[ED02]

Fault detection and diagnosis using multivariate statistical process control (MSPC) based on principal component analysis (PCA) and partial correlation analysis (PCORRA).

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Chemical plants have become increasingly complex and stringent requirements are needed on the desired final product quality. They also utilize a lot of energy, must be environmentally friendly and fulfill safety requirements. Accurate process fault detection and diagnosis (FDD) at an early stage is important to modern chemical plants in achieving the above requirements. This paper focuses on the application of MSPC as a FDD tool. A new FDD method based on correlation coefficients between process variables and quality variables are presented. The correlation coefficients between these variables are derived using multivariate projection techniques such as Principal Component Analysis (PCA) and Partial Correlation Analysis (PCorrA). The control charts used together with the develop correlation coefficients for FDD are Shewhart Control Chart and Range Control Chart. The proposed method was implemented on a simulated industrial column model. Results show that the proposed method was successful in detecting the pre-designed faults and also diagnosing the fault causes of each detected fault. The faults considered are single fault cause, multiple fault causes, significant faults and insignificant faults. These faults represent valve faults, sensor faults and controller faults. The major advantages of the present method are the simplicity and non-ambiguity in diagnosing the cause of each fault. The ambiguity of previous methods used for fault diagnosis such as contribution plot and fault signatures are overcome. The present method can be applied to any type of unit operation and can be even extended to multiple unit operations. For on-line process monitoring, this method can be modified by updating the data used to calculate the correlation coefficients between process variables. This modification is a research problem for future work.