

Explosions

Every year, hundreds of equipment items are damaged in an explosion. These events are often described in familiar terms:

- ✂ a flammable vapor, air and an ignition source generate pressure,
- ✂ which ruptures piping/buildings/equipment (like these column trays),
- ✂ leading to property damage, downtime, lost business and, in some cases, serious injury or death to personnel in the immediate area.



There are many ways to prevent explosions - this message will BRIEFLY discuss one: **How much flammable material is needed to generate an explosion?** The short answer is - in most cases, **LESS THAN YOU MIGHT THINK!**

Most flammable materials have a flammable range, a concentration of the flammable material in air, which will support combustion. If the concentration of the substance is above or below these “flammable limits”, combustion will not occur. Please recognize that these values depend upon a number of variables, including the material itself, the pressure, and the oxygen concentration.

Let's go take a fairly simple example – PROPANE, a material many of us have in our home B-B-Q grills. **How much propane is needed to fill a 2-car garage (say 20' by 20' by 10') to its lower flammable limit?** Propane's flammable limits in ambient conditions are between 2.3% and 9.5% (by volume) in air (ref: SAX, 9th edition). **SO....**

- garage volume = 20 * 20 * 10 = 4000 ft³
- lower explosive limit amount = 2.3% * 4000 ft³ = 92 ft³ of propane vapor
- which is equivalent to about 3 gallons of liquid –

Answer: **NOT MUCH!**

In a typical manufacturing site, flammable materials are handled in hundreds or thousands of gallons. It is obvious that careful control is needed for these materials. Very small quantities, even those involved with valve leakage, can generate events which have very severe consequences!

{PSID Members see Incident *327 }

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