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# A New Feedback Predictive Control Approach for Processes with Time Delay in the Manipulated Variable

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## Highlights

- **A novel feedback predictive control algorithm is developed and evaluated**
- **The scope of this study is the time delay and process lags within control system**
- **MPC and proposed FBPC were applied in two different studies for comparison**
- **Proposed FBPC shows advantages over MPC within the scope of this study**

## Abstract

The scope of this work is time delay ( $\theta$ ) in the manipulated variable (MV) and not in the controlled variable (CV), addressed by approaches such as the Smith Predictor. The classical algorithm for dead time in MV is model predictive control (MPC). The MPC control law is for the future predicted value of CV to be at the set point an integer value of sampling time steps ( $J$ ) beyond  $\theta$  time in the future. Hence, the effectiveness of MPC depends strongly on the accuracy of the future prediction of CV, which decreases as  $J$  increases. In addition, the larger the time lag for MV, the longer it takes to reach the set point and the greater  $J$  will be also. Therefore, to overcome these limitations, this work presents a new FBC predictive control approach that has a control law that uses a future prediction of CV a distance  $\theta$  into the future. Thus, its prediction horizon is minimal and it is not affected by the MV time lag. This approach is compared with MPC in two

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