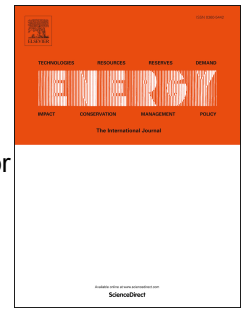
Accepted Manuscript



Effect of atmospheric condition and ammonia mass fraction on the combined cycle for power and cooling using ammonia water mixture in bottoming cycle

Mayank Maheshwari, Onkar Singh

PII: S0360-5442(18)30159-2

DOI: 10.1016/j.energy.2018.01.131

Reference: EGY 12243

To appear in: *Energy*

Received Date: 25 June 2017

Revised Date: 25 December 2017

Accepted Date: 25 January 2018

Please cite this article as: Maheshwari M, Singh O, Effect of atmospheric condition and ammonia mass fraction on the combined cycle for power and cooling using ammonia water mixture in bottoming cycle, *Energy* (2018), doi: 10.1016/j.energy.2018.01.131.

Effect of atmospheric condition and ammonia mass fraction on the combined cycle for power and cooling using ammonia water mixture in bottoming cycle

Mayank Maheshwari
Research Scholar at AKTU, Luck now, India
mayankmaheshwari80@rediffmail.com

OnkarSingh
HBTU, Kanpur,India
onkpar@rediffmail.com

Abstract:

Gas/steam combined cycle power plants are being extensively used for power generation due to their better performance as compared to gas turbine based or steam turbine based power plants operating in isolation. These combined cycle power plants have natural aspiration in compressors where the state of ambient air entering it, significantly affects the work requirement of compressors and thus affects the overall combined cycle power plant performance. It is felt that in tropical countries with significant seasonal variations, when the atmospheric temperatures become quite high during some months in a calendar year, the cooling of ambient air before entering compressor using the energy available in combined cycle power plant may help in improving the overall plant performance. In view of this a combined cycle with ability of producing power and provision of simultaneous cooling of air entering the compressor and cooling of gas turbine blades through ammonia water mixture and steam using closed loop cooling scheme has been studied in this paper. A comparative analysis of the combined cycle's considered shows that for a cycle pressure ratio of 40 and turbine inlet temperature of 2000K maximum work of 2093kJ/kg of compressed air is obtained for ammonia mass fraction of 0.6 for the combined cycle using only ammonia water mixture as coolant where as maximum first law efficiency and second law efficiency of 62.6% and 59.67% are being achieved for ammonia mass fraction of 0.7, for the same configuration and at an ambient temperature of 30°C. Cooling load of 22 kW is observed to be maximum for the configuration using steam and ammonia water mixture as coolant and