

## **Dispersion behavior in severe vapor cloud explosion incidents**

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Over the last thirty years, a number of severe vapor cloud explosions have taken place at fuel storage depots and petrochemical sites, including incidents at Buncefield (UK) in 2006, Jaipur (India) and San Juan (Puerto Rico) in 2009, and Amuay (Venezuela) in 2012. A review of these incidents has recently been undertaken to identify common factors, which has reached some unexpected conclusions. More than half of the incidents reviewed appear to have involved relatively modest release rates of dense vapor that dispersed in very low or nil wind speeds over a prolonged period of several tens of minutes. Following the ignition of these clouds, the burn pattern on the ground shows that the clouds spread outwards in all directions from the source. Commonly, this type of very low/nil wind dense gas dispersion behavior is not considered in hazard analyses. Indeed, many integral-type dispersion models that are used in the process safety industry are unable to simulate this behavior. The review of these vapor cloud incidents suggests that further work is needed to develop and validate models for dense gas dispersion in very low or nil wind speeds.