ABSTRACT

A wide variety of “lagging” indicators is available to management and engineers who are involved in process safety. They include injury rates as functions of injury severity, property loss rates as functions of value of loss, reports of process-safety audits and inspections, reports of production rates and productivity, reports of disciplinary actions and personnel-turnover rates, and other indications of previous or historical performance. However, as described in “Guidelines for Risk-Based Process Safety”, lagging indicators are useful only “when a highly responsive link exists” between (1) the compilation or calculation of the indicators and (2) managers of the processes at risk. Further, use of lagging indicators to guide the process-safety effort “is likely to fail when the lagging indicators are low-frequency, high-consequence events, such as catastrophic accidents. The absence of loss events [a lagging indicator] does not reliably indicate that a process safety management system is working well.” In contrast, “leading” indicators can predict future performance, so that the process-safety effort can be properly directed, and limited resources can be effectively applied. Among the most-important leading indicators are trends in safety and operational performances, trends in the deterioration of the physical and mechanical properties of critical components, and trends in the reliability and speed of response of control systems. Also, the effectiveness and promptness of responses to deficiencies found in process-safety audits or identified in process hazards analyses are leading indicators. These and additional leading indicators are presented in this paper, together with estimates of effectiveness in predicting future safe performance. An important descriptor of process safety culture is the effort that is devoted to monitoring leading (and lagging) indicators. Only with constant monitoring of these indicators can the safety of potentially-hazardous operations be maintained and improved.