



10 Tips to Help Optimize & Improve Your Steam Injection Heating Application...

1. Be sure to communicate all relevant process heating application information when requesting a quotation-

The PSX Heater Application Survey is designed to help guide you through the evaluation of your steam injection heating application. Basic information needed are flowrates (high, low, & nominal), inlet & discharge temperatures, and steam pressure. Other data such as fluid names, physical properties (solids, present, specific gravity, specific heat, & viscosities), liquid pressure, & proper flow velocities are all important as they help in the equipment selection process. It is also important to note any potential issues such as erosion or materials or construction requirements.

2. Select a steam injection heating device that will maintain high velocity steam flow into your process fluid –

There are two types of steam control, externally & internally modulated steam control. **Externally modulated** steam control utilizes a steam control valve to reduce the steam pressure to control temperature. This results in low velocity (sub-sonic) conditions and can lead to steam cavitation & poor temperature control. **Internally modulated** steam control utilizes a variable area jet diffuser which operates under choked flow (sonic) conditions. Mass flow, not pressure, is controlled which maintains your design steam pressure into the PSX Heater. Operating with high velocity (sonic) conditions assures complete & rapid steam condensation for smooth operation and reliable temperature control.

3. Identify your design steam pressure – Your design steam pressure will be the steam pressure that is available at the point of heating. To calculate, identify the steam header pressure that will supply your PSX Heater. Then calculate your line losses to establish what your design steam pressure is at the heater location.

4. Size for actual needs to optimize control – The PSX Heater has 100% turndown on steam and can exceed 10:1 liquid turndown. This allows the PSX Heater to operate in a wide range of varying flow & temperature conditions. Too often though, additional capacity is added through the design process. Over sizing the heaters capacity, relative to the actual design operating conditions, can lead to control issues. If the actual conditions you will be operating at are much smaller than your heaters capacity, you may end up having a very small control band to operate within. Like most valves, steam injection heaters operate best the steam trim is matched for your conditions. Each PSX Heater has multiple trim with various capacities to allow for future needs.

5. Maintain proper steam & liquid pressure relationship -

Steam velocity plays a critical role in rates of steam condensation. Therefore the steam pressure must be greater than the liquid pressure to maintain proper velocities for effective condensation. With the PSX Jet diffuser, the liquid pressure can be up to 80% of the steam pressure. From a design standpoint, it is recommended that liquid pressure should to 60-70% of the steam pressure or less to allow for process & steam pressure fluctuations. Please see PSX TB-4 for additional details.

6. Avoid flow fluctuations faster than the temperature control loop – Steam injection heating is very responsive to control changes which eliminates control loop lag issues found in traditional heaters. The PSX Heater is able to maintain +/- 1 °F set point control. In short, the PSX can be controlled as accurately as your temperature control loop can respond. Rapid changes in flow though, will lead to continuous control loop adjustments, which can impact temperature control.

7. Proper Steam line set-up & maintenance insures proper heater operation – Your steam supply and incoming steam line play an instrumental role in the heating process. Dry steam should be supplied through the proper use and placement of steam traps on the incoming steam line. It is also important to blow down your steam line before operation of the steam injection heater. Wet steam can cause rough operation and premature failure of internal heater components. Strainers placed on the incoming steam line are also recommended. The PSX Heater can handle superheated steam. This should be discussed during the application review process. Please see PSX TB-31 for additional steam line recommendations.

8. Review your boiler capacity compared to the steam load demand of the PSX Heater – Steam injection heating can come up online very quickly which makes it very suitable for intermittent heating requirements. Keep in mind though that when heating is called for, the heater will move to the full open position. If the heaters steam demand is close to the boilers available output, this can draw down your boiler faster than desired. If you find that initial start-up of your PSX Heater is drawing down your boiler, you can set-up a ramp up procedure to control the opening sequence of the heater which will allow your boiler to recover faster.

9. Do not use a steam control valve to regulate or control steam pressure – The PSX Heater has an integral actuator to control the mass flow of the steam through the heater. Once you have identified your design pressure at your point of heating, do not regulate or attempt to control A steam shut-off valve should be used to shut the steam down; however, regulating the steam pressure from the design pressure will most likely cause rough operation & temperature control issues.

10. Make sure to follow the recommended installation guidelines from the manufacturer - Proper installation of your heater will lead to reliable performance and reduce maintenance cycles. Piping layout should be reviewed in accordance with the manufacturer's installation guidelines. Proper instrumentation, steam traps, and temperature control loop lay-out will improve your process heating reliability. Periodic inspection per the O&M manual insures that the PSX Heater will be ready to perform when needed. As with all process equipment, good piping practices should be used along with following proper codes.

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