chemistry	Switch to a cleaner that is compatible with the base metal of the parts. Contact Magnaflux® for assistance in selecting the proper Daraclean® solution
• Cleaner tank begins to rust at corners	Galvanic action is corroding metal of cleaner tank	Verify that all equipment and cleaning tanks are properly grounded. Contact Magnaflux® for assistance in determining the root cause and solution to advanced cleaning problems.
• Cleaner system begins to leak	Galvanic action is corroding metal of cleaner tank	Verify that all equipment and cleaning tanks are properly grounded.

Problem	Possible Cause	Solution
• Cleaner system begins to leak	Rubber gaskets and seals being attacked by oils removed from parts	Verify that all seals used in cleaning equipment are compatible with the oils and solvents being removed from parts at the temperatures being used Contact Magnaflux® for assistance in determining the root cause and solution to advanced cleaning problems.

Some recommended steps for successful cleaning with Daraclean® cleaners

1. Verify that all equipment is properly grounded. Even weak trickle currents can accelerate corrosion of dissimilar metals.
2. Determine tank volume. Length x width x depth (in feet) x 7.5 = US gallons. (Multiply gallons by 0.66 to 0.75, depending on the amount of freeboard allowed.) Or [length x width x depth (in inches)] ÷ 231 = US gallons.
3. Select proper Daraclean® product based on method of cleaning, part material, soil characteristics, and specification requirements. (See our selection guides for assistance.)
4. Charge the tank at the recommended product concentration. For trials, start with the highest concentration practical; it is easier to reduce concentration after successful trials. For production, use the lowest cleaner concentration that will accomplish the desired cleaning.
5. Operate at the prescribed temperature. For trials, start with the lowest temperature and increase with successive trials. Note that higher temperatures will speed cleaning action and increase evaporative losses. Lower temperatures will slow cleaning action and increase foaming.
6. Make sure parts remain in the cleaning bath the required length of time.
7. Provide adequate rinsing and drying.
8. Check and replenish the bath on a regular basis to maintain the proper concentration. Automatic measuring devices, such as conductivity probes, may be used when appropriate. Field test methods such as refractive index or titration are suggested on a daily basis.
9. For extended bath life, skim and filter contaminants from the bath on a regular basis. If skimming or filtration is unavailable, discard spent solution when performance has deteriorated or when chemical makeup exceeds the initial charge.
10. Before charging a tank with fresh solution, clean the tank thoroughly, check to make sure the heating coils are free of scale and debris, and make sure the drain valve is securely closed.

For additional assistance with troubleshooting of cleaning processes, assistance with selecting the best cleaning solution for a particular part or soil, or for more general information about industrial parts cleaning, please contact Magnaflux® at 847-657-5300, or at www.magnaflux.com.