

Long Harbour: Nitrogen Awareness Orientation - 58

1. The Dangers of Nitrogen

1.1 Title Page



The Dangers of Nitrogen

February, 2019



1.2 L and D slide



Learning and Development



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1.3 Purpose

Purpose

This eLearning Module is approximately 15 minutes in duration and has been created to provide a basic awareness of Nitrogen gas and the dangers of working with and around it.

At the conclusion of this module you should be able to:

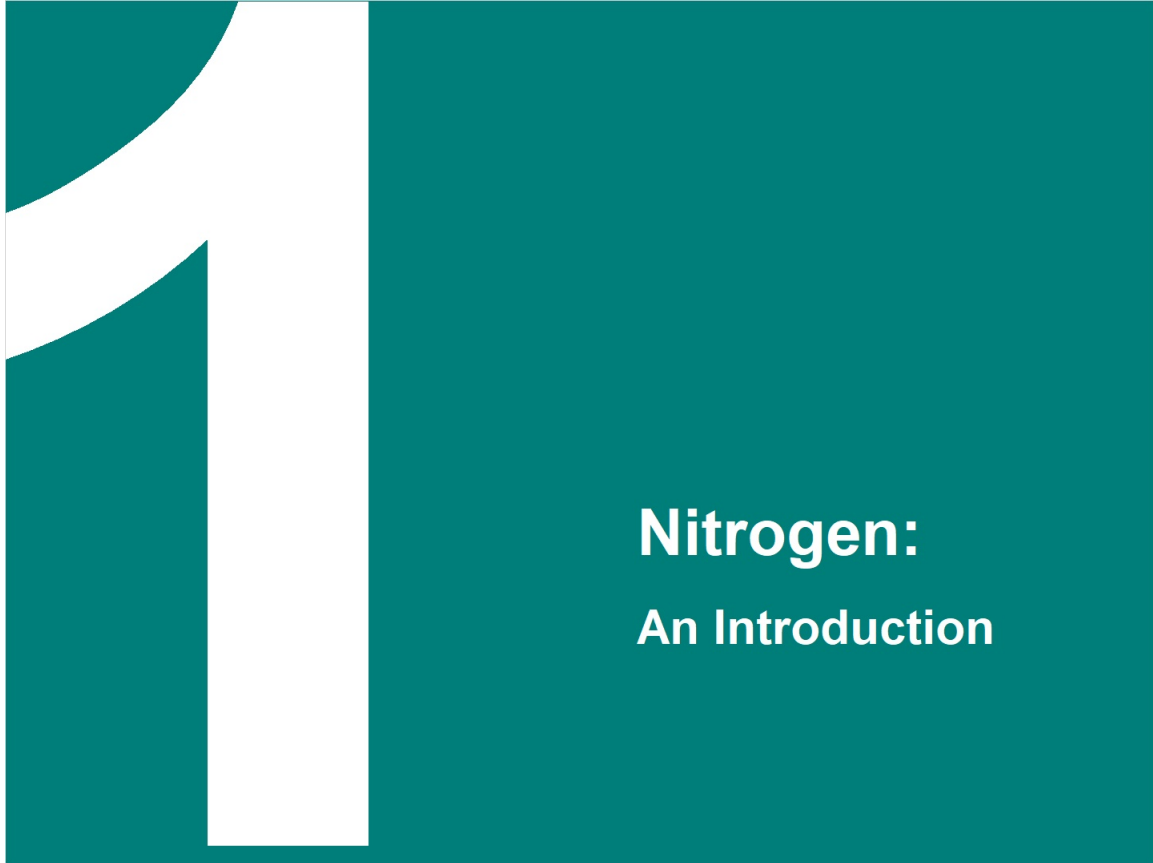
- Describe the characteristics of Nitrogen.
- Describe the health hazards attributed to Nitrogen.
- Identify first-aid measures for treating victims of Nitrogen exposure.

Note: *If you need to exit the module before you have finished you may do so and return later to where you left off.*



2. Introduction

2.1 Section Title Page

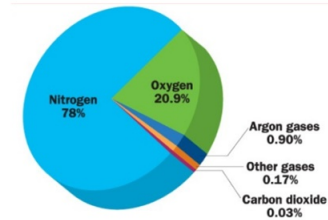


2.2 Nitrogen Characteristics

Nitrogen: An Introduction

Nitrogen is a non-toxic, odorless, colorless, tasteless, non-flammable gas that weighs approximately the same as air.

In fact, the air we breathe contains approximately 78% Nitrogen by volume while Oxygen constitutes approximately 21%.



2.3 Nitrogen Displaces Oxygen

Nitrogen: An Introduction

Nitrogen displaces oxygen.

Nitrogen gas is not a “poison” in the traditional sense but it presents a hazard of *asphyxiation* when it displaces oxygen.

Breathing an oxygen deficient atmosphere can have serious and immediate effects, including unconsciousness and possible death after only 1 or 2 breaths.



2.4 Nitrogen Is An Inert Gas

Nitrogen: An Introduction

One of the most important commercial uses of nitrogen is as an inerting agent to improve safety.

Nitrogen is an inert gas under most conditions (meaning that it does not react with or affect other material).



2.5 Purging Use

Nitrogen: An Introduction

It is often used to keep material free of contaminants, including oxygen; which can present a fire and explosion hazard when in contact with flammable materials or can corrode equipment.

Nitrogen is also used to purge air from equipment prior to introducing material or to purge flammable and toxic material from equipment prior to opening it for maintenance.



3. Health Effects

3.1 Section Title Page



3.2 Exposure Limits

Exposure Limits

Nitrogen gas is classified as a “simple asphyxiant” which is defined as a substance that dilutes or displaces oxygen in air without any other effect.

Exposure limits are not normally given to “simple asphyxiants” because the limiting factor is the available oxygen. Therefore, Nitrogen has no exposure limit.



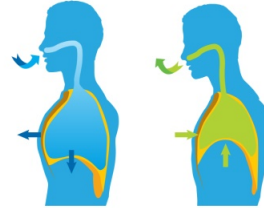
3.3 How We Breathe

How We Breathe

Breathing is stimulated and controlled by carbon dioxide (CO₂) present in the lungs.

As the CO₂ level increases, the brain sends a message to increase respiration.

When the CO₂ level drops, the rate of respiration will also decrease in order to maintain the proper balance.



3.4 How We Breathe (cont'd)

How We Breathe

It should be understood that just one deep breath of 100% N₂ can be fatal.

100% N₂ will displace CO₂ and O₂ completely.

In the absence of a CO₂ signal to the brain, the stimulus to breathe no longer exists!

You will stop breathing!!



3.5 Health Effects of Oxygen Dilution/Displacement

Effects of Oxygen Dilution/Displacement

Oxygen Content (Volume %)	Effects and Symptoms
21%	Normal breathing.
17%	A candle is extinguished. Vision may be impaired.
12 - 16%	Labored breathing, increased heart rate. Lack of attention and coordination.
11 - 14%	Unable to think. No longer perceives danger. Ability to self rescue is impaired. Fatigue, injury to heart, fainting.
8 - 11%	Fainting without warning. Nausea, vomiting, unable to stand, walk or crawl. Person is dying but does not care. It's all quite painless.
6 - 8%	Faint almost immediately, heart may continue beating for a few minutes, resuscitation possible if immediate.
0 - 6%	Fainting, almost immediate coma, convulsions, respiratory arrest, death. Brain damage even if resuscitated.



3.6 First Aid: Nitrogen Inhalation

First Aid: Nitrogen Gas Inhalation

- Call for help from trained personnel.
- If possible without exposing yourself to the hazard, remove victim(s) to fresh air as quickly as possible.
- If not breathing, trained personnel should administer CPR, as necessary.
- If breathing is difficult, trained personnel should administer supplemental oxygen, as necessary.



3.7 Liquid Nitrogen

Liquid Nitrogen

In addition to gaseous nitrogen being an inhalation hazard, liquid nitrogen is a colorless, odorless, and extremely cold liquid (-200°C).

Contact with this liquid or its cold vapors can cause severe frostbite burns.



3.8 First Aid: Liquid Nitrogen Contact

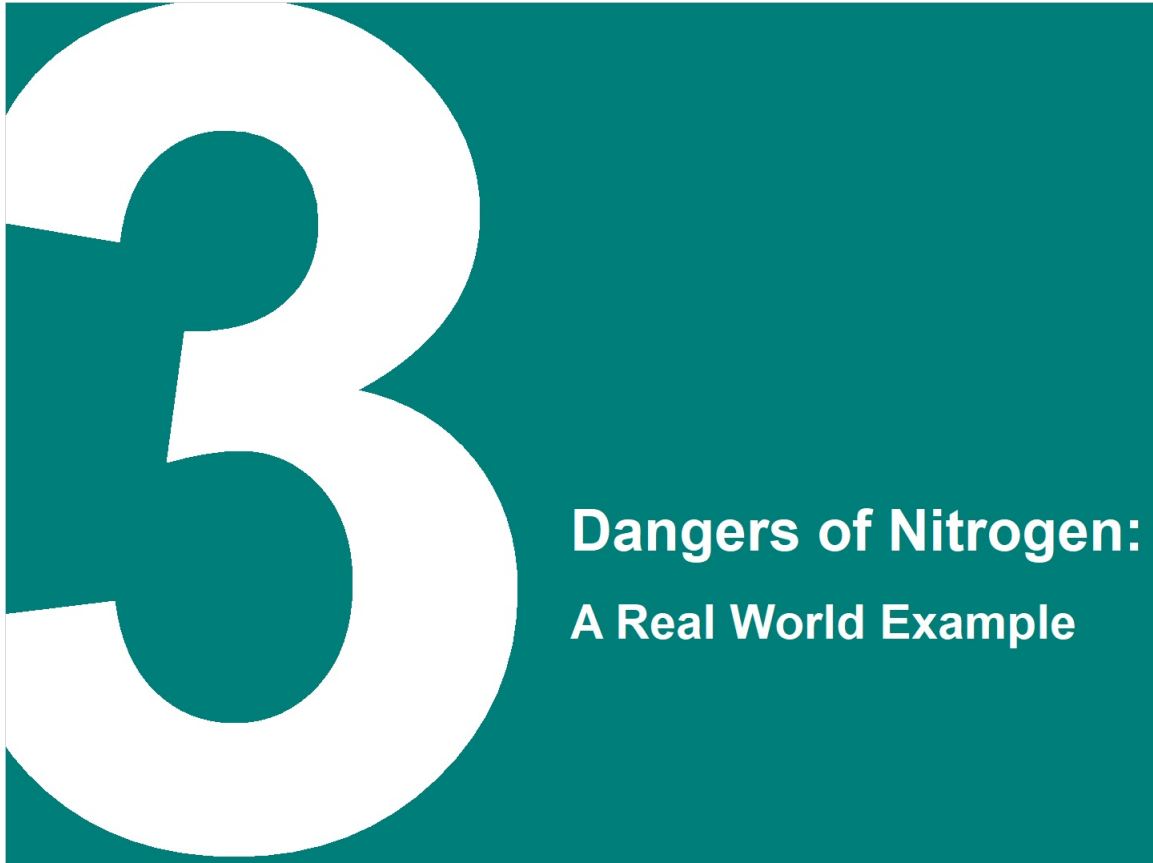
First Aid: Liquid Nitrogen Contact

- Call for help from trained personnel.
- If any liquid nitrogen contacts the skin, remove any clothing that may constrict blood circulation to the frozen area.
- Immediately warm areas affected by frostbite with tepid, luke-warm water. **DO NOT** apply any form of direct heat.
- **DO NOT** rub affected parts either before or after warming.
- Get the affected person medical attention as soon as possible.



4. A Real World Example

4.1 Section Title Page



4.2 Confined Space Injury and Fatality

Confined Space Injury & Fatality

- Two workers at a Union Carbide plant in Louisiana were inspecting a flange surface on a 48" diameter pipe using a black light to detect residual organic chemicals.
- They draped black plastic over the end of the pipe to create shade so the black light would illuminate surface deposits.
- The workers were unaware that some 50m away, Nitrogen was being injected into the system to protect new catalyst from exposure to moisture.



4.3 Confined Space Injury and Fatality (cont'd)

Confined Space Injury & Fatality

- Because the pipe was being purged it contained a high concentration of nitrogen. The temporary plastic enclosure trapped this high concentration.
- When the two men entered the black cover, they quickly lost consciousness from lack of oxygen.
- A passerby noticed an arm sticking out from the plastic and immediately called for help.



4.4 Confined Space Injury and Fatality (cont'd)

Confined Space Injury & Fatality

- The plant emergency response team arrived and removed the two men from the pipe and administered cardiopulmonary resuscitation.
- The two workers were transported by ambulance to a local hospital.
- Unfortunately, one worker was declared deceased upon arrival and the other worker, who eventually recovered, was admitted in critical condition and spent 5 days being given oxygen therapy.



4.5 Confined Space Injury and Fatality (cont'd)

Confined Space Injury & Fatality

- Safely working around Nitrogen has much to do with the way we treat Nitrogen.
- It is considered non-hazardous and is listed along with other utilities on some sites, thus we can often be lulled into a false sense of security and complacency.
- Always remember that if care isn't taken nitrogen gas can be a "silent-killer".



6. Conclusion

6.1 Section Title Page



6.2 Conclusion

Conclusion

As stated earlier, this module has been created to provide a basic awareness of Nitrogen gas and the dangers of working with and around it.



6.3 Conclusion (cont'd)

Conclusion

Depending upon your role and your assigned tasks you may require additional training for working with and around Nitrogen and in controlling its particular hazards.



6.4 Conclusion (cont'd)

Conclusion

If you are ever in doubt about any aspect of working with or around Nitrogen do not hesitate to stop and ask before proceeding!



6.5 Start The Module Quiz



Thank you for completing the
Vale Online Module Training.

To start the module Quiz

[CLICK HERE](#)