

Technical Article

Steaming Rate

The Steaming Rate (the rate at which a boiler produces steam, normally expressed in terms of Lbs/Hr or Kg/Hr) is an item that is frequently misunderstood and such a misunderstanding can lead to the purchase of the wrong size boiler. It is, therefore, essential that the Steaming Rate be qualified when selecting a boiler size.

The three common Steaming Rate terms are:

- From and at 212 °F Steaming Rate
- Gross Steaming Rate
- Net Steaming Rate

From and at 212 °F is the Steaming Rate for a boiler producing steam, at the outlet flange, at 212 °F, and 0 PSIG, with feedwater at the inlet flange at 212 °F and 0 PSIG. This is most common steaming rate term and is used most often in brochures, etc. that provide steaming rate data. One Boiler Horsepower (BHP) is, by definition, equivalent to 34.5 pounds of steam per hour, from and at 212 °F.

Gross Steaming Rate is the rate at which a boiler produces steam, at the outlet flange, based on application specific feedwater conditions at the inlet flange and application specific steam conditions. The Gross Steaming Rate, typically, differs from the from and at 212 °F Steaming Rate because both the feedwater inlet and the steam conditions are different than 212 °F and 0 PSIG.

A typical application may, for instance, have feedwater at 190 °F and produce saturated steam at 100 PSIG (338 °F). Since the inlet temperature is less than 212 °F and the outlet temperature is greater than 212 °F, the amount of heat needed to produce a pound of steam, at these conditions, is greater than the amount needed to produce a pound of steam with inlet and outlet temperatures of 212 °F. The Gross Steaming Rate is, therefore, frequently, less than the from and at 212 °F. It may, however, actually be greater, if the feedwater receiver is a pressurized deaerator that heats the feedwater to a temperature above 212 °F, for instance, 230 °F.

Net Steaming Rate is the steaming rate at which a boiler produces steam to your plant or process and, thus, is the most important steaming rate to consider. Net steaming rate, differs from Gross Steaming Rate in that it takes into account the amount of steam needed to heat the feedwater in the feedwater receiver (deaerator or hotwell): specifically, the Net Steaming Rate equals the Gross Steaming Rate minus the steaming rate to the feedwater receiver. Except for some very unusual applications, the Net Steaming Rate is less than the Gross or from and at 212 °F Steaming Rate.

Take, for example, a 100 BHP boiler operating with 100% make-up water at 60 °F and producing steam at 125 PSIG. In this case, the from and at 212 °F Steaming rate is 3,450 Lbs/Hr but the Net Steaming Rate is only 2874 Lbs/hr – 17% less than the from and at 212 °F Steaming Rate.

The effect of feedwater heating is applicable in all applications and, thus, should always be considered. There is another factor that has an effect and can be significant in some applications. That factor is the amount of “blowdown” that is required in order for the boiler to operate effectively. In this case, “blowdown”, refers to the amount of water that must be removed from the boiler system, on a regular basis, in order to control the level of Total Dissolved Solids (TDS) in the boiler. Water that is removed to control TDS has been heated and the amount of energy needed to heat this water reduces the amount of energy that is available to produce steam. (See the Boiler Blowdown article).

In summary, users should be certain to qualify steaming rates when using them to define the size of a boiler. Boiler Horsepower is a specific term and no further information is needed to select the size of a boiler. However, if a steaming rate is used to specify boiler size then the steaming rate must be qualified – from and at 212 °F, Gross or Net pounds, or KG, per hour.

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