

A six-order model for drum-boiler dynamics

노순다이, 송병호[†], 박재혁¹, 선도원¹, 이재구¹

군산대학교; ¹에너지기술연구원

(bhsong@kunsan.ac.kr[†])

A six-order mathematical model is developed to describe the dynamics of a natural circulating drum-type boiler system. The model is derived from basic conservation rules of mass, momentum, and energy. The six state variables of the model include the total volume of water, steam pressure, steam quality at the top of the riser, drum water level, downcomer-riser loop flow, and the volumetric fraction of steam in the water-steam mixture in the drum which describes the behavior of the drum-boiler system. This model is able to simulate the dynamic behavior of drum water level directly based on the mass balance of drum while the other studies have computed it by off-line with the aid of empirical equations and assumptions. Safe operation of boilers requires perfect level controller which leads to more requirements on the correctness of modeling. The simulation results of the presented model are compared with those in the literature.