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GAS TURBINE POWER AUGMENTATION USING FOG INLET AIR-COOLING SYSTEM

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ABSTRACT

Gas turbines are almost constant volume machines at a specific rotating speed, i.e., air intake is limited to a nearly fixed volume of air regardless of ambient air conditions. As air temperature rises, its density falls. Thus, although the volumetric flow rate remains constant, the mass flow rate is reduced as air temperature rises. Power output is also reduced as air temperature rises because power output is proportional to mass flow rate. This power output reduction is from 0.5% to 0.9% of the ISO output power for every 1°C rise in the ambient temperature. The solution of this problem is very important because the peak demand season also happens in the summer. One of the useful methods to overcome this problem is to apply the fog inlet air cooling system for the gas turbines.

In this paper the Rey Power Plant site climate conditions in the summer have been studied. The design conditions regarding the dry bulb temperature and relative humidity have been selected. The different inlet air cooling systems have been studied and the Fog system has been chosen. The economical study has shown that this system is very cheap in comparison with the installation of the new gas turbines. The capital cost is estimated to be 40 $/KW. The pay back period is around 1.5 year. The testing of this system has shown that the average power capacity of the power plant is increased by 19 MW and prevented the installation of a new gas turbine.

KEYWORDS: Gas turbine, Fog, power augmentation, Inlet Air Cooling