

Abnormal situation management: a process dynamics approach

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ABSTRACT

Abnormal situations are events that are outside of normal plant operating modes. It is estimated that the U. S. economy could reduce costs by \$20 billion per year by avoiding abnormal situations. Modern control systems can provide advanced warning for potentially abnormal conditions, thus alerting process operators to take appropriate actions. However, alarm limits are chosen by empirical procedures, which have been proved ineffective or insufficient in some control systems, such as the control system of a continuous exothermic reactor. Dynamic modeling of processes integrated with control systems can provide operators with early awareness of abnormal situations, direct the design of multi-variable alarm/shutdown systems, and help to choose appropriate alarm/shutdown limits.

Stochastic methods, such as statistical analysis and artificial neural networks, are other tools for abnormal situation management. As a supplement to process dynamics analysis, stochastic methods have the ability of heuristic causal reasoning, which can help to analyze unnoticed variables in dynamics analysis.