Practical Examples of Alternate Overpressure Protection Systems
An Owner’s Perspective

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Abstract

In 2007, the American Petroleum Institute (API 521/ISO 23251) published guidance on the use of High Integrity Protective Systems (HIPS). In 2009, The Dow Chemical Company (Dow) updated its internal work process to apply Dow’s risk based work processes to HIPS design, application and evaluation. The overall result is an efficient process that links together the existing work processes for conventional relief design, Layers of Protection Analysis (LOPA) and Safety Instrumented Systems (SIS). This produces a risk based method for applying and designing protection layers into HIPS. For additional details, refer to ”High Integrity Protection System Design Using a Risk Based Approach” by Robert J. Stack, AICHE 2010 spring meeting 6th Global Congress on Process Safety [1].

A natural extension of HIPS is to use system design and operating discipline to mitigate overpressure scenarios where use of fully instrumented protection layers or conventional relief devices is neither practical nor effective. For example, fire protection systems may be used to mitigate the consequences associated with a fire and reaction scenario where conventional relief devices and instrumentation systems are not possible. In Dow, this approach is referred to as Alternate Overpressure Protection (AOP).
System design (HIPS or AOP) is used to mitigate overpressure scenarios when: 1) a conventional pressure relief device (PRD) is not practical or effective, 2) a conventional PRD will not be reliable or 3) a conventional PRD will work but is not cost effective. In addition, system design can also be used to reduce the required relief size by limiting the operating window of the process.

The purpose of this paper is to provide several practical examples on the use of HIPS and AOP and to describe some of the challenges and associated strategies to ensure successful implementation and sustained process safety performance.