



# SAFE STORAGE AND HANDLING OF AMMONIUM NITRATE (AN)

The following provides safety guidance on ammonium nitrate. It does not address security issues.

## PROPERTIES

Ammonium nitrate readily absorbs water and is very soluble 190 grams dissolve in 100 grams of water at 20 °C.

AN sold for fertiliser is the same substance as AN sold for use as an explosive. The explosive grade is a lower density prilled material designed to absorb fuel.

Whenever AN passes 32 °C it undergoes a crystal change known as thermal cycling. It results in the prill breaking down, caking and becoming less useful as an explosive as it cannot absorb fuel.

## HAZARDS

Ammonium nitrate has three main hazards, toxic decomposition products, fire due to oxidising nature and explosion.

1. Pure ammonium nitrate melts at 170 °C and decomposes above 210 °C producing copious clouds of toxic fumes (mainly oxides of nitrogen) that may be yellow or brown. Some fertiliser grades of AN have an increased susceptibility to slow burning (cigar burning) due to chloride in the formulation associated with potassium as an additive.

2. Ammonium nitrate is an oxidising agent so it supplies oxygen to the fuel in a fire and supports burning even when air is excluded.

3. In a fire pools of hot molten ammonium nitrate may form and if confined (eg in a drain) may

explode. This is because hot and molten ammonium nitrate becomes very sensitive to shock particularly if it contacts incompatible material. As the size of the AN stack increases or the density of the product decreases, the vulnerability to detonation increases.

## ACCIDENTAL EXPLOSIONS

- *St Romain en Jarez, France, 2003*  
3-5 tonnes of AN in a farm warehouse exploded, 26 casualties.
- *Toulouse, France, 2001*  
40-80 tonnes of AN exploded (300-400 tonnes stored) at AZF fertiliser works, 30 killed, 2,242 injured. At the time the largest industrial accident in French history.
- *Taroom, Queensland, 1974*  
2 tonnes of AN on a truck exploded after the truck caught fire, killing 3.

Recent (2004) incidents that may also have involved ammonium nitrate include train explosions in Iran and N Korea and a truck explosion in Spain.

### *St Romain en Jarez, France 2 October 2003, details:*

Fire located in a double storey farmhouse in a small rural village of 1000 inhabitants.

16:02 fire brigade called to a farmhouse fire  
16:24 arrival of fire brigade to fight a farm warehouse fire

17:12 mass explosion occurs.

Casualties totalled 26; including 18 firemen (3 suffering injuries compromising life), 3 policemen and 5 civilians.

Houses (82) suffered structural damage. Nearest dwelling 60 metres from warehouse,  
-very serious damage to 150 metres  
- significant damage between 300 to 600 metres  
- damage observed as far as 650 metres.  
- steel beams projected to 500 metres  
- fire appliance destroyed.

The store contained a cold storage area of potatoes in plastic boxes, 3000 empty plastic boxes, hay stored on an upper level (the presumed source of the fire).

Ammonium nitrate was stored in 3 tonne bags.

From the surrounding damage the TNT equivalent was derived and the ammonium nitrate was calculated at 2.6 to 5.3 tonnes. This agreed with the witness estimates of 3 to 5 tonnes.

## STORAGE

If ammonium nitrate is stored in a building it should be a dedicated, single storey building constructed of material that will not burn such as steel, concrete or brick.

For many industrial situations an insulated shipping container is ideal. A second- hand, food-grade

container is already insulated and lined with stainless steel and it can readily have an aluminium floor fitted.

If ammonium nitrate is stored outside it should be protected from the weather.

Keep ammonium nitrate dry as the risk of explosion increases once the product becomes caked.

Avoid drains, channels and pits where molten ammonium nitrate from a fire could become confined.

Nitrate is a pollutant in waterways and aquifers. Storage sites should be selected to ensure no contamination of water, including that used in firefighting.

Locate storage away from sources of heat, fire or explosion.

Electrical equipment and wiring must be kept in good order and be regularly inspected as it can cause fires if faulty. Install main electrical switches and fuses outside the storage area to minimise the risk of fire.

Except when stored in an insulated shipping container, do not store the ammonium nitrate closer than 1 metre to walls and roof and never within 1 metre from electrical wiring or lighting.

Do not store ammonium nitrate in the same stack as other products.

It is preferable to store ammonium nitrate in a separate building from urea. If this cannot be achieved, store it so accidental mixing is prevented in any foreseeable accident situation. For example, use separate bays.

Store ammonium nitrate away from combustible materials by a distance of at least 8 metres or use a barrier of inert material of at least 1.5 metres width.

Wooden pallets are a fire risk; do not store unused wooden pallets in

the store unless separated by a suitable distance or barrier. Remove empty AN bags from the storage area.

Prohibit smoking in storage areas and display NO SMOKING signs or symbolic prohibition signs.

Outside the store there should be no combustible material within 8 metres and no standing timber within 15 metres.

Self-confinement of AN can increase the risk of detonation. It is preferable to limit stack sizes to 50 tonnes.

### HOUSEKEEPING

Keep vehicles, forklift trucks etc clean and well maintained to prevent ammonium nitrate contacting fuel, oil or grease.

Clean up spillages promptly and dispose of contaminated product by dissolving in water before disposal.

Do not use organic matter as a cleaning aid (eg sawdust), use inert material such as sand or vermiculite.

Do not allow pallets, ropes, tarpaulins or other equipment to become impregnated with ammonium nitrate.

Keep walls, floors and equipment clean.

Avoid hollow sections in equipment to prevent build up of ammonium nitrate. If unavoidable they must be regularly washed.

Ensure any contaminated equipment is thoroughly washed to remove ammonium nitrate before allowing maintenance, particularly that involving heat, such as welding or cutting.

AN can generally be disposed of by dissolving in water and using as a fertiliser.

### INCOMPATIBLE MATERIAL

Do not store ammonium nitrate in the same building as incompatible materials. The risk of fire or explosion is increased if ammonium nitrate is mixed with combustible or incompatible materials (including when molten in a fire) such as:

- Flammable or combustible liquids such as petrol, diesel, oil, grease, paint, carbonaceous material.
- Pressure vessels and gas cylinders.
- Oil based pesticides.
- Organic matter, such as hay, straw, grain and animal feedstuffs.
- Sulphur.
- Corrosive liquids, acids, alkalis and other reactive substances (oxidising or reducing) such as chlorates, hypochlorites, bleaching powder, nitrites, copper or chromium salts, chromates, permanganates.
- Powdered metals, alkali metals, zinc or galvanised iron, copper or copper alloy.
- Urea.
- Chlorides.
- Products which generate heat in the presence of moisture, such as quick-lime, and calcium cyanamide.
- Products, which will generate ammonia gas from the ammonium nitrate, such as cement, lime, basic slag and other alkaline substances.
- Other agricultural products whose behaviour towards ammonium nitrate is uncertain, for example branded pesticides, disinfectants or weedkillers.

*This information is provided to offer guidance, it is not to be taken as a statement of law and must not be construed to waive or modify any legal obligation.*