Brewers spend an inordinate amount of time cleaning. It can be time consuming, hazardous, boring...and frustrating. A common complaint of brewers—especially in breweries that run multiple batches through the brewhouse between clean-in-place (CIP) runs—is that soil can’t be effectively removed with CIP alone. Instead, brewers find themselves physically scrubbing kettles after CIP to remove the remaining soil. Protein tends to bind to metal, and alkalinity alone will not break the bond. The soil is typically very soft and wipes off easily with a sponge or cloth, but is not removed sufficiently with the spray from the CIP nozzle.

Many brewers accept this annoyance as “just the way it is,” but more and more are discovering that adding hydrogen peroxide (H₂O₂) to an alkaline cleaning solution can assist in removing protein and calcium deposits in brewhouse cleaning.

BREWHOUSE CLEANING CHALLENGES
Chlorinated caustic cleaners, once popular for breweries, were found to cause serious damage to stainless steel, including pitting and stress corrosion cracking (SCC). Many brewers have since discontinued using chlorinated alkaline cleaners. Non-caustic, oxygenated alkaline powdered cleaners introduced in the 1990s are still very effective, and are somewhat safer to use from a PPE (personal protective equipment) standpoint. These cleaners were well received by small craft brewers and became wildly popular with homebrewers.
With the rapid growth of the craft brewing industry, however, craft brewers graduating to larger brewing systems are finding that powdered cleaners are not as user-friendly as they were on a smaller brew system. Even if the brewery does not have a dedicated CIP system, liquids tend to be easier to measure and dispense than powdered products, and liquids do not have to be dissolved into water.

The challenge in brewhouse cleaning using sodium hydroxide (NaOH) and potassium hydroxide (KOH) cleaners is that without some assistance from other ingredients or processes, they often fail to remove all of the protein from the mash tun screen and brew kettle.

**Mash Tun**

Mash tuns and lauter tuns are typically not that difficult to clean because there is not as much heat required in the mash compared to the kettle, but protein in the malt can cling to the bottom of mash tun screens. Many mash tuns are manufactured with spray nozzles that clean the top of the mash screens but not the bottom. Often the screens have to be removed and scrubbed by hand to remove the soil from the bottom of the screens.

**Kettle**

The primary issue in the kettle is that soil tends to bake on to heated areas, and calcium also tends to precipitate there. Amber protein stains remain after CIP, and the brewer will often have to climb inside the kettle and scrub off the remaining soil that was not removed during cleaning. Acid is the best way to remove white calcium deposits on the jacket, but this requires a separate cleaning step. For direct-fired and immersion coil heated kettles and calandrias, there is so much heat applied to boil the wort that the baked-on soil often turns to carbon and is very difficult to remove. A concentrated caustic solution will remove the black charcoal-like deposit. In calandrias, the deposit can become so hard that drill bits will break off trying to remove plugged tubes.

**Heat Exchanger**

The heat exchanger can be difficult to clean and impossible to inspect unless it is taken apart. It can contaminate beer if not properly cleaned and sanitized prior to sending wort to it. Hops can clog the heat exchanger as well.

**USING H₂O₂ AND CAUSTIC**

In recent years, the addition of either peracetic acid or hydrogen peroxide has been found to greatly assist the displacement of protein deposits when added to sodium and potassium hydroxide cleaning solutions at the point of use. Unfortunately, hydrogen peroxide is not stable at high pH, so it must be added to the cleaning solution just before turning on the pump. Caution: Combining the concentrates results in a violent reaction, so before starting the CIP, make sure the caustic is in solution and mixed well when adding the hydrogen peroxide.

Tips for using this method:

- Proper PPE is a must! Be sure to use proper eye and skin protection. Eye protection is especially important when transferring concentrated peracetic acid or hydrogen peroxide solutions.
- Use just enough to do the job. As little as 1 ounce of 34-percent hydrogen peroxide per gallon of caustic cleaning solution can be sufficient. Too much hydrogen peroxide can cause pump cavitation, making cleaning less effective.
- As mentioned previously, keep in mind that hydrogen peroxide concentrate and caustic concentrate are incompatible. The hydrogen peroxide and caustic concentrates absolutely cannot be combined or come in contact with each other, or a violent reaction will occur. The caustic needs to be evenly mixed with water before the hydrogen peroxide can be added safely.
- The solution will only last about an hour at most, so try to get all of the cleaning done in under an hour.
- Either peracetic acid or hydrogen peroxide can be used, but hydrogen peroxide is a more cost-effective option (typically about one-third the cost of EPA-registered peracetic acid).
- Cleaning must be done hot for best results. Unlike chlorinated caustic cleaning, which is done below 140° F (60° C), you will get the best cleaning with an oxygenated boosted cleaning solution in the range of 160 to 180° F (71 to 82° C).

Adding hydrogen peroxide to a caustic cleaning solution can dramatically enhance the cleaning power of the caustic used to clean the brewhouse. The bubbles in the cleaning solution, while short-lived (not stable for the long-term), help displace starchy and protein soils from the metal by getting underneath the soil and forcing it from the metal surface. The soil can then simply be rinsed away.

After attending Mesa College in Grand Junction, Colo., Dana Johnson joined BIRKO Corporation in 1979 and began calling on the brewing industry in 1995. A homebrewer since 1989, Dana has authored numerous articles for Zymurgy, The New Brewer, and other brewery trade publications. Dana is on the Brewers Association safety subcommittee, is the current president of the MBAA (Master Brewers Association of the Americas) Rocky Mountain District, and is a GABF judge.