BP OIL -- TOLEDO REFINERY

Document Type: Procedure	**Refinery Wide**	**Procedure No.:** SAF 086
Effective Date: May 9, 2016	Use of Nitrogen (N_2)	**Rev. No.:** 9
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SCOPE	This document serves as an overview of the refinery nitrogen practices and procedures used to protect people from an oxygen-deficient exposure.
HEALTH **Special PPE & Special Hazards**	Nitrogen is considered non-toxic since 78% of the air we breathe contains nitrogen. It is colorless and odorless, and considered the invisible killer. When nitrogen gas displaces oxygen in the air, humans can be asphyxiated due to a lack of enough oxygen. Supplied breathing air is mandatory when oxygen levels fall below 19.5%.
SAFETY	Standard refinery PPE Safe operating procedures for any job requiring the use of nitrogen.
REFERENCE DOCUMENTS	• Process Safety Standard (PSME) No. 18 “Use of Nitrogen” • Operating manual for gas detection equipment. • SAF- 032 Confined Space Entry • SAF- 033 Inert Entry • SAF- 033 Inert Entry Confined Space Permit
SPECIAL MATERIALS & EQUIPMENT	Direct reading, gas testing equipment Supplied air respirators
QUALITY	N/A
ENVIRONMENTAL	N/A

OVERVIEW

Nitrogen (N_2), as a gas, is colorless and odorless. When nitrogen concentration increases, the oxygen concentration decreases and the atmosphere may contain less than 19.5% oxygen. Breathing atmospheres of less than 19.5% oxygen can lead to progressively more adverse health effects, including rapid death (see Table 1). Nitrogen displaces carbon dioxide in the lungs, which tells the body to stop breathing. Nitrogen is typically used to displace air to create an oxygen deficient atmosphere, but other gases such as helium and argon, can create similar hazards.

Toledo Refinery uses nitrogen in several applications. As a gas, some uses include: 1.) inerting equipment to prevent flammable atmospheres; 2.) preparing equipment for maintenance by purging out hydrocarbons; 3.) removing air/oxygen in equipment before startup; 4.) blanketing tanks to prevent the ingress of air; 5.) certain welding operations; 6.) decommissioning equipment to prevent the "rusting" process; Nitrogen is also used as a liquid for cooling purposes and is stored in large quantities in liquid form.
The use of nitrogen can be harmful. Due to the hazards of working in nitrogen atmospheres, alternative processes not requiring entry into an inert atmosphere must be considered and, when appropriate, become the preferred alternative.

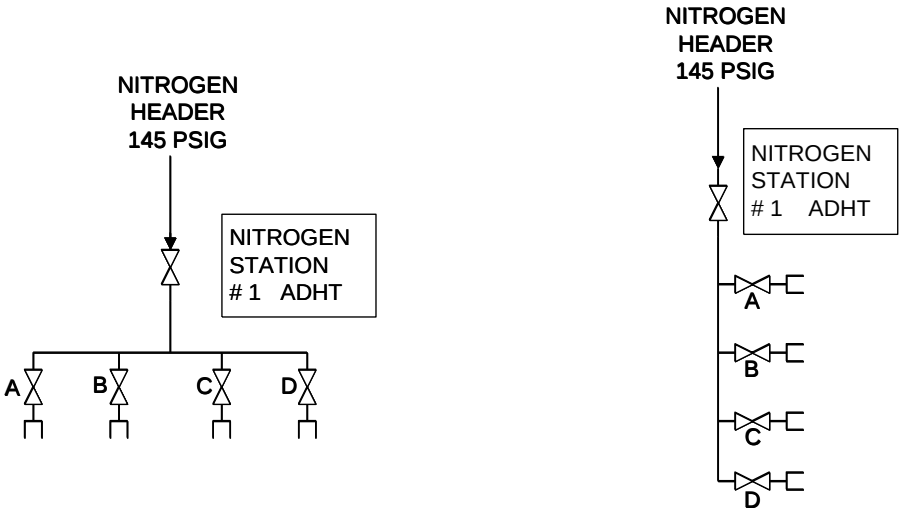
Nitrogen quality will be controlled through the contract agreement with the nitrogen provider for the TIU. This will include the presence of O_2 analyzers. The Reformer 3 nitrogen system is equipped with continuous analyzers.

1.0	Routine Nitrogen Use	__1.1	Permanent nitrogen connections REQUIRED for safety or process reasons must include a non-return device (e.g., check valve) to prevent potential contamination of the nitrogen system.
		__1.2	Utility stations on a nitrogen distribution system must have a non-return device (e.g., check valve), and must be clearly identified. Green signs with white lettering depict the nitrogen stations in the refinery. Special connectors and hoses that are not common to any other systems will be used.
		__1.3	Where nitrogen is continuously in use, permanent warning signs (stating suitable precautions) must be located at all access points, such as manways, stairways, etc.
		__1.4	Temporary warning signs must be located wherever potential personnel exposure to nitrogen exists due to the temporary use of nitrogen, i.e., during vessel or line venting or purging with nitrogen.
		__1.5	A variety of applications for nitrogen use occur in the refinery quality laboratory. High-pressure nitrogen cylinders are used for several analyzing techniques.
		__1.6	N2 is not allowed to be used to supplement the loss of instrument air.
2.0	Securing Nitrogen Utility Stations	__2.1	All nitrogen utility stations that are not in use must be secured with locks and tags. All nitrogen utility stations throughout the plant will be controlled by using the following procedure. Each area, or unit, will number specific **Nitrogen Stations**. The **Unit Name** will be included.

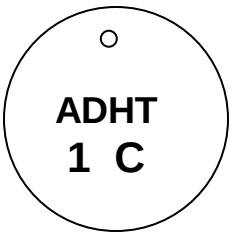
Here is an example:

NITROGEN STATION # 1 ADHT

__2.2 At each ***Nitrogen Station***, each ***Nitrogen Supply Valve*** will have an assigned ***Letter,*** from top to bottom for Vertical Manifolds and left to right for Horizontal Manifolds.



__2.3 Each ***Nitrogen Supply Valve,*** at each ***Nitrogen Station,*** will be tagged with the ***Unit Name***, the ***Nitrogen Station Number,*** and the ***Nitrogen Valve Letter***.



Example of a tag

__2.4 All ***Lettered Valves*** will be closed and locked.

__2.5 One ***Identifying Tag*** will be fixed to the valve with a lock and chain and "S" hook or other secure method of attachment. The locks must also be identified with the information on the valve tag. This maybe completed with a tag or by marking the lock directly.

__2.6 A ***Nitrogen Lock Out Board*** will be located in a specified location of each Unit. Keys for the locked Nitrogen valves will be fixed to the ***Nitrogen Lock Out Board*** with a ***Car Seal***.

__2.7 When a ***Lettered Nitrogen Valve*** is unlocked for service, an Identifying Tag or the removed locked will be placed on the ***Nitrogen Lock Out Board.*** If this is not feasible another identifier can be placed on the board.

3.0 Entry into Oxygen-Deficient Atmospheres

__3.1 See SAF-033 for information on inert entry

4.0 Temporary Nitrogen Stations

__4.1 Temporary nitrogen stations are required to meet the requirements of this procedure including:

- Signage
- Tags
- Locked out on U-bolt board
- Unique nitrogen connections

5.0 Training

__5.1 All persons who may be exposed to the danger of nitrogen must be trained in the hazards of nitrogen.

__5.2 This training will include at least the following:

- Where nitrogen is used and how its presence can result in an oxygen deficient atmosphere.
- Potential health effects due to low oxygen exposure.
- Methods to detect and measure low oxygen concentration.
- Requirements and authorization to work in and around an inerted vessel.
- Emergency procedures and rescue plans.
- Lessons learned involving nitrogen incidents.

__5.3 Refresher N_2 training is provided before the start of a large turnaround project and/or catalyst change out.

__5.4 A written test is administered to insure a level of competency with the N_2 training given and to provide for a training record.

Revision History

Revision history

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes
9/9/11	M. Chambers / J. Parker	Removed specified monitor style reference in Reference Documents Section. Also, updated Section 2.6 to reflect new lockout board location. MOC#: M20114894-001
9/23/14	Jon Parker	Remove use of N2 as secondary instrument air supply. Connections and other procedures were changed under #MOC 20123556-001
5/9/16	Stephanie Sedlak/Emily Stewart	5 year comprehensive review. Changes made to the tagging requirements and removed requirements for Inert Entry due to new SAF-033 procedure. M20161281-001

Table 1

TYPICAL HUMAN PHYSIOLOGICAL RESPONSES TO OXYGEN DEFICIENCY

Oxygen (%vol)	Effects & Symptoms
23.5	Maximum “Safe Level”
21	Typical O_2 concentration in air
19.5	Minimum “Safe Level”
15-19	First signs of hypoxia. Decreased ability to work strenuously. May induce early symptoms in persons with coronary, pulmonary or circulatory problems.
12-14	Respiration increases with exertion, pulse up, impaired muscular coordination, perception and judgment.
10-12	Respiration further increases in rate and depth, poor judgment, lips blue.
8-10	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea, vomiting, inability to move freely.
6-8	6 minutes – 50% probability of death 8 minutes – 100% probability of death
4-6	Coma in 40 seconds, convulsions, respiration ceases, death

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