

Steam: The effects on hoses



Steam & its effect on hoses

Water can occur in three different states, namely, solid, liquid or gaseous. The gaseous state called 'steam' can also be subdivided into three different forms, which are determined by the pressure and temperature.

These three forms are:

- Wet saturated steam or 'wet steam'
- Dry saturated steam
- Superheated steam or 'dry steam'

The following steam diagram is given for clarification. The thick black line shows the boiling point of water at the different pressures. Each point on this line represents saturated steam. Saturated steam can be released as un-evaporated water particles.

Saturated steam can therefore be 'dry' or 'wet'. Each point below the line (zone A) represents warm water, each point above the line (zone B) represents superheated steam.

The black line in zone B shows the process of saturated steam being converted into superheated steam. If a hose is pressurised to 10.5 bar at a temperature of 186°C, saturated steam is present.

When the pressure is reduced (e.g. as a result of a volume expansion) or when there is a temperature increase, superheated steam is created. The steam therefore follows the black line to point X.

Rubber steam hoses are suitable for saturated steam. Using rubber hoses for superheated steam is not desirable.

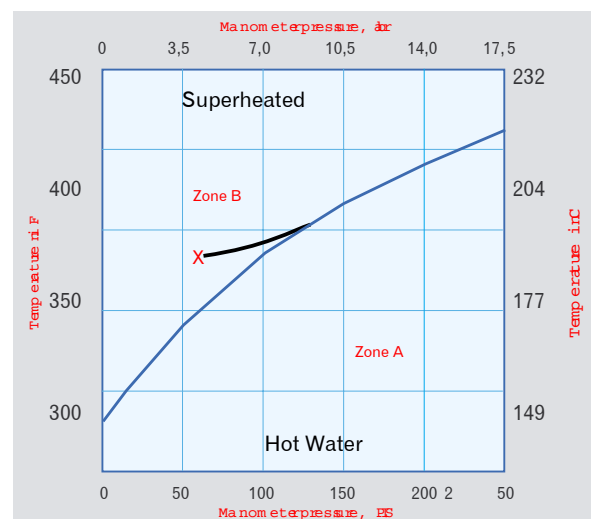
This will significantly reduce the life because the rubber of the hose ages quickly. After use, the hose must be 'drained' so that any remaining water particles are removed. If not, the water particles will be absorbed through the internal wall and when the hose is used again these water particles will be converted back into steam.

Due to the increase in volume, blisters will appear in the internal wall and the hose will no longer be fit for use. This is called the popcorn effect.

Flextech are able to test hoses in a controlled and fully recorded test procedure. Please contact us for details.

How do you choose the right steam hose?

- Determine the required internal diameter. (The diameter is normally determined by the dimensions of the pipe connection to which the hose assembly must be connected. It is important not to choose an internal diameter larger than the diameter of the feed pipe. This would cause the pressure in the hose always to be greater than in the pipeline.)
- Determine the working pressure and temperature.
- Determine the state of the steam. (The steam diagram indicates, from the combination of the working pressure and temperature, whether the steam is saturated or superheated.)
- Choose the right hose and connection. (Make allowance for the form of the steam as well as the pressure and temperature.)
- Determine the required length. (The length is determined by the application. We recommend you take the bend radius into account. In case of a permanent installation we recommend you install the hose so that it is easy to 'drain' after use)
- Determine whether the hose must be tested.



Temperature of saturated steam at different working pressures