

Feed characteristics dependent parameter estimation in multistep batch process by using statistical analysis

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In this study, we propose a method to estimate batch operation control inputs, which are functions of parameters of a high order regression model. In some processes, the control parameters show a strong dependence on a combination of several factors concerning previous operation steps performed on the feed material (called “feed characteristics” hereafter). Therefore, the present control parameters can be estimated by using the parameters from previous operations with same feed characteristics. Here, we propose a method to use not only data from operations of exactly same feed characteristics but also those from operations of “similar” feed characteristics, in order to overcome data shortage because of complexity of multistep batch process. Statistical significance of different feed characteristic factors was tested by MANOVA (multivariate analysis of variance). The test provides a basis to distinguish between the effects of each level of factors. Highly similar feed characteristics can be substituted for each other, resulting in a significant increase in the amount of available data and accuracy of parameter estimation. We compare this new parameter estimation based strategy with the original one using real industrial data.