Hazards of Unplanned Power Outages:
Implementing Appropriate Safeguards

Tara L. Henriksen, Delmar “Trey” Morrison III and Russ A. Ogle
Exponent, Inc.
1011 Warrenville Rd Suite 215
Lisle, IL 60532
thenriksen@exponent.com

Abstract

Accident root cause investigations often may identify unplanned power outages as the cause of a catastrophic accident. Unplanned power outages can be an initiating event that leads to an emergency shutdown of a process unit. If the emergency shutdown is managed incorrectly, it can result in an uncontrolled release of hazardous chemicals.

In 2008, over 200 power outages across the U.S. resulted in incidents or hazardous releases at chemical processing or handling facilities. It is generally accepted that this type of accident is the result of multiple causal factors. To prevent a catastrophic accident, it is necessary to employ one or more safeguards to interrupt the chain of accident events. A process hazards analysis is the most effective tool for identifying these safeguards and evaluating their effectiveness prior to an incident. Examples of such safeguards are emergency shutdown procedures with operator training, emergency shutdown systems (including safety instrumented systems), and backup power supplies.

Often, secondary power is able to keep processes running until primary power can be restored or until a safely controlled shutdown can be completed. With the appropriate pre-incident planning, process safety design solutions can decrease the risk of an incident during this time.

This paper explores the ways in which hazard analysis and emergency planning can be utilized to ensure a safe transition to a secondary power source during an interruption of primary power. A case study of an accidental release of hydrochloric acid in which multiple safeguards were defeated after a power outage is presented. An interesting feature of this incident was the excessive testing of the emergency power system that led to its premature, and undetected failure. Thus, when commanded to operate during a power outage, the backup system failed. We illustrate how a layer of protection analysis, coupled with the development of best practices from industrial safety standards, would have suggested a better inspection and test protocol for the emergency power system. A sample checklist for process safety planning for a power outage is included to guide facilities in creating or revising current procedures during unexpected power outages.