

Paraphrasing 2



BLEVE due: July 5th 1973 gave rise to a drastic BLEVE incident in Kingman, Arizona. This incident killed 11 firemen. BLEVE means Boiling Liquid Expanding Vapor Explosion. Most reported cases of BLEVE are linked with inflammable liquids and gases, resulting to fatal cases. This means that the cases are contributed by the failure of Liquefied Petroleum Gas (LPG) vessels or containers which had been exposed to flames or heat. Like in this discussed case, the incident occurred following a fire that broke out as propane was being taken from a railroad car to a storage tank. A leak was identified and endeavors to correct the defect by striking the fitting with a large wrench triggered the gas to ignite, which turned the tank car into a blowtorch. Processes that are linked to BLEVE include heat transfer (from flame to tank, between liquids and vapor phases, and from tank walls to the liquid and vapor stages, thermodynamic changes within the tank linked with pressure buildup, tank failure, material property degradation, and activation of pressure relief valve. Thus, issues with a missing relief valve, poor maintenance, inaccurate instruments, and inoperative or bypassed safety devices are linked with BLEVEs (Laboureur et al., 2013).

Most cases of BLEVEs are conveyed by fragmentation, blast effects, and fireball radiation. A BLEVE leads to spontaneous, vigorous liquid boiling and the production of a shock wave. This is a type of explosion that occurs in a vessel under rapid heating process containing a high degree of pressurized liquid, for example, liquefied petroleum gas that has failed catastrophically. This substance (e. g. propane) is stored under pressure and contains a boiling point below ambient temperature range. In the case where the liquid contains a temperature above ambient boiling points, but it is heated before it is emitted by an external heat source to a temperature exceeding its

boiling point can result to a BLEVE. This means that when the vessel fails, the internal pressure drops drastically to atmospheric and the hot liquid rapidly boils releasing a lot of vapors. This damage is as a result, of a pressure wave from the rapid expansion of the emitted vapor and flying fragments of the vessel and piping; if the material is combustible a hazard takes place. The hazard brought about by a BLEVE of a container containing flammable liquid is a fireball, a major fire, and the production of a powerful radiant heat flux. Moreover, BLEVE can be employed to refer to any sudden loss of containment of liquid more than its normal boiling point at the time of its failure. This can be accompanied by fragmentation of the vessel, and if the liquid is flammable, then a fireball, or vapor cloud explosion is expected (National Fire Protection Association & International Association of Arson Investigators, 2005).

A container or vessel can fail for several reasons mostly damage by mechanical impact of another object. This damage results to the development of a brutal force affecting the internal pressure which creates a crack if the container material is brittle. Therefore, if the container is faced with the impact of any means, it may rupture completely resulting to BLEVE. Other reasons of a container or vessel failure are corrosion, internal overheating, and manufacturing defects which can make the container's metal weaken beyond the degree at which it can withstand internal pressure and cause large cracks and in some cases completely separate the container into pieces. In addition, is a vessel or container is exposed to external fire source below its design pressure point, BLEVE may occur if the vapor space is exposed to flames. This is because the flames heat and weakens the metal leading to its failure.

A precaution all plant employees have to keep in mind is to expect and be ready for a BLEVE in case there is a fire outbreak. All protective safety systems must be well maintained to enhance safety. Most importantly, water spray fire protection systems i. e. fire water monitor nozzles provide protection against BLEVE as they keep the vessels cool thus maintaining mechanical integrity when exposed to a heat source (Laboureur et al., 2013). In reference to the Kingman incident, standard procedures for handling a BLEVE became well known in all fire departments nationally. Films and pictures of this incident form part of the training course.

References

Laboureur, D., Heymes, F., Lapebie, E., Buchlin, J. M., & Rambaud, P. (2013).

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overpressure: Multiscale comparison of blast wave modeling. *Process Safety Progress*.

National Fire Protection Association., & International Association of Arson Investigators.

(2005). *Users manual for NFPA 921: Guide for fire and explosion investigations*. Sudbury: Jones and Bartlett.