



## Advanced Operator Support – Detection and Isolation of Abnormal Events

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## **Advanced Operator Support – Detection and Isolation of Abnormal Events**

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Regardless of how accurately a Multilevel Flow Modeling (MFM) model describes the causal nature of a complex industrial system, its effectiveness at performing causal reasoning is limited by the current approach of detecting abnormal events. Currently, the states of MFM basic functions are determined by monitoring their associated process quality variables with traditional univariate control charts such as Schewart, CUSUM, and EWMA. The problem with this approach is that the application of univariate control charts rests on the assumption that process variables are independent of one another. In reality, the true condition of MFM basic functions may only be revealed in a multivariable analysis of several process variables.

In this contribution, the advantages of using a multivariable analysis approach for detecting abnormal events in multivariable processes are introduced. The application of an autoencoder, which is an artificial neural network used for dimensionality reduction, for detecting faults occurring in complex, nonlinear dynamic systems is presented. This contribution also demonstrates how additional learning constraints can be imposed on the autoencoder such that it facilitates fault isolation for determining MFM function states.