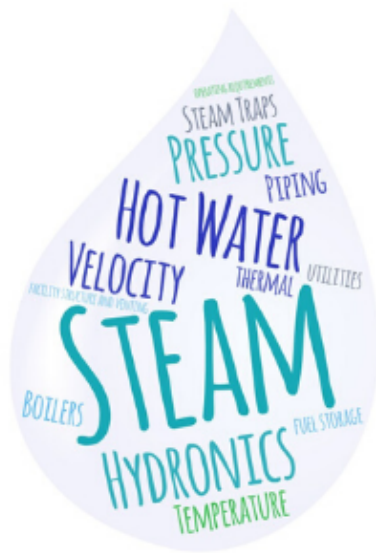


STEAM AND HYDRONIC PRODUCTS SELECTION GUIDE



Although steam systems have been around for hundreds of years, understanding how to size and select steam and hydronic products for hot water and condensate systems remains a complex skill. The Carotek Steam and Hydronic Selection Guide makes it easier to understand the steam and hot water system sizing and selection process.

The appeal of steam for industrial, commercial & institutional processes is that it can transfer large amounts of energy in a controlled manner. Steam systems have many applications - heating, cooling, mechanical (like steam turbine pumps and compressors), and thermal (like melting out wax in investment castings for parts manufacturing). Steam system sizing and selection depends on the application, operating requirements, facility structure, venting, fuel storage, and utilities.

COMPONENTS OF A STEAM SYSTEM

Steam and hydronic systems consist of boilers in a steam supply generating facility, a steam and condensate return water piping system, and a steam use facility. Steam system piping includes:

- **Steam mains** that carry steam from a boiler to steam heated units
- **Steam branch lines** that allow steam to travel from the steam main to the steam heated unit
- **Trap discharge lines** that allow condensate and flash steam to travel from the trap to a condensate return line
- **Condensate return lines** that collect condensate from multiple trap discharge lines, and then carry condensate back to the boiler

Other components of steam and hydronics system include steam traps, pressure and temperature controls, pressure boosters and circulators, condensate pumps, steam coils, and heat exchangers. Steam system sizing and selection requires appropriately sized versions of each of these elements.

PROCESS FOR STEAM SYSTEM SIZING AND SELECTION

When designing a steam system from the ground up, these steps outline the general process for hot water system sizing and selection:

1. Determine process temperature.
2. Determine the heat load and convert it to steam flow. Factor in the steady-state profile as well as transient and instantaneous demand.
3. Determine where boilers will be located relative to the process.
4. Based on the previous measurements, determine the overall pressure and temperature, and whether the system will be superheated. This will help determine initial pipe size.
5. Based on the overall temperature and pressure, select the appropriate boilers.
6. Select the pipe material (based on temperature and pressure), pipe size, and runs. Runs may require anchors, hangers, and flexible loops or joints, and must allow for expansion.
7. Determine the location and types of steam traps. Steam traps can be affected by how often the system will be shut down, and they must be placed properly to prevent water hammer.
8. Select the insulation type and thickness.

The general framework for steam and condensate system sizing and selection varies depending on what variables are already determined.

HOW TO SIZE PIPES FOR STEAM SUPPLY AND CONDENSATE RETURN LINES

Properly sized steam lines improve function and efficiency of the steam system. Undersized pipes cause high pressure drop and starve the process of steam. Oversized steam pipes don't impair operation, but they do increase both capital cost and operating cost unnecessarily. Both radiation loss and pressure drop can be avoided through proper sizing of steam lines.

There are two main criteria for sizing steam supply and condensate return lines.

1. Initial pressure and allowable pressure drop. The total drop, including all drops related to line loss, elbows, valves and other factors, should not exceed 20% of the maximum pressure.
2. Steam velocity. Both noise and erosion increase with velocity.

Pipe sizing charts available from steam manufacturers can simplify the pipe sizing portion of condensate system sizing and selection. There are many additional factors to be considered, so a consulting engineer can assist with design of steam lines and condensate return lines.

Carotek a recognized industry leading supplier, service center, and maintenance facility for steam systems. Carotek offers extensive local product inventory, expertise, and support for a range of leading steam and hydronic products, including extensive training, audits and management services.

Contact Carotek for complete steam and hydronic system solutions assistance.