



Five Common **Hot Water** Challenges in the Pet Food Industry



HOT WATER SPOTLIGHT

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Hot water is a critical component of any facility. Hot water is used for temperature critical applications such as cleaning/washdown (140°F or 60°C) and for sanitation (180°F or 82°C). If precise temperatures aren't met, then facilities may face fines or even shutdown from the FDA. Yet, water is a utility and often the last of your concerns. Your objective is to keep your plant running without too many interruptions. You may even believe in the approach of, "If it's not broke, then don't fix it." This mindset could be costing you money and efficiency. If you find that you are always heating to higher temperatures just to reach your set-point temperature. Below are some common hot water problems at a facility and the reasons why you should be addressing them now.

Challenges Discussed In This Hot Water Spotlight

- Safety is Your #1 Priority
- Not Reaching or Maintaining Critical Temperatures
- Running Out of Hot Water
- Hard Water
- Cavitation/Steam Hammer/Vibration

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Challenge 1: Safety is Your #1 Priority

Employee safety is already the number one priority at your processing plant. Safety and proper maintenance go hand in hand. To get safety right, your water heating system has to be correctly designed to start with and then an effective maintenance program has to be put in place to keep the equipment in peak working condition. When it comes to heating water, employees can be exposed to hot steam or water in several scenarios including but not limited to, leaking equipment, hammering and vibration issues, and faulty hose stations.

Why is it a Concern?

- The health and wellbeing of everyone at the facility is your number one priority.
- If an injury occurred, OSHA would need to get involved which could result in fines, that the company could be financially responsible for or possibly shutdown if the issues were severe enough.
- Loss of production for proper investigation and solution of the problem
- Steam velocity – Properly designed system will not show signs of early wear/degradation.
- Wet Steam; Water condensate (droplets) have considerable kinetic energy that will mechanically wear and erode elbows and valves.
- Slips and Falls: Steam Condensate or water leaks can make walking surfaces slick; fixing leaks is the easiest way to prevent slips and falls. A Steam Fog can also be dangerous to work in as it limits visibility to the surroundings.
- Steam Leaks: Steam will erode metal and the leak will increase, which means you need to be very proactive in stopping it.

Why is this Happening?

- Review your current hose station equipment and check if safety features are in place. Some common hose stations have caused burns or other injuries if instructions were not properly followed and if items like strainers and steam traps were not installed in conjunction with the hose station.
- Review your current steam piping. If there is steam piping to each individual hose drop, then this could be a potential problem. Ideally, the water heating equipment would eliminate this extra piping. The steam is easier to control if it is from one central location.
- Scaling and fouling may be a concern. See challenge 4 for more information.
- When purchasing new equipment, ensure that it is properly sized and installed.
- Review the installation recommendations of the equipment manufacturer. To eliminate 'wet steam', additional equipment such as a drip leg or condensate trap may be needed.
- Inspect equipment regularly to ensure that there is no wear or leaking



Challenge 2: Not Reaching or Maintaining Critical Temperatures

Your main objective is to reach critical temperatures of 140°F (60°C) or 180°F (82°C). Yet, when you measure the discharge temperature, it is not accurate to your set point temperature. Therefore, you overshoot the temperature to ensure that you reach the minimum requirements. Overtime, you keep having to increase the set point temperature or realize that the temperature is fluctuating drastically above or below your set point.

Why is it a Concern?

- FDA shutdown or fines when not meeting critical temperatures (140°F or 180°F) (60°C or 82°C)
- Risk of contamination which is a concern for the public's health and safety. The result could possibly be a product recall.
- Ruined product when ideal temperature is not met in application specific circumstances
- Product consistency concerns due to large swings in temperature
- Increase in energy usage when temperature set point is increased
- Increase in water usage when ideal temperature is not being achieved

Why is this Happening?

There are multiple reasons why this issue could be occurring. Below are a few common scenarios.

- Scaling and fouling may be a concern. See challenge 4 for more information.
- The steam pressure may be too low for the design of equipment. A reliable heating system needs to be designed with your specific plant in mind. Review the initial sizing the conditions provided to the equipment manufacturer. If production has increased or processing conditions have changed, the equipment may no longer be properly sized. Updated equipment or new components may be needed to compensate for these variations.
- Look at components up and downstream from the heating equipment. Sometimes, an equipment failure is due to a broken temperature element failure. Otherwise, calibration of equipment may be needed.



Challenge 3: Running Out of Hot Water

During high demand periods such as third shift cleaning and wash down of a facility, it is common to run out of hot water. During production, lack of hot water may result in a line speed “slow-down” to allow the hot water capacity equal the demand on the system.

Why is it a Concern?

- Lack of hot water may make the plant less “clean”. Cleanliness means that if the plant surfaces and tools, such as knives, the product comes in contact with are kept clean. Therefore, there will be little or no contamination by microorganisms whether bacteria, molds, or viruses. This results in no rejected product.
- Time is wasted which leads to money loss if employees are standing around waiting for hot water to be readily available
- Production delays until the desired temperature is reached.

Why is this Happening?

There are multiple reasons why this issue could be occurring. Below are a few common scenarios.

- The flow rate may be too high. The heating equipment is not designed for the capacity required. Otherwise, too much water is being used which is also why you may be running out of hot water. Review the initial sizing conditions provided to the equipment manufacturer. If production has increased or processing conditions have changed, the equipment may no longer be properly sized. Updated equipment or new components may be needed to compensate for these variations.
- This is a variation on the first point, but turndown capabilities of your equipment may be a concern. Review the equipment’s turndown capabilities. Some pieces of equipment are not flexible enough to account for the varying conditions of wash down versus normal production. At that point, other equipment may need to be considered or resizing may be needed depending on changes in processing conditions.



Challenge 4: Hard Water

When water temperatures increase, hard minerals falls out of solution in the form of hard mineral deposits often referred to as limescale. This occurs most frequently in processes or equipment that heat water. The higher the temperature, the quicker and thicker limescale forms within the system. The result is an increase in scaling/fouling of processing equipment. Lime scale significantly increase energy consumption. For instance, a heat exchanger with a small amount of scale and increases energy consumption by 40%. System pumps also consume more energy as they work harder to circulate water around a scaled system.

Why is it a Concern?

- In water heating equipment, scale builds up in layers on heat transfer surfaces, insulating water from efficient heat transfer resulting in higher energy costs.
- Cleaning and maintenance can be challenging if hard water causes scaling and fouling. The chemicals used for regular cleaning, along with the staff hours needed for thorough cleaning can be a large use of money, time, and resources.
- If too much time is needed for cleaning and maintenance, then production could be interrupted.

Why is this Happening?

Hard water can cause a variety of problems, but the most common is scaling and fouling.

- Scaling and fouling may be a problem if hard water is present. Regular cleaning may be needed which involves acid bathing the equipment. If the damage is severe enough, then these items may need to be replaced. In fact, replacing key parts or more frequent maintenance may be needed. Abrasive hard water may cause corrosion of metal components which can damage piping and other equipment.

There are a few methods to try and address scaling and fouling. The first is to try and oversize the heating equipment to compensate for the efficiency lost from the hard water.

Another option is to look at incorporating a water softener. A water softener incorporates a specially charged media which attracts calcium ions. Once the media becomes covered in calcium it must regenerate. It does this by flushing a concentrated salt brine through the media to clean the beads which is rejected down the drain (backwash).

A third (and preferred method) would be an equipment provider that could supply a catalytic solution that could replace the use of water softener. Unlike conventional water softeners that physically remove minerals, the catalytic reaction causes calcium, the principal mineral associated with scale, out of solution. The calcium is suspended in the form of a microscopic crystal (calcium carbonate in the aragonite state). As a result of this treatment the amount of calcium left in solution is reduced, this prevents super saturation of calcium from occurring as the water passes through the system. In this way the treatment provides a characteristic of a softer water, specifically no scale. The microscopic crystals are either harmlessly consumed or they go down the drain.



Challenge 5: Cavitation/Steam Hammer/Vibration

If your heating equipment is violently shaking, then it is a concern that needs to be addressed. It is not only dangerous (see challenge 1 for more information on employee safety), but it is also can be an expensive maintenance problem.

Why is it a Concern?

- Inconsistent steam mixing and heat transfer leading to product inconsistency and wasted energy
- Imprecise temperature control which translates to higher energy costs
- Tanks walls can be damaged which leads to the maintenance headache of welding over the damaged sections of the tank. At this point, it is also a major safety concern if hot water and hot steam would leak out of the sides of a tank.
- Steam hammer can lead to process equipment failure if the problem is severe enough. Steam hammer should not be mistaken for water hammer that occurs in piping systems that utilize quick closing valves or that do not have a proper attenuation system. Steam hammer, on the other hand, is a result of uncondensed steam instantaneously cavitating on the tank wall or piping with damaging force.

Why is this Happening?

There are multiple reasons why this issue could be occurring. Below are a few common scenarios.

- Uncondensed steam causes bubbles to form and collapse on tank walls, causing hammer and damage to the tank and peripheral piping.
- Check if you have an externally modulated steam pressure valve. This type of operation can lead to steam hammer or unit vibration as the steam mixes with the process fluid in the piping or tank. Over time, this can contribute to equipment wear, piping damage and lead to poor performance. If you have an externally modulated valve, consider purchasing an internally modulated option which eliminates the problems associated with hammer and vibration.
- Monitor flow changes. Ideally, they should be gradual, and the temperature control loop should be able to respond to these changes. Review the initial sizing conditions provided to the equipment manufacturer. If production has increased or processing conditions have changed, the equipment may no longer be properly sized. Updated equipment or new components may be needed to compensate for these variations.
- Check your steam line for condensate. If there is excessive condensate in the steam line, then hammering and vibration could occur. If needed, purge the steam line. Depending on the piece of equipment, a drip leg and condensate trap may be recommended. Check with the equipment manufacturer for their specific recommendations.





Optimize your Water Heating with Hydro-Thermal

Do you have one or more of these issues at your facility? Would you like to learn how to optimize your water heating? The steam heating experts at Hydro-Thermal are available to complete a free audit of your plant. We are available to provide tips on increasing your efficiency, reducing energy costs, and ensuring that you always have hot water when you need it. Contact us at info@hydro-thermal.com or 262-548-8900 to schedule your free appointment.

About Hydro-Thermal Corporation

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