What all rescuers should know -
Chemical propellant for airbags can kill !

Report by Len Watson

Last updated 11/2010

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Sodium Azide (NaN_3) airbag propellant is a growing health hazard and environmental problem -

Vehicle Airbags use a chemical compound that is so toxic that even small amounts can kill. Yet tons and tons of Sodium Azide (NaN_3) are routinely transported around the longitude and latitude of the world. Additionally scrapped airbags sit like environmental time bombs in the myriad of scrap yards that we see in most communities.

On March 26, 2005 at a national meeting of the American Chemical Society in San Francisco, atmospheric scientist Eric A. Betterton (University of Arizona) said 'scientists really don't know where or how all this Sodium Azide will inevitably wreak greatest environmental havoc'. For several years now, both he and his undergraduates have been carrying out experiments to gain a greater understanding.

Although Sodium Azide is already used in many industrial products, such as explosives, detonators, anticorrosion solutions, broad-spectrum biocides and airline safety chutes, with the advancement of passive vehicle safety systems a much larger threat to our environment has emerged over the last 15 years.

Betterton stated -

> "As the demand for airbags increases, and as vehicle fleets age over the next few decades, the amount of Sodium Azide that could potentially be released to the environment will greatly exceed the approximated 5 million kilograms (11 million pounds) that has already been incorporated into airbag inflators in the United States alone."
>
> "Given the huge surge in production, there exists a greatly increased potential for significant accidental spills and subsequent human and environmental exposure to this material."

Sodium Azide

Sodium Azide (NaN_3) looks like common table salt but is every bit as powerful a poison as Sodium Cyanide. Even in minute amounts it can kill everything from bacteria and fungi to animals and humans.

Ingesting or adsorbing as little as 50 milligrams (less than two-thousandths of an ounce) can cause the average adult to collapse into a coma-like state within five minutes. Blood pressure will drop and the heart will become tachycardic. Ingest a few grams, and death can occur in as little as 30 minutes.

Studies as far back as 1970 show that at 10 parts per million in the soil, Sodium Azide kills or degrades the seeds of many plants. Betterton noted that at 200 ppm, it not only sterilises the soil - but also changes soil chemistry, killing all soil bacteria and fungi.

Little is known about the environmental effects of Sodium Azide. However what is known is that Sodium Azide is water-soluble. Betterton states that "Spills could possibly migrate into the water table via sewers, streams, lakes, and groundwater systems,".

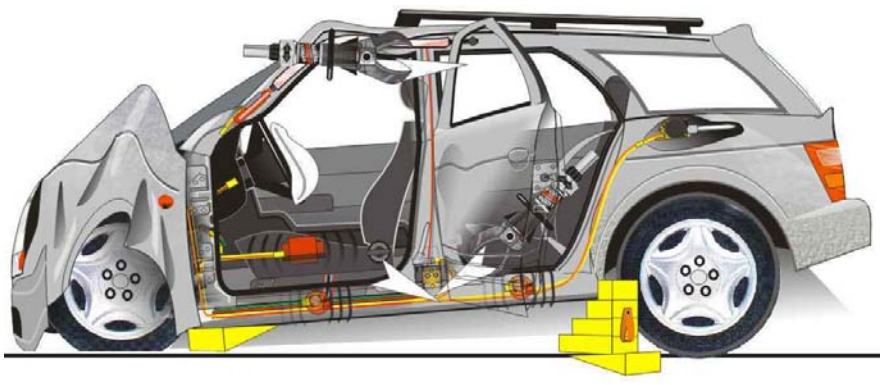
The compound when wet protonates volatile Hydrazoic Acid, a potential threat to rescuers, vehicle recovery agents and even sanitation workers and others that may come in contact with the Acid or Hydrazoic Acid gas.

Betterton and his students tested how readily it oxidises when exposed to some environmental oxidants that may be found in water, such as Hydrogen Peroxide, an ingredient in natural rainwater, and ozone, a very powerful oxidant in the atmosphere.

Oxidisation is just one way Sodium Azide degrades in the environment. Betterton's studies also show that Sodium Azide combines readily with water to form Hydrazoic Acid. The "Henry's Law constant" for Hydrazoic Acid, or the ratio of how much Hydrazoic Acid that remains in solution and how much will be released as highly toxic Hydrazoic Acid gas into the atmosphere. The Henry's Law constant identifies that much more of the acid is released as gas into the atmosphere than remains in water.

Rescue Implications -
The wide use of Sodium Azide as a means of propellant to inflate airbags in passive restraint systems is readily accepted as the motor industry standard. Tiny tablets of Sodium azide are packed into a 50mm-diameter metal canister inside the airbag module. The driver-side airbag inflator holds about 50 grams of Sodium Azide. The passenger-side airbag inflator is about 150mm in diameter and holds in the region of 200 grams to inflate the larger front passenger bag. Moreover and perhaps much more prevalent, seat airbags and seatbelt pretensioners can also contain Sodium Azide.

This knowledge gives immediate recognition to the risk that rescuers face when performing certain extrication evolutions in releasing trapped vehicle occupants. Apart from the obvious risk of deploying undeployed systems as the wreckage is cut away, rescuers are also confronted with the possibility of inadvertent cutting through a module releasing Sodium Azide. The highest probability of this would appear to exist when removing the side of the vehicle.



Cutting away the centre post complete with the rear door on the 4 door car usually necessitates cutting into the base of the centre post. To inadvertently cut through the pretensioner unit can liberate the Sodium Azide and powder the pellets in the process. This becomes more prevalent where a 'combi' tool is used to cut the base of the centre post.

Release of Sodium Azide -
A similar situation also exists where the 1/4 panel on a 2 door car or coupe needs to be cut away to release a rear seat occupant. The hydraulic cutter has sufficient power to cut through the pretensioner's cartridge and, where it does not deploy under the cutting pressure, liberate its contents.

Potentially this situation could be exacerbated if it were raining at the time or, if the powdered residue on the cutter's blades were to fall into open wounds or the dust inhaled on a windy day.

Of course avoiding the pretensioner in the first place would appear to be the answer; but 'what if' still identifies a valid training need.

'Side removal' performed using a combi tool carries the highest risk of inadvertently cutting through the pretensioner module.

We must also consider that in the process of extricating people from crashed vehicles rescuers will cut away doors, roofs and remove seats. Some doors and seats which, on many occasions, will increasingly incorporate undeployed airbags; when removed will become a hazard putting investigating officers, recovery agents and reclaimed parts and scrap technicians at risk. This in time promises to become a serious situation generating thousands of door, seat and roof units year on year in the UK alone.

End of life airbag
Every airbag has a rated life expectancy in which it should perform as intended. Most manufacturers state 10 some state 15 years. As the module matures and its life cycle reached and exceeded, pellets will suffer from fatigue and crumble. The increased surface area of degraded propellant will give rise to faster ignition with much greater deployment force that can burst the airbag.

With age the integrity of the hermetic container can fail. Sodium Azide is hydroscopic and atmospheric water vapour can leak through the inner foil and the squib seal and corrode contacts and the container itself, which in turn can leak Hydrozoic Acid.

End of life vehicle processing (Depollution).
From the 2.3 million End-of-Life Vehicles (ELV) in the UK each year, scrap yard technicians increasingly remove airbags and store them. Some are left in cars as they stand degrading in the lot. Some are crushed and the airbag canister can burst open, spilling Sodium Azide and generating dust or Hydrazoic Acid.

Airbag storage is a problematic issue for many organisations. Any airbag store needs to meet a minimum specification and be licensed. The store must be securable, weatherproof and clearly labelled with the appropriate warning signs. A method of stock control / tracking of contents is also required. Licences are normally granted by the local Trading Standards Explosives Officer. Currently, it is illegal to attempt to dispose of live airbags in any UK landfill site.

With a view to control the ELV a directive was passed into European law in October 2000 and was due to be transposed into national law in all Member States by 21 April 2002. Unfortunately this was delayed (as in most other Member States), the UK is currently in the process of introducing the remaining provisions. However it is their aim to reduce, or prevent, the amount of waste produced from ELVs and increase the recovery and recycling of ELVs that do arise. Moreover they only state that airbags and pretensioners must be removed or deployed before depollution. How they actually enforce and police this is quite another matter.

No one currently knows the lifetime of Azide in the atmosphere and what the accumulative effect may be. What we do know is that Sodium Azide is a very dangerous and volatile substance and one that must be treated with a high degree of respect.

Security implication
A security warning would also seem to be in order. How long have we got before unscrupulous people realise the potential this readily available chemical holds for mayhem and terrorism? It takes little imagination to visualise the possibilities that could exist. Such an easily acquired chemical with high reactivity that changes its state so readily must give rise to serious security implications. Fortunately its saving grace is in the fact that it could prove lethal to reclaim from its sealed container.

Facts About Sodium Azide - What sodium azide is

- Sodium azide is a rapidly acting, potentially deadly chemical that exists as an odourless white solid.
- When it is mixed with water or an acid, sodium azide changes rapidly to a toxic gas with a pungent (sharp) odour. It also changes into a toxic gas when it comes in contact with solid metals (for example, when it is poured into a drain pipe containing lead or copper).
- The odour of the gas may not be sharp enough, however, to give people sufficient warning of the danger.

Where sodium azide is found and how it is used

- Sodium azide is best known as the chemical found in automobile airbags. An electrical charge triggered by automobile impact causes sodium azide to explode and release nitrogen gas inside the airbag.
- Sodium azide is used as a chemical preservative in hospitals and laboratories. Accidents have occurred in these settings. In one case, sodium azide was poured into a drain, where it exploded and the toxic gas was inhaled (breathed in).
- Sodium azide is used in agriculture (farming) for pest control.
- Sodium azide is also used in detonators and other explosives.

How you could be exposed to sodium azide

- Following release of sodium azide into water, you could be exposed to sodium azide by drinking the contaminated water.
- Following contamination of food with sodium azide, you could be exposed to sodium azide by eating the contaminated food.
- Following release of sodium azide into the air, you could be exposed by breathing in the dust or the gas that is formed.
- Sodium azide can also enter the body and cause symptoms through skin contact.
- An explosion involving sodium azide may cause burn injury as well as expose people to the toxic gas, hydrozoic acid.
- CDC has received no reports of sodium azide exposure following automobile airbag deployment.

How sodium azide works

- The seriousness of poisoning caused by sodium azide depends on the amount, route, and length of time of exposure, as well as the age and pre-existing medical condition of the person exposed.
- Breathing the gas that is formed from sodium azide causes the most harm, but ingesting (swallowing) sodium azide can be toxic as well.
- The gas formed from sodium azide is most dangerous in enclosed places where the gas will be trapped. The toxic gas quickly disperses in open spaces, making it less harmful outdoors.
- The gas formed from sodium azide is less dense (lighter) than air, so it will rise.
- Sodium azide prevents the cells of the body from using oxygen. When this happens, the cells die.
- Sodium azide is more harmful to the heart and the brain than to other organs, because the heart and the brain use a lot of oxygen.

Immediate signs and symptoms of sodium azide exposure

- People exposed to a small amount of sodium azide by breathing it, absorbing it through their skin, or eating foods that contain it may have some or all of the following symptoms within minutes:
    - Rapid breathing

    - Restlessness
    - Dizziness
    - Weakness
    - Headache
    - Nausea and vomiting
    - Rapid heart rate
    - Red eyes (gas or dust exposure)
    - Clear drainage from the nose (gas or dust exposure)
    - Cough (gas or dust exposure)
    - Skin burns and blisters (explosion or direct skin contact)
- Exposure to a large amount of sodium azide by any route may cause these other health effects as well:
    - Convulsions
    - Low blood pressure
    - Slow heart rate
    - Loss of consciousness
    - Lung injury
    - Respiratory failure leading to death
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to sodium azide.

What the long-term health effects may be

Survivors of serious sodium azide poisoning may have heart and brain damage.

How people can protect themselves and what they should do if they are exposed to sodium azide

- First, get fresh air by leaving the area where the sodium azide was released. Moving to an area with fresh air is a good way to reduce the possibility of death from exposure to sodium azide.
    - If the sodium azide release was outside, move away from the area where the sodium azide was released.
    - If the sodium azide release was indoors, get out of the building.
    - If leaving the area that was exposed to sodium azide is not an option, stay as low to the ground as possible, because sodium azide fumes rise.
    - If you are near a release of sodium azide, emergency coordinators may tell you to either evacuate the area or to "shelter in place" inside a building to avoid being exposed to the chemical. For more information on evacuation during a chemical emergency, see "Facts About Evacuation". For more information on sheltering in place during a chemical emergency, see "Facts About Sheltering in Place".
    - If you think you may have been exposed to sodium azide, you should remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- **Removing your clothing:**
    - Quickly take off clothing that may have sodium azide on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head.
    - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.

- **Washing yourself:**
    - As quickly as possible, wash any sodium azide from your skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
    - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them and put them with the contaminated clothing. Do not put the contacts back in your eyes (even if they are not disposable contacts). If you wear eyeglasses, wash them with soap and water. You can put your eyeglasses back on after you wash them.
- **Disposing of your clothes:**
    - After you have washed yourself, place your clothing inside a plastic bag. Avoid touching contaminated areas of the clothing. If you can't avoid touching contaminated areas, or you aren't sure where the contaminated areas are, wear rubber gloves or put the clothing in the bag using tongs, tool handles, sticks, or similar objects. Anything that touches the contaminated clothing should also be placed in the bag. If you wear contacts, put them in the plastic bag, too.
    - Seal the bag, and then seal that bag inside another plastic bag. Disposing of your clothing in this way will help protect you and other people from any chemicals that might be on your clothes.
    - When the local or state health department or emergency personnel arrive, tell them what you did with your clothes. The health department or emergency personnel will arrange for further disposal. Do not handle the plastic bags yourself.
    - For more information about cleaning your body and disposing of your clothes after a chemical release, see "Chemical Agents: Facts About Personal Cleaning and Disposal of Contaminated Clothing".
    - If someone has ingested sodium azide, do not induce vomiting or give fluids to drink. Also, if you are sure the person has ingested sodium azide, do not attempt CPR. Performing CPR on someone who has ingested sodium azide could expose you to the chemical.
    - When sodium azide is ingested, it mixes with stomach acid and forms the toxic gas, hydrozoic acid. If a person who has ingested sodium azide is vomiting, isolate and stay away from the stomach contents (vomit) to avoid exposure to the toxic gas.
    - Do not pour substances containing sodium azide (such as food, water, or vomit) in the drain, because the drain can explode and cause serious harm.
- Seek emergency medical attention right away and explain what has happened.

How sodium azide poisoning is treated

Sodium azide poisoning is treated with supportive medical care in a hospital setting. No specific antidote exists for sodium azide poisoning. The most important thing is for victims to seek medical treatment as soon as possible.

How you can get more information about sodium azide

You can contact one of the following:

- Regional poison control centre USA: 1-800-222-1222
- Centres for Disease Control and Prevention
    - Public Response Hotline (CDC)

- 800-CDC-INFO
- 888-232-6348 (TTY)

o E-mail inquiries: cdcinfo@cdc.gov

NOTES:
This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

The Centres for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

For technical information - visit - http://www.resqmed.com/TI-SodiumAzide.htm

If you wish to comment, add to or reply in general to this report, please use the contact under.

Reply to:

Len Watson **-**  *Click icon to launch e-Mail*

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