Material Safety Information

Section I - Product Identification
Product Name: Ozone
Synonyms: Triatomic Oxygen, O_3
Chemical Family: Oxidizer
Molecular Formula: O_3
Molecular Weight: 48.0

Section II - Hazardous Ingredients
Components: Ozone Gas
Concentration: 0-4% by weight
Gas Registry: 100287-15-6

Section III - Physical Data
Boiling Point: -169.42*F (111.9*C)
Melting Point: -315.40*F (-193*C)
*Solubility in Water by weight at 20*C*:
0.003g/l (3 ppm)
Vapor Density (air = 1): 1.6
Appearance and Odor: Ozone is colorless at all concentrations experienced in industry. It is a very pungent characteristic odor usually associated with electrical sparks. Ozone odor is generally detectable at concentrations of 0.02-0.05 ppm.

Section IV - Fire / Explosion Hazard Data
Ozone is a powerful oxidizing agent and oxidation with ozone evolves more heat and usually starts at a lower temperature than oxidation with oxygen. It reacts with non-saturated organic compounds to produce ozonides, which are unstable and may decompose with explosive violence.

Ozone is an unstable gas which, at normal temperatures, decomposes to biatomic oxygen. At elevated temperatures and in the presence of certain catalysts such as hydrogen, iron, copper, and chromium, this decomposition may be explosive.

Flash Point: Not Applicable
Auto-ignition Temperature: Not Applicable
Flammability: Non flammable but vigorously supports combustion.
Extinguishing Media: Depends on Source media.

Section V - Reactivity Data
Conditions Contributing to Instability: Ozone spontaneously decomposes under all ordinary conditions, so that it is not encountered except in the immediate vicinity of where it was formed. The decomposition is speeded by solid surfaces and by many chemical substances.

Incompatibilities: Ozone is a powerful oxidizing agent and reacts with all oxidizable materials, both organic and inorganic. Some reaction products are highly explosive.

Hazardous Decomposition Products: None
Special Precautions: None

Section VI - Health Hazard Data
Permissible Exposure Limit: The current standard for ozone is 0.10 ppm (parts of ozone per million parts of air) averaged over an eight-hour work shift. This may also be expressed as 0.2 milligrams of ozone per cubic meter of air (mg/m^3). No criteria is set for the permissible concentration of ozone in water.

Symptoms of Exposure: A sharp irritating odor is noticed after exposure to very low concentrations (~ 0.04 ppm) of ozone for even a brief period of time. As the concentration of ozone increases, the ability to smell it may decrease. Irritation of the eyes, dryness of the nose and throat, and a cough may be experienced. If the ozone concentrations continue to rise, more severe symptoms may develop. These may include headache, upset stomach or vomiting, pain or tightness in the chest, shortness of breath or tiredness, which may last for several days or weeks. Finally, with higher levels of exposure, the lungs may be damaged and death may occur.

Toxicological Properties: Ozone is extremely irritating to the upper and lower respiratory tract. The characteristic odor is readily detectable at low concentrations (0.02 ppm to 0.05ppm). Ozone produces local irritation of the eyes and mucous membranes and may cause pulmonary edema at high exposure. Systematically, ozone has been reported to mimic the effects of ionizing radiation, and may cause damage to chromosomal structures. A partial tolerance appears to develop with repeated exposures. Although most effects are acute, the possibility of chronic lung impairment should be considered, based upon animal experimentation.

Section VII - Preventative Measures
Leak Procedures: Persons not wearing protective equipment and clothing should be restricted from areas of leaks until clean-up has been completed. If ozone is leaked, the following steps should be taken:

1. Ventilate area of leak to disperse gas.
2. Stop flow of gas.

Waste Disposal Method: Do not dispose of ozone off gas to atmosphere without properly designed off gas destruct unit.

Engineering Controls:
Respiratory Protection: Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

Ventilation: All potential sources of ozone off gas must be collected with suitable collection system. All ozone off gas must pass through a properly designed ozone off gas destruct unit prior to release to atmosphere.

Personal Protective Equipment: Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations.

Only appropriate respirators shall be provided and used when the use of respirators is the only means of controlling exposure for routine operations, or during an emergency.
(Refer to Table 1 of ANSI/ASTM E591-77 for appropriate respirator selection.)

MSDS For Ozone Levels Exceeding 0.1 ppm

Material Safety Data Sheet
May be used to Comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

Note: Blank spaces are Not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Identity *(As Used on Label and List)*
Ozone

Section I

Manufacturer's Name
Alpine Industries, Inc.
Address *(Number, Street, City, and Zip Code)*
9199 Central Ave NE
Blaine, MN 55434

Emergency Telephone Number

Telephone Number for Information
(612) 780-9388
Date Prepared
7/31/90
Signature of Preparer *(optional)*

Section II - Hazardous Ingredients / Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Ozone	OSHA PEL 1986 (29 CFR1910, sub Z) OSHA TLVTWA 8 hr 0.10 ppm FDA TLVTWA 24 hr 0.05 ppm			100%

TWA = Time Weighted Average
TLV = Threshold Level Value

Section III - Physical / Chemical Characteristics

Boiling Point
-169.42*F (111.9*C)
Vapor Pressure (mm Hg.)
>1 atm
Vapor Density (AIR = 1)
1.6

Specific Gravity (H_20 = 1)
Density of Gas (air = 1) 1.6
Melting Point
-315.4*F (-193*C)
Evaporation Rate
(Butyl Acetate = 1)

Solubility in Water
Negligible
Appearance and Odor
Blue colored gas or Liquid = Blue-colored gas or liquid often associated with electrical or lightening discharge

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Use)
Not Available

Flammable Limits	LEL	UEL
% by Volume	No Listing	No Listing

Extinguishing Media
Water Spray of Fog
Special Fire Fighting Procedures
Not Applicable

Unusual Fire and Explosion Hazards
Not Applicable

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	

Incompatibility *(Materials to Avoid)*
None Known

Hazardous Decomposition or Byproducts
None Known — Ozone Spontaneously decomposes to Oxygen gas at ordinary room temperatures.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section VI - Health Hazard Data *Exceeding 0.10 ppm*

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	X		

Health Hazards *(Acute and Chronic)*
Acute - Eye and Mucous membrane irritation above OSHA TLVTWA
Chronic - Pulmonary edema at extreme aggravated long-term exposure

Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
None			Yes at 0.10 ppm

Signs and Symptoms of Exposure
Eyes, throat, nose irritation, pressure pains in chest, nausea, dizziness

Medical Conditions Generally Aggravated by Exposure: Extreme heart and lung problems

Emergency and First Aid Procedures
Move victim to fresh air source. If condition persists, receive medical attention.

Section VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
Ventilate area

Water Disposal Method
Ventilation

Precautions to Be Taken in Handling and Storing
Use ozone at an olfactory level of barely detectable in the presence of plants, pets, or people.

Other Precautions

Section VIII - Control Measures

Respiratory Protection *(Specify Type)*
Wear self-contained breathing apparatus in levels higher than 20 ppm.

Ventilation	Local Exhaust	Special
	Mechanical (General)	Other Replace air in specified area

Protective Gloves — Eye Protection

Other Protective Clothing or Equipment

Wok / Hygienic Practices

* USGPO 1986-491-529/45775

ALPINE INDUSTRIES

310 T. Elmer Cox Drive • Greeneville, TN 37745 • (423) 638-7246

Just The Fax

Technical Support

Phone #: (800) 989-2299

Fax #: (423) 798-6437

Date: 08-18-2000

Fax # Called: 1-315-435-4002 (315-357-2989)

Pages to Follow: Four

For Assistance, Contact: Andy Fisher

Attention: D. Gillies

Message

Material Safety Data Sheet for Ozone follows.
Reference Bora serial number 295147
As requested by D. Years

ALPINE INDUSTRIES

310 T. Elmer Cox Drive • Greeneville, TN 37745 • (423) 638-7246

Ozone Accumulation

Alpine Industries produces a variety of ozone and ion generating devices for the purposes of air purification. One of your concerns is the total quantity of ozone being produced. Due to the various configurations of indoor environments, Alpine directs the user to calculate the "smallest area" of (square footage) in the environment, and not to exceed that number on the labeled indication setting on the purifier control (ozone output control), in relationship to the plate configuration installed inside the purifier. (see respective unit's Owner's Manual). This practice of appropriate use of our products has been demonstrated and documented by the Envirocon Corp. Used in this manner, our products will not exceed 0.05 ppm of ozone which is the FDA limit for 24 hour exposure.

The production method of ozone we are using is based upon input voltage from a rheostat (variable resistor) to a transformer which amplifies the voltage. Component failure in either the control mechanism or transformer will result in less or no ozone production. In other words, if there are any failures in the ozone production process it will occur on the side of safety, not with higher levels of ozone production.

The Envirocon Report is one document included within the "Air Purification Focus Pack" which is available through the Order Line Department. (Item # 64160) Dealers should contact Alpine Industries - Order Line Department at (800) 486-4994 to order the "Air Purification Focus Pack" Documents.