

That is a gradual decrease to no latent heat whatever at 3200 lbs. per square inch - the critical pressure. Observing the figures for 200 lbs. pressure it will be noted that 844 heat units are required to be added to the water after the boiling temperature has been obtained, and that the boiling temperature can be obtained by adding only 534 heat units (i.e. sensible heat) to the water as it enters the boiler, or in other words the latent heat required is more than twice the sensible heat required.

In the Benson Generator THE ESSENTIAL FEATURE is that steam is generated at or above the critical pressure and temperature of the water, i.e. at or above 3200 lbs. per square inch and 706 deg. Fahrenheit.

This critical point is so called because it is at this stage that the water does not require any latent heat to convert it into steam and where there is no difference in the physical properties of water or steam, or it might also be defined as the maximum conditions under which water can exist as water. At any combined higher pressure and temperature the water would exist as a gaseous condensible fluid which we may call steam. This change from water to steam takes place very rapidly and without ebullition, it also takes place without shock.

The essential feature then is firstly to provide by external means this critical pressure, and this is easily maintained by a hydraulic feed pump, which supplies the steam generator with water at, say, 3500 lbs. per square inch. Then so soon as the heat from the furnace can raise the temperature to say 750 deg. Fahrenheit, we have a perfectly dry steam, as from the figures already given before it will be remembered we have no latent heat to add, or in other words, all the heat added is a sensible heat. The change from a water to a gaseous fluid will take place quickly and without ebullition and correspondingly without the troubles associated with ebullition.

Calculations will easily show that by generating steam at these very high pressures and temperatures, we have a thermo dynamic overall efficiency at least 20% better than the overall efficiency of a plant operating under present conditions. This means, of course, a saving in fuel to the same extent.

The reason why an overall efficiency can be obtained so much better is explained by the following figures:-

Take any number of steam conditions with the same total heat of 1350 heat units, which would cost about the same to generate in any boiler, then at 3200 lbs. the steam would need to be superheated to 910 deg. Fahrenheit, and we would have available for conversion into work in the turbine plant at 29" vacuum 585 heat units.

At 300 lbs. the steam would be superheated to 670 deg. Fah. and we have available only 460 B.T.U.s. so that at the highest conditions we have 27% more heat units available for the same fuel consumption.