Risk Criteria, Protection Layers, and Conditional Modifiers

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ABSTRACT

Risk analysis assesses the likelihood and consequence of events. The acceptability of the identified risk is determined by comparing it to a specified risk tolerance. The criteria applied depend on the analysis boundary, which may be loss of containment or extend to the harm posed by the loss of containment. Risk analyses generally begin with a determination of the likelihood that a hazardous event could result in loss of containment or some other undesirable consequence. These analyses require estimation of the likelihood that the initiating event will occur and the probability that the protection layers will not operate as required. Conditional modifiers are considered when the analysis is evaluating the likelihood that harm may be caused by the loss of containment. Various methods for performing risk analyses are discussed in several CCPS publications including Chemical Process Quantitative Risk Analysis (1), Hazard Evaluation Procedures (4), and Layers of Protection Analysis (8). However, the link between the selected risk criteria as described in Guidelines for Developing Quantitative Safety Risk Criteria (3) and the factors considered in the analysis is not clearly described in these texts. Recognizing this opportunity, this paper begins with a brief introduction to risk analysis concepts to provide a foundation for a discussion of the typical analysis boundaries and associated risk criteria. Then, it discusses how the analysis boundary and risk criteria affect the consideration of protection layers, enabling conditions, and conditional modifiers.