Journal of Engineering for Gas Turbines and Power, vol.135, no.5, pp.054501-1-054501-5, May, 2013.

Hybrid model-based fault detection and diagnosis for the axial flow compressor of a combined-cycle power plant

J.A. García Matos; M.A. Sanz Bobi; A. Muñoz San Roque; A. Sola Rosique

Abstract-

This technical brief is focused on the research area of fault detection and diagnosis in a complex thermodynamical system: in this case, an axial flow compressor. Its main contribution is a new approach which combines a physical model and a multilayer perceptron (MLP) model using the best advantages of both types of modeling. Fault detection is carried out by an MLP model whose residuals against the real outputs of the system determine which observations could be considered abnormal. A physical model is used to generate different fault simulations by shifting physical parameters related to faults. After these simulations are performed, the different fault profiles obtained are collected within a fault dictionary. In order to identify and diagnose a fault, the anomalous residuals observed by the MLP model are compared with the fault profiles in the dictionary and a correlation that provides a hypothesis with respect to the causes of the fault is obtained. This methodology has been applied to axial compressor operational data obtained from a real power plant. A case study based on the successful diagnosis of compressor fouling is included in order to show the potential of the proposed method.

Index Terms- Flow (Dynamics), Compressors, Modeling, Axial flow, Combined cycle power stations, Flaw detection

Citation:
García Matos, J.A.; Sanz-Bobi, M.A.; Muñoz, A.; Sola, A. "Hybrid model-based fault detection and diagnosis for the axial flow compressor of a combined-cycle power plant", Journal of Engineering for Gas Turbines and Power, vol.135, no.5, pp.054501-1-054501-5, May, 2013.