

Explosion in a Tank

EPSC Learning Sheet April 2022



What Happened:

A Sulfuric acid tank was emptied, aerated and prepared for inspection. During removal of rusted bolts of a cover on the tank roof using a grinder, an explosion occurred. Hydrogen had collected under the tank roof.



Aspects:

- Concentrated Sulfuric acid with some water becomes very corrosive for carbon steel and generates hydrogen:
$$\text{H}_2\text{SO}_4 + \text{Fe} \rightarrow \text{H}_2 + \text{FeSO}_4$$
- Measuring the presence of flammable gas was done at the manhole (entry) at the bottom of the tank. The explosive mixture (hydrogen/air) however accumulated under the dome at the top of the tank.
- Hydrogen in air has a very wide explosive range, it has a very low ignition energy at stoichiometric concentration and leads easily to a violent deflagration or detonation upon ignition. Assure top venting of acid tanks that are prepared for maintenance and inspection.
- Avoid accumulation of hydrogen at high locations.

Hydrogen can accumulate at high locations forming an unexpected explosive mixture