

## Cleaning, Sanitation, and sterilization

- Why talk about this?
  - It's the biggest factor of beer quality
  - There are still commercial breweries that can't get this right
- Definitions:
  - Cleaning
    - Removal of soils
    - Soils can contain and/or hide microorganisms
    - Organic soils
      - Yeast, protein, fat, starch, sugar
      - Alkaline Cleaners / Caustic soda (Sodium Hydroxide)
    - Inorganic soils
      - Scale (beerstone)
      - Minerals
      - Requires acid cleaner
  - Sanitation
    - 99.999% (5 9's) of microorganisms
  - Disinfection
    - Destroys all microorganisms (excluding spores)
  - Sterilization
    - Absence of all microorganisms including spores
- Order
  - Clean then sanitize:
    - You can't sanitize dirt.
    - You can't sanitize that carboy surface under the piece of dirt either
  - Rinse to remove excess soils
  - Clean
    - Scrubbing, soaking
      - Don't scrub plastics!
    - In some cases heat helps soften and loosen dirt
  - Rinse
    - Removes cleaning solution and debris
  - Sanitize
    - Kills microorganisms
- Types of cleaners
  - Dish soap
    - Leaves residue, needs to be rinsed
    - Makes fats water soluble
    - Not recommended
  - Caustic Sodas
    - Harsh, corrosive to organisms or metals
    - Strong acids or Strong bases
    - Lye, Sodium Hydroxide, Sodium Phosphate
      - Dissolves organic matter
      - Doesn't rinse well, Corrosive to skin, dissolves aluminum
  - Alkaline solutions
    - A basic solution (ph 7-14)

- PBW
  - Dissolves organic matter
  - Less aggressive than caustic soda
  - Works best when hot
  - Doesn't foam, so can be pumped
  - Great when soaking
- Craft Meister Alkaline Brewery wash
  - Similar to PBW
  - Although
    - Avoid on aluminum
    - Effective with cold water
    - Good for overnight soaks
- BLC (beer line cleaner)
  - Dissolves organic matter, dissolves scale
  - Designed for dispensing systems
- Oxygen based
  - OxiClean Free
    - Dissolves organic matter
    - Can leave a residue
    - Loses effectiveness over time, due to oxidation
    - Not the same as PBW
- Acids
  - Five star acid cleaner, Vinegar
    - Dissolves scale
    - Corrosive in high concentrations
- Hybrid
  - Craft Meister Keg and Carboy cleaning tablets
    - Mix of alkaline and oxygen detergents
    - Works with hot water
    - 2 tablets / 3 gal water
    - Not as effective as alk brew wash for overnight soak
- Types of sanitizers
  - Chlorine based
    - Clorox
      - 100-200ppm / 10-30 mins
      - (1-2 oz bleach / 5 gal water)
      - Cheap but must rinse!
        - chance for re-contamination
      - Can etch stainless
      - Can impart a chemical taste
  - Iodine based
    - Iodophor, BTF, IO-star
      - 12 to 25 ppm / 10-20 min
      - (1-2tbsp / 5 gal)
      - No rinse
      - If used properly, they say there's no taste or odor
        - But they also say if you use too much, it will effect the taste
        - Which means it depends on how sensitive you are to the taste

- Can stain
  - Must stay cool (below 120F)
- Anionic Acid
  - Star San
    - 780 ppm / 1-2 min
    - Short contact time
      - Pretty much, if it's wet, it's sanitized
      - Can be sprayed!
    - Can last a while if:
      - Use distilled water
      - Reduce air exposure
    - Must be at pH ≤ 3
    - No rinse
    - No taste
    - Don't fear the foam
      - Or use Saniclean, which is low foam sanitizer. Needs 2-3 min contact time though
    - Do not mix with Chlorine!
- Alcohol
  - Isopropyl
    - 70% / 30 sec
    - Flammable
- Other
  - Boiling
    - Times quoted are highly variable
    - Cdc says water is safe of virus, bacteria, parasites if boiled for 3 min at our altitude
    - World health organization says 158F for 1 minute will kill 99.999% of bacteria, protozoa, viruses in water
    - 240F is required to kill botulism, but beer is pretty safe from botulism due to low pH
  - Heat
    - 350F for 60 min = Sterile
  - Dishwasher
    - Sanitizing cycle
- How do you know if you're doing a good job?
  - Test it using a wort stability test
  - Clean and sanitize a mason jar
  - After brewing up a batch of wort, transfer some cooled wort into the mason jar. seal it and store at room temp
  - How many days can you go before it goes off? (Meaning you start seeing signs of contamination)
    - Bad: A couple of days
    - Good: 3+ days
    - Great: a week+
- Tips
  - Longer contact time improves results
  - Higher temps will improve results (except for iodophor)

- More chemicals does not improve results
  - Can harm you and your equipment
- Cleaner and sanitizer must come in contact with 100% of the surface
  - This means you need to take things apart to clean them
  - Disassemble keg posts and remove poppets
  - Disassemble ball lock connectors
  - Disassemble cobra taps
    - Remove the rubber stopper and clean the spring and post underneath
  - Disassemble threaded connections
- Always add chemicals to water, never add water to chemicals
  - Doing so creates a super concentrate that can damage you and/or your equipment
- Once it's sterilized, don't touch it!
  - Or keep your hands wet with sterilizer
  - Or cover with plastic wrap
- Replace plastic equipment if scratched or if old
  - Or move to hot side of the process
- *brettanomyces*
  - Just another yeast
  - Can be killed with sanitization
- When it comes to cleaning, be OCD
- When it comes to sterilization, be paranoid!
- When working with yeast (starters, culturing, etc)
  - You need sterilization, sanitation isn't enough