

Case History Types of Steam Water

STEAM GENERATORS

In the industrial sector, steam generators, or steam boilers, are used to produce saturated steam that can be used for different purposes, depending on the field of application.

They are typically used when direct and indirect heating needs to take place simultaneously; when heat transfer is required at a constant temperature, with high heat transfer rates; when heating large quantities of process hot water is required.

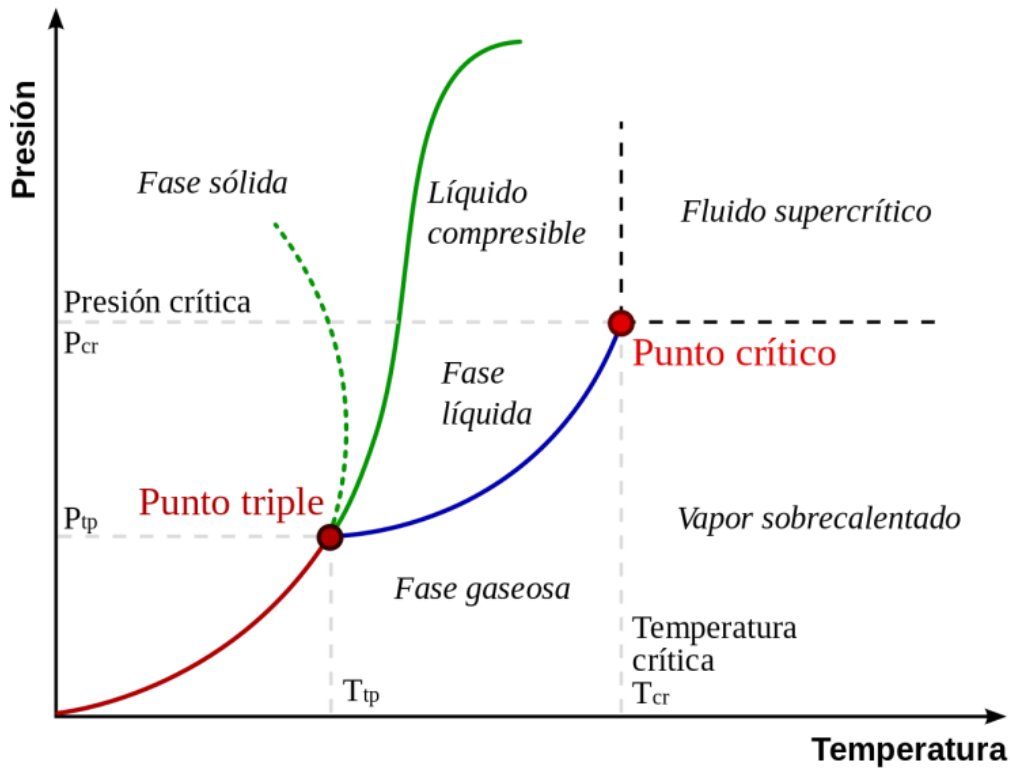
It is called saturated vapor when the pressure and temperature conditions correspond to a point of change of state, in this case, from liquid to gaseous. In this way, at that temperature, particles in both states can coexist.

In practice, dry saturated vapour is defined as one in which all the particles are in a gaseous state, and wet saturated vapour when there are some particles in a liquid state.

On the other hand, superheated steam is one that has a temperature higher than saturation. Superheated steam is created by the superheating of saturated or wet steam to reach a point greater than saturation. This means that it is a vapor that contains a higher temperature and lower density than saturated vapor at the same pressure. Superheated steam is primarily used for motion-impulse applications such as turbines, and is not normally used for turbines.

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In the image you can see the different states of the water depending on the pressure and temperature at which it is.

The blue line shows the change from liquid phase to gas phase, i.e. the curve of saturated vapor.

It can be seen that the higher the pressure, the phase change occurs at a higher temperature.

Advantages of Using Saturated Steam for Heating

Saturated steam has several properties that make it a great source of heat, particularly at temperatures above 100°C. Some of these are:

- Balanced heating through latent heat transfer and with a great improvement in productivity and product quality
- The pressure can control the temperature, and can be set quickly and accurately
- High heat transfer coefficient. The required heat transfer area is smaller, allowing the reduction of the initial cost of the equipment. Having said that, it is necessary to keep the following in mind when heating with saturated steam:



Heating efficiency can be reduced if a steam other than dry steam is used for heating processes.

Contrary to common perception, not all steam generated in a boiler is dry steam, but somewhat wet steam, which contains some unvaporized water molecules.

Heat loss through radiation causes some of the vapor to condense. Therefore, the generated wet steam becomes even more humid, and more condensate is also formed, which must be removed by installing steam traps at the appropriate points.

When steam is generated using a boiler, it usually contains moisture from the non-vaporized water particles which are drawn into the steam distribution lines. Even the best boilers can discharge steam containing up to 3% moisture. At the moment when the water approaches a state of saturation and begins to evaporate, normally, a small portion of water, usually in the form of droplets, is carried away in the steam flow and carried to the distribution points.

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