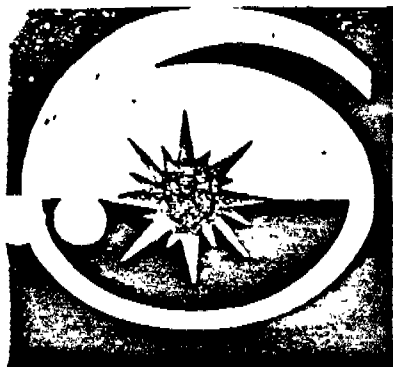




Reactive Chemicals News

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Several of you have commented that the reactive chemicals quiz questions are good training material. The questions below should test your basic knowledge of the subject. They came from a presentation that Irv Snyder made several years ago to various audiences in an effort to heighten awareness for potential reactive chemicals incidents. The entire presentation can be found in Central Research Index (CRI) Laboratory Report Code ZZ-RD-94-1.

REACTIVE CHEMICALS QUIZ

1. A man is welding a hot tap flange on an ethylene line. There are not spills, leaks or flammable vapors, but suddenly the line blows up. What happened?
2. A man is cutting the head off a drum of CHLOROTHENE*, and the drum blows up. CHLOROTHENE* is a well-know cleaning solvent which is widely used due to its low toxicity and non-flammable properties. What happened?
3. A titanium heat exchanger containing only a bit of water blows up as it is cut open with a torch. What happened?
4. A man is using a CO₂ fire extinguisher to temporarily apply an inert blanket to a tank containing gasoline. The tank blows up. What happened?
5. A man welding a fitting on the top of a sulfuric acid tank is killed as the tank blows up. What happened?
6. An out of service water header in a plant blows up as it is cut open with a torch. What happened?
7. A little acetone is used to dry out a flask and then it is poured down the sink in the lab. The sink blows up, even though the person is sure there was no source of ignition present anywhere. What happened?
8. There is a small styrene spill on the concrete slab. To make sure everything is cleaned up, some oil absorbent material is spread on the spill, swept up and put in a trash container. That evening, the trash container catches fire. What happened?
9. A tank car is being loaded with styrene considerably below its flash point when it blows up? What happened?

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REACTIVE CHEMICALS QUIZ ANSWERS

1. Ethylene raised to over 300 °C can spontaneously decompose into carbon and hydrogen releasing large quantities of energy. This occasionally happens in a low density polyethylene reactor, and the result is known as a black decomp.
2. Chlorothene®, while needing a high energy spark, is flammable between 8 weight percent and 15.5 weight percent in air.
3. Titanium heated to high temperatures will "burn" the oxygen out of water to give titanium dioxide and hydrogen. Hydrogen has a broad flammability range in air, and this caused the explosion.
4. Carbon dioxide coming rapidly out of a fire extinguisher will generate static electricity, which can ignite a flammable vapor in air. Carbon dioxide extinguishers should only be used on paper, wood and electrical fires. They do not belong out in a plant where flammables are present.
5. Sulfuric acid is oftentimes stored in rubber lined tanks. However, a rubber lined tank can have small flaws where the acid can get to the steel. The result is corrosion which produces hydrogen. If you haven't checked your acid tank, you would be interested to know that the vapor space in many of these tanks is flammable. This can easily be controlled by purging the vapor space with air.
6. Isolated water headers have been known to generate hydrogen in the vapor space due to corrosion. Even when cutting into a water header, it is a good idea to drill a small hole and check to see if the inside of the pipe has a flammable atmosphere.
7. The person before you put some peroxide down the sink. Acetone plus peroxide forms trimeric acetone peroxide, which is notoriously unstable.
8. Oil absorbent materials greatly increase the surface area of a chemical exposed to air. Left in a confined space, the material starts to oxidize slowly and then heats up to its autoignition temperature. Certain types of insulation soaked with a whole variety of hydrocarbons will appreciably lower the autoignition temperature.
9. The tank car had a trace of benzene in the bottom. Since styrene always contains some benzene, this minor quantity did not effect the styrene purity. However, this small quantity of benzene did vaporize when the styrene was allowed to drop through the vapor space into the car. Without proper grounding between the liquid and the loading arm, a static charge developed, a spark resulted and the car blew up.

I hope you scored well. It is important to note that all of our reactive chemicals incidents last year were "known chemistry" - known by someone within Dow but not necessarily by the person doing the job associated with the incident. Clearly application of knowledge is one of our greatest challenges in reactive chemicals.

If any of you have additional reactive chemicals quiz questions that could be used in future *Reactive Chemicals News* publications, please send them to me.



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