Quality control for keg cleaning

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Of all the refillable beer containers currently in use, the modern beer keg is certainly one of the most difficult to analyze with standard quality control methods. Other refillable beer containers - bottles, growlers, serving tanks and bright beer tanks - are all relatively easy to inspect internally.

Even the old-style beer kegs had the filling port on the side through which an inspection lamp could be inserted. The modern keg, alas, has no such feature. This leaves the brewer in a bit of a quandary when it comes to verifying the effectiveness of his keg cleaning system.

Brewpubs often face a special challenge in the keg cleaning area, since many of them are not willing to make the large capital investment needed for an automated cleaning and filling system. If this is the case, the brewpub should at least invest in a valve-extraction toolkit, which costs about $250.

Every brewery needs to have the ability to extract the valve and spear assembly from its kegs. This is best done with a special tool that fits over the valve collar and depressurizes the keg. The tool simultaneously pushes down on the valve enough to allow the removal of the snap ring that holds the valve in place. A special pick is then used to pull out the snap ring.

Simply attacking the snap ring with pliers and a screwdriver invariably leads to broken rings, bloody knuckles, and tool-throwing unhappiness. The modest investment in the right tool pays off quickly. The reason to pull the spear is to look inside the keg. Nothing beats the physical examination of the keg interior. It is amazing what can be found. The spear itself often is not cleaned properly and may have bits of crud baked onto its surface. If so, use a non-metallic scouring pad (a green scrubby) and some foaming detergent to clean the outside.

If the interior of the spear also is fouled, a brush can be run up inside it. Never use steel wool or metal brushes on stainless steel. The resulting scratches will just make cleaning more difficult the next time.

Next use a flashlight wand to examine inside the keg, looking for streaks or deposits. Beerstone and yeast sediment often can be found, especially in kegs that have been unused for a year or two. This point cannot be overstated: Looking inside some of the kegs after cleaning is the best method to verify the cleaning process.

In a brewpub with a limited keg stock and no mechanized cleaning system the best approach is to pull all the keg valves as soon as possible after use to prevent bacterial growth. Then rinse the kegs and spears in hot water (110° to 120° F). If only a few kegs are involved, filling and soaking them overnight with 2 percent caustic solution might be practical.

If many kegs are being cleaned at the same time, it is wise to hook up a little spray ball on a stand to wash the interiors. The spears can be cleaned manually by soaking in caustic, then scrubbing and brushing. Avoid using chlorinated caustic cleaners on the spears, because the rubberized seals in the valve assembly may break down or swell and distort in the presence of chlorine. Excess contact time with chlorine also can corrode stainless steel, forcing you to purchase new spears.

In this small-brewery scenario it is advisable to leave the spears out of the kegs until they are to be used again. This way the kegs can be inspected immediately prior to filling. Put dust covers or aluminum foil on the valve openings to keep out dirt and then store them upside down. Prior to filling, the kegs should be rinsed with hot water, sanitized with iodophor or a similar sanitizer, and rinsed again with cold water. Reassemble, purge with carbon dioxide, and fill them right away. It is not a good idea to let kegs sit around in

a ready-to-fill state for more than a few hours, because the effects of the sanitizer might be lost.

Making Sure Your System Works Correctly

Any brewery that has some type of keg cleaning system, be it a simple recirculation tank running solution through hoses or a multi-lane, high-capacity installation, must find a way to verify the functionality of that system. Simply assuming your cleaning system is working is like driving with your eyes shut. It can be done, but it is not a very good idea.

The first step is to understand how the cleaning system works and what can go wrong. Most keg cleaning systems begin the cleaning cycle by purging any remaining beer from the keg with compressed air. Steam should not be used at this stage, because soil will bake onto the keg surface.

The keg is then rinsed with water, washed with caustic or acid, rinsed again, and sanitized with steam, hot water, or chemicals. Finally it is pressurized with CO2 and is ready to fill. Some cleaning systems can do multiple wash and rinse cycles and some can use caustic and then acid in the wash cycles. There are a few common problems that can hinder the effectiveness of any cleaning system. Pressure, temperature, and concentration are the first three things to look for when troubleshooting a system. Quite often the rinse water is not at the right pressure. A pressure gauge should be installed on the water supply so the operator can read it easily. Sometimes the water or detergent supply pump is not running or, in the case of a new installation, it may be running backward. If so, the pressure may be about half of what is expected. Water scale can build up in the tubing over time and also can lead to pressure problems. Regular acid cleaning prevents this problem, and it is a good idea to occasionally disassemble the piping to make sure it is not obstructed.

Temperature is another important factor. Rinse water should be 125° to 160° F to be properly effective. Caustic cleaners work best at higher temperatures, although temperatures over 175° F can cause precipitation of soils that then become more difficult to remove. Phosphoric acid cleaners work well at room temperature. If any temperature is not being maintained, there is a good chance that either cleaning or rinsing is not occurring properly.

Improper concentration of chemicals is one of the most common mistakes in keg washing. Generally, caustic concentration should be about 2 percent and acids should be 1.5 percent to 2.0 percent. Be sure to follow the usage guidelines from the chemical vendor, and check the detergent tank daily.

The chemical salesperson should provide a titration kit to use if you lack a lab equipped for this. Using pH papers will not help determine the proper use concentration, because pH and concentration are two distinct measurements. If solutions are too weak, the cleaning is not effective; if solutions are too strong, the rinse ability decreases.

Checking the pH on the final rinse water is a good way to verify whether rinsing is complete. It is also advisable to alternate between acid and caustic cycles every other week to prevent beer stone buildup inside cooperage.

Checking Effectiveness

Even if the keg cleaning system is working as designed, verifying its effectiveness can be a challenge. There are a few tools available that can make this task easier, and some creativity can also come into play.

Again, removing keg valves is essential. Once the keg is opened, the interior and the spear can be swabbed to check for soils and bacterial growth. Traditional swabbing and plating takes a few days for results, so if you can afford it, an ATP swab unit is handy for this application. These units give an indication of the presence of organic compounds within about two minutes.

If you can't justify the expense of an ATP unit, you might be able to borrow one for a few keg tests every now and then. They are becoming quite common in the food and dairy industry, as well as in breweries, so a few phone calls and offers of beer might pay off.

Naturally enough, taste testing is an excellent way to check for keg cleanliness, but for some reason it does not seem to happen often enough in many breweries. Keg beer can be tasted under normal serving conditions or the beer can be abused by heating and cooling prior to tasting. The latter method gives faster results and can be as simple as setting a keg out in the summer sun for

a day. Due to the volumes of beer involved, 1/6 barrel (5 gallon) kegs are commonly used for such testing.

Plating out draft beer is another option, but it can be tricky to get good samples from a keg. Most beer-tapping devices are not able to be autoclaved or swabbed with alcohol and flamed. Running sanitizer solution through a regular tapping device is possible, but the risk of false-positive readings remains high.

An option is fabricating an autoclavable keg sampler. A stainless steel keg coupler is needed, as opposed to chromed brass. Weld a neck and sample valve onto the outlet and replace the plastic handle with either wood or stainless steel so it does not melt.

Obtain small samples for plating by shaking the keg a bit until enough beer comes out. Use CO2 pressure to push out larger samples like those needed for carbonation testing.

This device allows greater flexibility for the quality control staff, because they also can use it to plate out residual rinse water from kegs before they are filled.

Test kegs are also available for aiding in quality control and troubleshooting efforts. These basically consist of a regular keg with several thick Plexiglas windows on the side that allow you to view the washing and filling cycles. Unfortunately these kegs are quite expensive ($1,500 or more) and of limited use. The vapor clouds and water flowing past the windows make it difficult to determine whether the cleaning is truly uniform, and test kegs are not normally coated with the kinds of soils that kegs from the field encounter. On the other hand, they are nice to have as part of a daily start-up check to make sure things at least look as if they are working properly

Equipment Tips

As with most procedures in brewing, the best way to ensure quality is to design the equipment to accommodate the process rather than tailoring the process to accommodate the equipment. Because keg cleaners and fillers are usually purchased as a self-contained system, it is important to shop carefully for the features that will make everyone happy. There is a wide variety of systems on the market, and not all systems are created equal.

An important feature is steam. Some systems use it for sanitizing and some cannot accommodate it at all. Those that do not use steam should have some kind of chemical sanitizing setup. Hot water is simply inadequate to the task. Those systems that do use steam will need a steam filter. Otherwise, the kegs will get blasted full of rusty condensate and boiler-treatment chemicals.

The steam contact time is also important to consider, because on some units this is very brief. One interesting idea is to inject peracetic acid sanitizer into the steam inlet, hitting any bugs present with both wet heat and chemicals.

Another good feature is multiple cleaning cycles or the ability to tailor the cleaning cycle easily. This can be as simple as a selector switch or as fancy as a logic controller with an operator interface module. Overall, it is better to be able to change the cleaning cycle directly through the processor rather than with a simple selector switch. Processor functions can be locked out, whereas a selector switch typically will be set at the fastest rate (and shortest cleaning cycle).

Modern beer kegs are certainly easier and safer to clean and fill than the older belly-bung kegs, but they have taken from the brewer the ability to readily inspect inside. This should not be used as an excuse for neglecting this critical step. Physical examination coupled with routine chemical, biological, and sensory analysis will assure the brewer that the beer leaving the brewery is as good as possible.

Keg Cleaning

This is the basic keg quality control program used at the Frederick Brewing Co.

Physical

- Examine keg interiors regularly (pull three from every run)
- Check beer carbonation
- Check dissolved oxygen levels

- Check air, water, CO_2, and steam pressures

Chemical

- Titrate chemical cleaners and sanitizers daily

Biological

- Swab keg interiors
- Swab keg cleaning and filling heads
- Plate out beer and/or water samples

Sensory

- Taste beer regularly
- Watch the cleaning and filling process
- Listen to the cleaning and filling process

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