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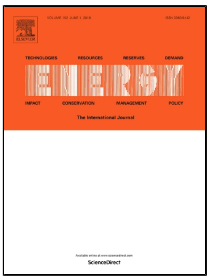

Failure Diagnosis and Tolerant Control Method for Hydrothermally Aged SCR System by Utilizing EKF Observer and MRAC Controller

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Abstract: For ensuring emission performances of a selective catalytic reduction (SCR) system, it shall be critically robust and adaptive against any hydrothermal aging failure throughout its whole service life. Simulation was carried out here to investigate its hydrothermal aging effect by using such hydrothermal aging model and the corresponding results showed that its performances were significantly influenced while the catalyst (V_2O_5/WO_3-TiO_2) was hydrothermally aged. On this basis, an extended-Kalman-filter-based (EKF-based) observer was designed to identify its hydrothermal aging states and the corresponding results indicated that the actual hydrothermal aging degree could be estimated quickly and accurately. Moreover, a Lyapunov-based model reference adaptive controller (MRAC) was designed to improve its control performances based on the diagnosis information from the EKF-based observer while V_2O_5/WO_3-TiO_2 was hydrothermally aged. Thus, its hydrothermally aged failure-tolerant control performances could be remarkable improved by means of Lyapunov-based MRAC.

Keywords: Diesel engine; Urea-SCR; Failure-diagnosis; Failure-tolerant control; EKF-based observer; MRAC