Abstract

The field of application of control methodologies to gas turbine holds tremendous research potential. This paper, presents the fractional-order (FO) robust controller design for the fuel-speed loop of a gas turbine. The aim of the controller is to maintain the turbine speed, against the plant gain variation and disturbance. To the best of our knowledge this is probably the first effort to propose the design of a fractional-order controller for the speed control of a power plant gas turbine. Nowadays the application of fractional-order (FO) modeling and control is the most appreciated area for research. The Fractional Calculus field has originated from the fundamental area of fractional calculus which is the mathematical branch dealing with differentiation and integration with arbitrary order of the operation. On the other hand, FO controllers have proved their efficacy over the conventional integer-order (IO) controllers by providing more flexibility in the design and also by guaranteeing a more robust closed-loop configuration. The proposed FO controller is designed with the concept of Bode’s ideal loop transfer function. Simulation studies clearly shows that the proposed FO controller makes the closed loop system more robust against the plant uncertainties and disturbances as compared to the integer order PID controller.
References


Index Terms

Computer Science

Applied Sciences

Keywords

Gas turbine  Fractional-order control  Bode's ideal loop transfer function  Robust control.