

Inferential Sensor - Based Adaptive Principal Components Analysis of Mould Bath Level for Breakout Defect Detection and Evaluation in Continuous Casting

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Abstract: This paper is concerned with a method for breakout defect detection and evaluation in a continuous casting process. This method uses Adaptive Principal Component Analysis (APCA) as a predictor of inputs -outputs model, which are defined by the mould bath level and casting speed. The main difficulties that cause breakout in continuous casting are, generally, phenomenon related to the non-linear and unsteady state of the metal solidification process. PCA is a modeling method based on linear projection of the principal components; the adaptive version developed in this work uses the sliding window technique for the estimation of the model parameters. This recursive form updates the new model parameters; it gives a reliable and accurate prediction. Simulation results compare PCA, APCA, nonlinear system identification using neural network (NN) and support vector regression (SVR) methods showing that the APCA gives the best Mean Squared Error (MSE). Based on the MSE, the proposed approach is analyzed, tested and improved to give an accurate breakout detection and evaluation system.

Keywords : Soft sensor, continuous casting, Adaptive principal component analysis, breakout detection and evaluation.