204e Method to Identify Significant Shifts in Nonlinear Systems
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A method to monitor nonlinear systems and identify significant shifts in these systems is presented in two mathematical methods. Both methods use analysis of the demonstrated variance to identify significant shifts with limited data. The methods require that the form of the nonlinear equation is known. The first method compares the variance between the measured and estimated response at a single datum point with the variance demonstrated by the nonlinear system. An F-test is performed to determine if the variances are significantly different. The second method compares the variance of defining the dataset as two nonlinear systems with the variance of defining the dataset as one nonlinear system. An F-test is performed to determine if the variances are significantly different. The method of monitoring for significant shifts in nonlinear systems is presents in a case study of constant flux mammalian cell culture primary clarification.

The presented methods can improve process monitoring decisions in two ways. First, changes in the relationship of nonlinear systems may require action in the process control strategy. Second, identifying the point at which a significant change occurred in a process can improve the data analysis or root cause analysis by examining the dataset as significantly different systems.