



## chapter 8

# system maintenance and cleaning

**I**n addition to alcohol and carbon dioxide, finished beer contains proteins, carbohydrates and hundreds of other organic compounds. Yeast and bacteria routinely enter draught systems where they feed on beer and attach to draught lines. Minerals also precipitate from beer leaving deposits in lines and fixtures.

Within weeks of installing a brand new draught system, deposits begin to build up on the beer contact surfaces. Without proper cleaning, these deposits soon affect beer flavor and undermine the system's ability to pour quality beer.

When undertaken using proper solutions and procedures, line cleaning prevents the buildup of organic material and mineral deposits while eliminating flavor-changing microbes. Thus, a well-designed and diligently executed maintenance plan ensures trouble-free draught system operation and fresh, flavorful beer.

### Cleaning Standards

Many states require regular draught line cleaning, but all too often the methods used fall short of what is needed to actually maintain draught quality. In pre-

paring this manual, our committee polled all sectors of the beer industry and called on our own many decades of cumulative experience to determine the necessary and sufficient conditions for proper draught maintenance. In this chapter, we recommend and detail the practices that have proven effective in sustaining draught quality.

Please note that all parts of the recommendations must be implemented. The proper cleaning solution strength won't be effective if the temperature is too cool or there's insufficient contact time with the lines. The lines themselves will remain vulnerable to rapid decline if faucets and couplers aren't hand-cleaned following the recommended procedures.

As a retailer, you may or may not clean your own draught lines, but you have a vested interest in making sure the cleaning is done properly. Clean lines make for quality draught beer that looks good, tastes great and pours without waste. Take the time to review these guidelines and monitor your draught cleaners—no matter who they are—to ensure that your system receives the service it needs to serve you and your customers well.

## Summary Cleaning Recommendations

These guidelines reflect the key actions needed to maintain draught systems and pour trouble-free high-quality beer. Before performing these actions, please read the detailed recommendations found elsewhere in this chapter as they contain many details important to effective and successful cleaning.

### Perform draught line cleaning every two weeks (14 days), as follows:

- Push beer from lines with cold water.
- Clean lines with caustic solution at 2% or greater concentration for newer, well-maintained lines or 3% concentration for older or problematic lines. Maintain a solution temperature of 80° - 125°F.
- Caustic solution should be circulated through the lines for 15 minutes at a velocity of 2 gallons per minute for electric pump cleaning or left to stand in the lines for no less than 20 minutes for static cleaning.
- Disassemble and hand clean faucets; hand clean couplers.
- After cleaning, flush lines with cold water until pH matches that of tap water and no visible debris is being carried from the lines.

### Quarterly (every three months):

- Disassemble and hand clean all FOB-stop devices (a.k.a. beer savers, foam detectors)
- Disassemble and hand clean all couplers.
- Perform acid cleaning of draught lines as follows\*:
  - Push beer or caustic cleaner from lines with cold water.
  - Clean lines with an acid line cleaner mixed to manufacturer's guidelines. Maintain a solution temperature of 80° - 125°F.
  - Circulate the acid solution through the lines for 15 minutes at a velocity of 2 gallons per minute for electric pump cleaning or let stand in the lines for no less than 20 minutes for static cleaning.
  - After acid cleaning, flush lines with cold water until pH matches that of tap water and no visible debris is being carried from the lines.

## Common Issues

Later in this chapter, we cover the details of cleaning solutions and procedures, but first let's review some related issues. We'll start with an important look at safety, then briefly discuss design considerations

and wrap up with the long-term maintenance issue of line replacement.

## Cleaning Safety

Line cleaning involves working with hazardous chemi-

cal. The following precautions should be taken:

- Cleaning personnel should be well trained in handling hazardous chemicals.
- Personal protection equipment including rubber gloves and eye protection should be used whenever handling line cleaning chemicals.
- Cleaning solution suppliers offer Material Safety Data Sheets (MSDS) on their products. Cleaning personnel should have these sheets and follow their procedures while handling line cleaning chemicals.
- When diluting chemical concentrate, **always add chemical to water** and never add water to the chemical. Adding water to concentrated caustic chemical can cause a rapid increase in temperature, possible leading to violent and dangerous spattering or eruption of the chemical.

### System Design and Cleanliness

Draught system designs should always strive for the shortest possible draw length to help reduce operating challenges and line cleaning costs. Foaming beer and other pouring problems waste beer in greater volumes as draw length increases. Line cleaning wastes beer equal to the volume of the beer lines themselves. Longer runs also place greater burdens on mechanical components, increasing repair and replacement costs.

Large venues like stadiums, arenas and casinos often combine very long draught runs with long periods of system inactivity that further complicate cleaning and maintenance. Additional maintenance costs eventually outweigh any perceived benefits of a longer system.

### Other Line Cleaning Methods

Devices that purport to electrically or sonically clean draught lines are not a suitable substitute for chemical line cleaning. Although some sonic cleaners may inhibit bacteria and yeast growth, they have little or no cleaning effect on draught hardware and fittings.

### System Maintenance: Line Replacement

- All vinyl jumpers and vinyl direct draw lines should be replaced every year.
- All long-draw trunk line should be replaced in the following instances:
  - When the system is ten years or older.
  - When flavor changes are imparted in a beer's draught line from an adjacent draught line.
  - When any line chronically induces flavor changes in beer.
- Draught lines may need to be replaced after pouring root beer, fruit-flavored beers, margaritas or ciders. Such beverages may permanently contaminate a draught line and possibly adjacent draught lines in the same bundle. Such contamination precludes future use of that draught line for beer.
- In the case where a coupler's gas back flow valve (Thomas valve) is or ever has been missing, the gas line may well have been compromised and should be replaced.

### Detailed Recommendations

The following sections detail the committee's recommendations on draught line cleaning. We begin with the basic issue of tasks and their frequency then move into the more involved questions of cleaning solutions and procedures. The final pages of this chapter detail the procedures for electric pump and pressure pot cleaning.

### Cleaning Frequency and Tasks

- Every two weeks (14 days)
  - Draught lines should be cleaned with a caustic line cleaning chemical following the procedures outlined in this chapter.
  - All faucets should be completely disassembled and cleaned
  - All keg couplers or tapping devices should be scrubbed clean
- Quarterly (every three months)

- o Draught lines should be de-stoned quarterly with an acid line cleaning chemical or a strong chelator in addition to the regular caustic cleaning. (The committee is working with brewing industry researchers to complete further studies on line-cleaning chemistry, including additives such as EDTA.)
- o All FOB-stop devices (a.k.a. beer savers, foam detectors) should be completely disassembled and hand detailed (cleaned).
- o All couplers should be completely disassembled and detailed.

## Cleaning Solutions and Their Usage

### *Caustic-Based Cleaning Chemistry*

- Caustic chemicals remove organic material from the interior of the draught line, hardware and fittings. The removal of this buildup prevents growth of beer-spoiling bacteria such as lactobacillus, pediococcus and pectinatus.
- Use a caustic cleaner specifically designed for draught line cleaning that uses either sodium hydroxide, potassium hydroxide or a combination of both.
- Some caustic line cleaning solutions add EDTA or another chelating agent to help remove calcium oxalate (beer stone) from draught lines.
- Never use solutions that contain any amount of chlorine for line cleaning.
- Based on brewery testing, we recommend that caustic line cleaning solution be mixed to a solution strength of at least 2%. A 3% caustic solution is more appropriate for lines more than 7 years old or for any line that imparts a flavor change to the beer served from it.
- Mix caustic solution with water warmed to a temperature between 80° - 125°F.
- Caustic cleaner must remain in contact with the draught line for at least:
  - o 15 minutes when solution is being re-circulated, and
  - o 20 minutes for static, or pressure pot cleaning.

### *Acid Chemical*

- Acid line cleaner removes inorganic materials such as calcium oxalate (beer stone) and calcium carbonate (water stone) from the interior of the draught line, hardware and fittings.
- EDTA or another chelating agent added to the regular caustic cleaning solution may reduce calcium oxalate buildup in draught lines and may decrease the need to clean regularly with an acid-based cleaner.
- Acid-based line cleaners suitable for draught line cleaning contain solutions of phosphoric acid.
- Some acid-based cleaners use acids that can harm your draught equipment:
  - o Hydrochloric acid corrodes to stainless steel and should no be used for cleaning draught lines.
  - o Nitric acid is not compatible with nylon products, including some commonly used draught line tubing, and should not be used for cleaning draught lines.
- Mix acid line cleaner to the solution strength recommended by the manufacturer.
- Mix acid line cleaner with water warmed to a temperature between 80° -125°F.
- Acid solution must remain in contact with the draught line for at least:
  - o 15 minutes when solution is being re-circulated, or
  - o 20 minutes for static, or pressure pot cleaning.

### *Water Rinsing*

- Always flush draught lines with fresh water before pumping chemical into the line.
- Always flush draught lines with water **after** using

- any chemical solution (caustic and acid).
  - Continue water flushing until:
    - o No solid matter appears in the rinse water.
    - o No chemical residue remains in the draught line.
  - Confirm chemical removal by testing the solution with pH strips or a pH meter.
    - o Before beginning the rinse, draw a reference sample of tap water and test its pH.
    - o During rinsing test the rinse water exiting the draught system periodically.
    - o When the pH of the rinse water matches that of the tap water, the chemical is fully flushed out.
  - **Chemical solution must never be flushed from draught lines with beer.**
- o The flow rate can be controlled by:
    - Minimizing the number of draught lines cleaned at one time.
    - Increasing the size of the pump used.
  - o Assess the flow rate by filling a standard 60 oz. beer pitcher with the cleaning solution outlet. At 2 gallons per minute it fills in 15 seconds or less.
  - The pressure on the draught lines during re-circulation should never exceed 60 psi.
  - Under these conditions, chemical solution should re-circulate for a minimum of 15 minutes.

Static or pressure pot cleaning offers an alternative method to clean runs of less than 15 ft. This requires 20 minutes of contact time with the cleaning solutions to make up for the lack of circulation.

## Cleaning Methods and Procedures

To be effective, cleaning solutions need to reach every inch of beer line and every nook and cranny of the connectors and hardware. You can hand clean some items like couplers and faucets, but most of the system must be reached by fluid flowing through the beer lines. The industry currently uses two cleaning procedures for beer lines: re-circulation by electric pump and static or pressure pot cleaning.

Electric pump re-circulation improves cleaning efficiency by constantly moving the cleaning solution through the beer lines through the cleaning period. You can use this method on all draught systems and it is the preferred approach for nearly all long-draw systems.

*Key considerations in setting up an electric pump cleaning:*

- The chemical flow should be the reverse of the beer flow wherever possible.
- Configure cleaning loops to achieve a flow rate of 2 gallons per minute, or approximately twice the flow rate for beer.

The remainder of this chapter covers use of these cleaning methods, starting with setup and proceeding to the detailed steps for each procedure.

### *Before You Start*

Regardless of your cleaning methods, some system designs require specific attention before you begin cleaning. Here's a list of items to check and consider.

- On glycol-chilled systems, the glycol chiller should be shut off where possible to maintain solution temperature during cleaning. Failure to do so compromises cleaning effectiveness and may cause cleaning solution or rinse water to freeze in the lines.
- In pneumatic beer pump systems:
  - o Turn off the gas supply to the pumps.
  - o On the line(s) to be backflushed, set the pump valve orientation to "Backflush." Pumps that lack a "backflush" option may be damaged by cleaning and should be cleaned using a different method.
- All legs in 'split lines' (lines that are 'teed' in the cooler or under the bar to feed more than one

faucet from a single keg) must be cleaned as completely separate draught lines.

*Re-circulation-Electric Pump Cleaning Step-By-Step Procedure:*

1. Begin by connecting two keg couplers with a cleaning coupler. (Do not engage the couplers.)
  - If cleaning four lines, connect a second set of lines with another cleaning coupler, creating a second 'Loop.' Cleaning more than four lines at once is not recommended, as it will be difficult to achieve the proper chemical flow rate.
  - To clean the lines and couplers used for series kegs, connect the couplers attached to the gas lines and place series caps with check ball lifters on all other couplers.



2. On the corresponding lines at the bar, remove both faucets from their shanks.
  - When cleaning two lines, attach the 'Out' hose from the pump to one shank and a drain hose or spare faucet to the other shank.
  - When cleaning four lines, attach the 'Out' . hose from the pump to one shank, connect the other shank in the loop to a shank in the second loop with a 'jumper' hose and attach a drain hose or spare faucet to the remaining shank in the second loop.
  - When cleaning four lines, ensure that the drain hose and 'Out' hose from the pump are not on the same coupler "loop."
3. Fill a bucket ("Water Bucket") with warm water and place the 'In' hose into the water.
  - Turn pump on and flush beer into a second bucket ("Chemical Bucket") until the line runs clear with water.
  - Shut pump off and discard the flushed beer.
4. Turn pump back on allowing warm water to run into the clean Chemical Bucket.
  - Measure the flow rate of the liquid by filling a beer pitcher or some container with a known volume. Flow rate should be a minimum of 2 gallons (256 oz.) per minute
    - o If cleaning is configured for four lines and flow rate is too slow, remove the jumpers and clean each pair of lines separately
  - Allow bucket to fill with just enough water to cover the inlet hose of the pump.
  - Add the appropriate amount of line cleaning chemical to achieve 2-3% caustic in solution based on age and condition of beer line.
5. Remove the 'In' hose from the Water Bucket and place into the Chemical Bucket.
  - There should now be a closed loop
  - Water should be draining into the same bucket that the pump is pulling from.
6. Allow solution to re-circulate for a minimum of 15 minutes.

- While waiting, clean your faucets.
  - Fill Water Bucket with cold water.
7. Begin your rinse by removing the 'In' hose from Chemical Bucket and placing it into the Water Bucket (filled with cold water).
  8. Continue pumping cold water from the Water Bucket into the Chemical Bucket (shutting off pump and dumping Chemical Bucket as needed) until all chemical has been pushed out of the draught lines and there is no solid matter in the rinse water.
  9. Finish up by shutting off the pump, detaching the cleaning coupler, and replacing the faucets.

*When Finished*

- Be sure to return all system components to their original functional settings; i.e., turn glycol pumps back on, turn on gas supply to pneumatic beer pumps, etc.

*Static – Pressure Pot Step-By-Step Procedure:*

1. Fill the cleaning canister with clean water.
2. Untap the keg and tap the cleaning canister. Engage the tapping device.
  - When cleaning series kegs, connect the tapping devices attached to the gas lines and place series caps on all other tapping devices.
3. Open faucet until the beer is flushed out and clear water is pouring.
4. Untap the canister and fill the canister with cleaning chemical mixed to the appropriate strength to achieve 2-3% caustic in solution based on age and condition of beer line.
5. Tap the canister again.
6. Open the faucet until the water is flushed out and chemical solution is pouring from the faucet.
7. Shut off the faucet and untap the canister.



- If the system is driven with pneumatic beer pumps, shut off the gas supply to the pumps to turn them off.
8. Remove the faucet and clean.
  9. Replace faucet and retap the canister.
  10. Pull through solution again to replenish the contents of the draught line. Chemical should be replenished at least twice during the cleaning process.
  11. Allow to soak a total of 20 minutes.
  12. Untap canister, empty and rinse.
  13. Fill the canister with clean, cold water and retap.
  14. Open the faucet and rinse until all chemical has been flushed out and there is no solid matter in the rinse water.
  15. Finish by untapping the canister, retapping the keg and pouring beer until it dispenses clear.

*When Finished*

- Be sure to return all system components to their original functional settings; i.e., turn back on glycol pumps, turn on gas supply to pneumatic beer pumps, etc. ■