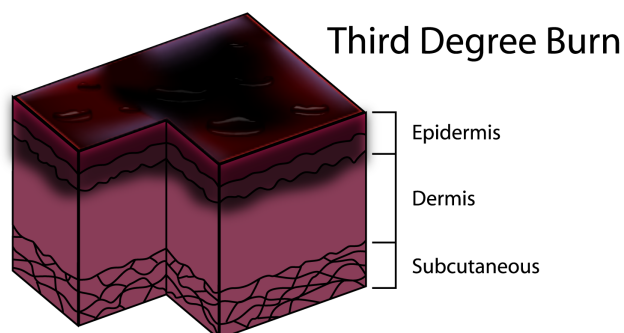
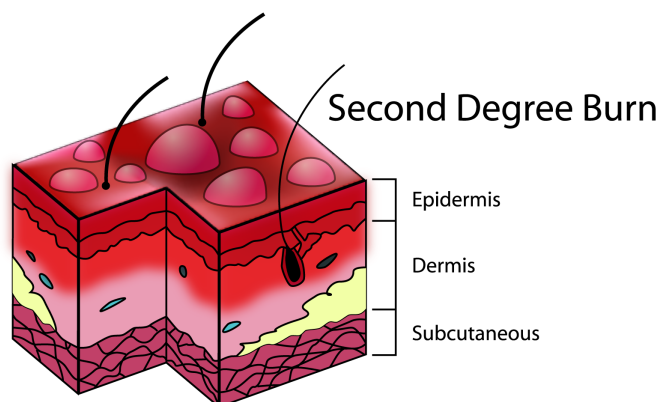
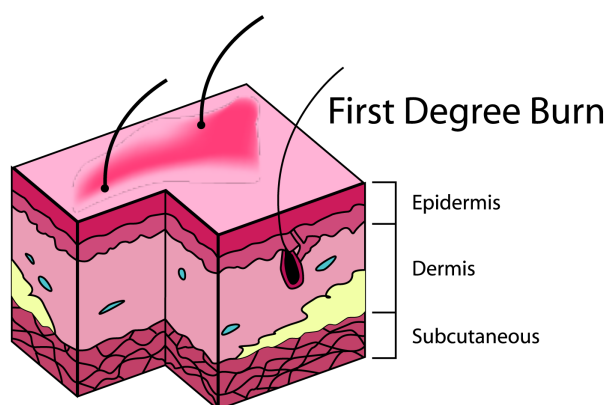


Preventing Kettle Boilovers

Kettle boilovers can result in devastating burns, serious injury and even death. The sad truth is that boilovers are entirely preventable. Boilovers are abnormal events that are usually tied to actions of the brewer in determining process parameters. The lack of suitable hazard controls amplifies the opportunity for a boilover.



Burn Trauma

Burns are tissue and nerve damage caused by rapid heating of the body's surface. Wort burns are particularly damaging because they have a higher heat capacity than water and are sticky, leading to high thermal energy transfer with increased contact time.

Wort burns result in irreversible damage to the body, including cell death, denaturation of proteins, and severe immune system responses that can result in delayed organ failure and death. When 30-percent or more of the body's surface area is burned, internal effects beyond the burn sites include: a weakened immune system, over-production of anti-inflammatory mediators, reduced heart contractions, vasoconstriction of organs, and then organ failure. Those who live through burn trauma are often left with disfiguring scars, organ damage, and post-traumatic stress disorder.

Boilover Root Causes

Boilovers may have many contributing factors, and the risk of a boilover is increased by the coincidence of factors. With many boilover incidents, it is evident that the worker involved was not fully aware of the hazard or trained in ways to control the hazard. Some brewhouses are designed so that the brewer has nowhere to go to get out of the 'line of fire,' should the kettle boil over. Worker attention to the task and situational awareness of the surroundings are also important factors.

IT WILL NEVER HAPPEN TO ME

- » It is worth your time to listen to Kerry Caldwell's story at the Master Brewers Podcast Podcast. "Breathe, Breathe, Breathe, Scream"

View the podcast [HERE](#)

Many boilover incidents are complicated by the lack of engineering controls. Things like foam sensors, temperature measurement, and the use of a foam inhibitor are crucial to brewer safety. Economically driven practices, like brewing more wort volume than a system was designed for, are a major factor and highly discouraged. Other shortcuts include: lack of training, lack of standard operating procedures (SOP), absence of warning signs, and having no preventative maintenance program.

Essential Best Practices

Make every effort to reduce all contributing factors to avoid a boilover.

Engineering Controls

- Install a foam sensor / heat cut-off switch and maintain its cleanliness.
- Be able to turn off kettle heating from a safe position, out of the line of fire.
- Use a visible temperature display and periodically check calibration settings.
- Use a foam inhibitor (food-grade surfactant).
- Use see-through manway and internal kettle illumination.
- Keep a cold water hose nearby to knock down foam.
- Use licensed and insured commercial electricians and plumbers in brewhouse construction.

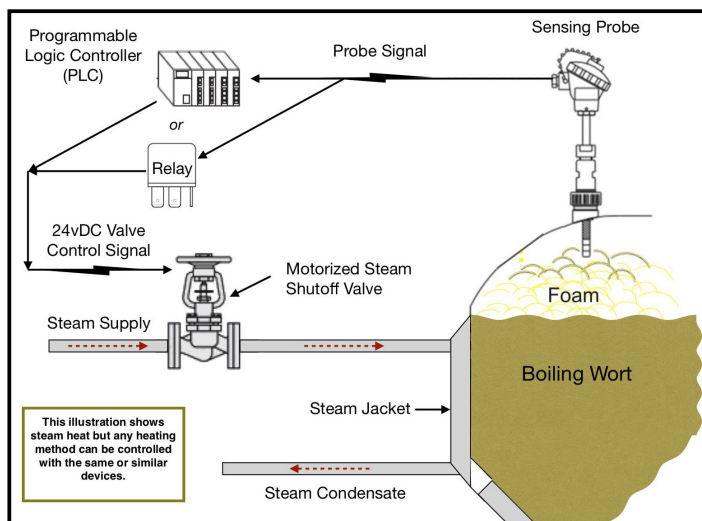


Illustration courtesy of Brewers Association Safety Subcommittee

Foam Detection for New Kettles and Retrofits

New equipment: include foam detector and kettle overflow protection in the design specifications.

Retrofitting used or existing equipment:

- Select an overflow sensor or switch that can be calibrated to detect foam and is rated for hot applications.
- Select a sensor that mounts from outside the kettle, usually through a 2-inch tri-clamp fitting.
- Adjust sensor to the correct volume, typically halfway between the height of a non-foamy boil and the lowest point in the manway.
- Mount sensor and control circuit wiring securely, so as not to be damaged.
- Modify clean in place (CIP) and inspection procedures to maintain a clean, functional sensor.
- Conduct calibration and training with a certified instrument technician.

Other considerations:

- Make sure a cold water hose with spray nozzle is located with easy reach of the brewer.
- Develop or revise brewing SOPs with brewing staff. Include sensor use, cleaning, and calibration. Keep a copy close by the brewhouse.
- Keep "as built" piping and instrument diagrams (P&IDs) and/or construction drawings on file. Review and revise in the case of retrofitting foam controls.

More information:

<https://www.mbaa.com/brewresources/brewsafety/BrewSafety/Boil-Over%20Protection.pdf>

Procedural Controls

Never brew more than your system was designed for. A properly designed brew kettle volume will be 50 to 60-percent greater than the hot wort knockout volume; that extra volume is to account for wort expansion and foaming and should never be used for increasing brew length.



- Brew volume-appropriate batches.
- Monitor kettle heating and boil conditions; know how to quickly reduce heating.
- Trim kettle heat until hot break occurs.
- Add hops and other ingredients gradually while staying out of the line of fire; consider using concentrated hop products.
- When using a high protein grain bill, expect a foamier boil.
- Double check all wort transfer plumbing and valve positions before kettle knockout.

Administrative Controls & Safe Work Practices

Train all staff to understand and respect the hazards of the brew kettle.

- Keep unnecessary personnel away from the brewhouse during boiling.
- Establish emergency procedures in case of boilover.
- Establish a preventative maintenance program and regularly check the performance of temperature sensors, foam sensor, steam valve closures, and programmable controls.
- Maintain a balanced workload to avoid rushing, frustration, fatigue, and distraction.

- Train and encourage staff in behavioral safety, including:
 - Avoiding the line of fire.
 - Maintaining balance, traction, and grip.
 - Avoiding alcohol and drugs during brewing activities.
 - Avoiding horseplay.
 - Maintaining situational awareness at all times.



Personal Protective Equipment

Brewers should always wear long work pants over the outside of their chemical boots. Boots and shorts are not acceptable attire for brewing. Eye protection should always be used. Steam from wort at full boil can also cause burns. Neoprene gloves rated for high heat are a good choice. Brewery background noise should be kept as low as practicable to allow for awareness of ambient machine noise and warning systems.

