



COMPRESSED GAS ASSOCIATION, INC.

SAFETY ALERT

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PREVENTING ENERGY RELEASES IN CARBON DIOXIDE BY-PRODUCT PLANTS CAUSED BY HIGH HYDROCARBON/AIR MIXTURES IN FEED-GAS SUPPLIES

Feed gas streams to by-product carbon dioxide (CO₂) plants can become contaminated with high levels of hydrocarbons and oxygen (or air) when a process upset occurs at the feed-gas source. This can result in a potential for fire and/or explosion within the CO₂ plant process equipment. There is a potential for this kind of incident at practically all types of CO₂ by-product feed-gas sources.

Such an incident occurred recently at a U.S. CO₂ plant. The alcohol plant that supplied the CO₂ plant with feed gas experienced an upset caused by a failed level switch. The upset resulted in abnormally high concentrations of alcohol and air in the feed-gas stream. An energy release downstream of the CO₂ plant's first stage compressor caused a breach of the interstage piping. Discharged compressor oil caught fire and further damaged the surrounding piping insulation.

To prevent these types of incidents, a process evaluation should be conducted to determine what type and the level of contaminants and/or oxidizing gases that, if present in the incoming gas stream, will cause an unsafe gas mixture in the CO₂ plant. A suitable monitoring system should be used to measure the contaminant concentration and/or oxygen concentration in the incoming gas. For example, a monitoring and shutdown system could be designed to prevent exceeding 50% of the lower explosive limit (LEL) for any hydrocarbons that could be present and/or an oxygen concentration that will produce a flammable mixture in the CO₂ plant. These limits should be established based on the CO₂ plant's operating pressures, temperatures, recycle streams, and potential plant upset conditions.

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Carbon Dioxide Committee