An Application of Risk-based Design Criteria: HF Alkylation Rapid Acid Deinventory System

Stephen D. Unwin, PhD
The Unwin Company
1920 N.W. Blvd, Suite 201
Columbus, Ohio 43212

Robert R. Roberts
Roberts and Roberts
8642 Villa La Jolla Dr., Suite 6
La Jolla, California 92037

ABSTRACT

The value of systematic, hazard identification techniques in the management of operational safety has been demonstrated to many through practical experience. What may have initially been a regulatory burden to certain companies seeking compliance with the OSHA PSM Standard has proven to become a central, practical basis for decision-making. Furthermore, an insight finding growing acceptance is that relatively small enhancements in the technical risk-basis for a process hazard analysis (PHA) method can result in disproportionately greater return in terms of its value as a decision tool. Application of quantitative risk assessment, though not specifically demanded by PSM, is a refined form of PHA that can provide robust, defensible bases not only for safe process operation, but also for safe process design.

Ultramar currently operates a UOP HF Alkylation Unit at its Wilmington Refinery. An Acid (HF) Isolation and Evacuation System (AIES) was installed at the unit to mitigate the unlikely event of a significant acid leak. Three design options were originally identified, each with distinctive characteristics in terms of accident mitigation capability and reliability. Selection among the AIES options was based on a detailed, comparative assessment of operational risk. The assessment had three principal objectives:

1. Quantify the accident risks associated with each of the three AIES design options.
2. Identify those design and operational characteristics of the options that distinguish them from the perspective of reliability and risk.
3. Based on comparison of the three risk profiles, provide a robust technical basis for identifying the preferred option for implementation.

This paper describes the methods used in the risk-based design selection.