Ammonia: fertilisers to be handled with care

Use of fertilisers

Global use of fertilisers has more than doubled in the last thirty years. More than 160 million tonnes of fertilisers are spread over the surface of the planet each year and in six decades use of these substances will have increased five times. The large quantity of these fertilisers is, of course, one of the principal factors behind agricultural pollution.



Accidents

They can also be the cause of deadly accidents. The explosion at a fertiliser plant near Waco, Texas, is only the latest in a long list of fatal incidents involving ammonium nitrate, which is used both as a fertiliser and for explosive devices. Since 1921, seventeen unintended explosions of ammonium nitrate including casualties have been recorded.

The most serious industrial accident in the history of the United States happened in 1947 when a cargo ship exploded in the Port of Texas City, leaving 581 dead and 3500 injured.

Three other ammonium nitrate accidents have caused more than 100 deaths: the explosion of a BASF plant in Oppau, Germany, in 1921 (561 dead); the explosion at a plant in Tessenderlo, Belgium, in 1940 (189 dead); and the 2004 cargo train explosion of Ryongchŏn, North Korea, which caused at least 160 deaths.

Production

The food shortage and consequent rise in world food prices has led to a record demand for fertilisers around the world, increasing trade in nitrogen, the main ingredient of many fertilisers.

Fertiliser production is big business – the United States exported $10.8 billion – worth of them in 2012, about 9% of world consumption. Nearly every state in the US has at least one major fertilisers production facility located within it.

Ammonia

One of the most common ingredients found in fertilisers is ammonia. It is delivered to the soil as a colourless liquefied gas called anhydrous ("without water") ammonia, comprising 82% nitrogen to 18% hydrogen, which is absorbed on contact with the earth. Its chemical formula is NH_3. An alternative form of ammonia delivery is in granulated form as ammonium nitrate, or NH_4NO_3, which derives from NH_3 combined with nitric acid. Both chemicals are stable but burn at high temperatures if initiated by another source. NH_3 requires additional special handling because of the risk of skin burns from exposure to the deep-chilled liquid.

NH_4NO_3, a soluble white powder that is readily soluble in water, becomes explosive beyond 290 degrees Celsius (554 degrees Fahrenheit) – a trigger than can come from lightning or a fire triggered by an electrical spark.

But an explosion only occurs when it is stored in large volumes, causing a chain reaction. The chemical stored in the facility in Texas is not generally considered as much of a fire or explosion risk as other nitrogen-based fertilizers. But it seems that under certain conditions, what has been thought of as a safe chemical can turn deadly.

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1 Decide which nouns the words underlined in the passage refer to.

1. *they* refers to .....
2. *which* refers to .....
3. *them* refers to .....
4. *it* refers to .....
5. *it* refers to .....
6. *which* refers to .....
7. *its* refers to .....
8. *which* refers to .....
9. *that* refers to .....
10. *it* refers to .....

2 Ask suitable questions to these answers.

1. .....
   Fertilisers can pollute the environment and cause serious incidents.
2. .....
   A chemical compound called ammonium nitrate.
3. .....
   At a fertiliser plant near Waco, Texas.
4. .....
   There have been seventeen incidents caused by ammonium nitrate since 1921.
5. .....
   The food scarcity and the increase in world food prices.
6. .....
   Nitrogen.
7. .....
   Approximately 9% of world fertiliser consumption.
8. .....
   A colourless liquefied gas.
9. .....
   Anhydrous ammonia combined with nitric acid.
10. .....
    When the temperature goes above 290°C.

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