

Gas Turbine power Augmentation by Overspray Inlet Fogging

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Abstract

The power output of a gas turbine (GT) is highly affected by ambient temperature. A higher ambient temperature will result in a lower power output, due to reduced inlet air density and mass flow rate. Therefore, GT power loss can be recovered by cooling the inlet air. Due to compression with intercooling, overspray inlet fogging (wet compression) can increase power more than using only evaporative inlet cooling. It can also be used to recover aircraft thrust loss due to high ambient temperature operation, or to boost takeoff thrust. This paper is focused on the effects of adding an overspray inlet fogging system to an existing GT power plant.

Simulation runs were made for adding an overspray inlet fogging system to a GE 7111EA GT engine to compare with the baseline case (28.2°C, 75.7% relative humidity). Power augmentation using evaporative and overspray inlet fogging can range from 1.85 to 16.8 MW, which amounts to a 2.5 — 22.4% power increase. Moreover, the net efficiency is also increased by 1.62%. Therefore, overspray inlet fogging is capable of both boosting the GT power and improving the efficiency. Results from this study can be used as a guideline for GT power augmentation by overspray inlet fogging.

Keyword : turbine
temperature