

The Buncefield accident—why was the explosion so severe.

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Abstract:

In the early morning of December 2005, a vapour cloud explosion occurred at the Buncefield oil depot in Hemel Hempstead, UK. The vapour cloud was a result of the spillage of about 300 tonnes of winter- grade gasoline following the overfilling of the storage tanks on the site. The resultant explosion was very severe. Fortunately, there was no fatality but 43 people were injured and there was extensive damage to the oil depot, its immediate surrounding areas and widespread damage up to 10 km. Damages were of order £1 billion. An oil depot, such as the one in Buncefield, had not been considered to have the potential for a severe vapour cloud explosion. Unlike a refinery, there was little equipment and pipework congestion in an oil depot. There did not appear to be any factors present that could lead to a severe vapour cloud explosion. An initial investigation report stated that the damage was consistent with the current understanding of vapour cloud explosions. The Buncefield Major Incident Investigation Group commissioned the Explosion Mechanism Advisory Group to carry out a review of possible explanations. This was part of a Joint Industry Project (JIP) which examined the evidence in detail and carried out experimental work to fill some of the knowledge gaps. The results of Phase 1 of this JIP are published in a report (HSE, 2009a); key conclusions are summarised here. The group examined a range of explosion mechanisms and concluded that the most likely explanation was that a deflagration occurred in the dense vegetation along Three Cherry Tree Lane. The deflagration progressed to a detonation. Phase 2 of the project is now being developed. Its objectives are to verify the deflagration to detonation transition hypothesized in Phase 1, the viable explosion mechanism, and produce data to allow the development of a guidance for the industry to minimize the risk of an effectively product overspill, generation of flammable vapour and consequence of explosion. Participation of interested parties from the world would help Phase 2 to better achieve its objectives.

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