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**Use of Combustible Gas Detectors in Safety Instrumented Systems – A  
Practical Application Case Study**

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**Abstract**

A risk assessment carried out on a chemical process identified a flammable liquid release as a potential hazard. A flammable liquid is used as a solvent in the process and is present in a dryer vessel during normal operations. The product from this vessel is a dry powder that is transferred to a packaging room directly below the vessel. Any leaks through the product discharge valve or inadvertent opening of the valve during the drying process or inadvertent opening/leak through of the flammable liquid feed valves during the discharge process could lead to flammable liquid release in the packaging room with potential for fire and explosion.

It was determined that the hazard could not be detected through conventional process variables and that the only way to detect the hazard was to use combustible gas detectors. An analysis was conducted which led to the design being considered a Safety Instrumented System and not a Fire and Gas System. Further risk assessments were conducted including a Fault Tree Analysis, Event Tree Analysis, and Probability of Failure on Demand (PFD) calculations for the combustible sensors as well as PFD average calculations for the Safety Instrumented Function (SIF) to confirm that the design of the SIF met the required risk reduction targets.