World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:10, No:05, 2016

Effects of Inlet Filtration Pressure Loss on Single and Two-Spool Gas Turbine

Authors : Enyia James Diwa, Dodeye Ina Igbong, Archibong Archibong Eso

Abstract : Gas turbine operators have been faced with the dramatic financial setback resulting from compressor fouling. In a highly deregulated power industry where there is stiffness in the market competition, has made it imperative to improvise means of reducing maintenance cost in other to yield maximum profit. Compressor fouling results from the deposition of contaminants in the presence of oil and moisture on the compressor blade or annulus surfaces, which leads to a loss in flow capacity and compressor efficiency. These combined effects reduce power output, increase heat rate and cause creep life reduction. This paper also contains a model of two gas turbine engines via Cranfield University software known as TURBOMATCH, which is simulation software for detecting engine fouling rate. The model engines are of different configurations and capacities, and are operating in two different modes of constant output power and turbine inlet temperature for a two and three stage filter system. The idea is to investigate the more economically viable filtration systems by gas turbine users based on performance only. It has been demonstrated in the results that the two spool engine is a little more beneficial compared to the single spool. This is as a result of a higher pressure ratio of the two spools as well as the deceleration of the high-pressure compressor and high-pressure turbine speed in a constant TET. Meanwhile, the inlet filtration system was properly designed and balanced with a well-timed and economical compressor washing regime/scheme to control compressor fouling. The different technologies of inlet air filtration and compressor washing are considered and an attempt at optimization with respect to the cost of a combination of both control measures are made.

Keywords : inlet filtration, pressure loss, single spool, two spool
Conference Title : ICAMAME 2016 : International Conference on Aerospace, Mechanical, Automotive and Materials Engineering
Conference Location : Montreal, Canada
Conference Dates : May 16-17, 2016

Open Science Index, Aerospace and Mechanical Engineering Vol:10, No:05, 2016 publications.waset.org/abstracts/44384.pdf