



N00296.000298  
MOFFETT FIELD  
SSIC NO. 5090.3

**DEPARTMENT OF THE NAVY**  
SOUTHWEST DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
1220 PACIFIC HIGHWAY  
SAN DIEGO, CA 92132-5190

5090  
Ser 06CH.MP/0840  
August 16, 2001

Farhad Azimzadeh  
Regional Water Quality Control Board  
San Francisco Bay Region  
1515 Clay Street, Suite 1400  
Oakland, CA 94612

**Subject: CERTIFICATION REPORT ADDENDUM FOR THE WEST-SIDE AQUIFERS  
TREATMENT SYSTEM UPGRADES, MOFFETT FEDERAL AIRFIELD, MOFFETT  
FIELD, CALIFORNIA**

Dear Mr. Azimzadeh:

Please find enclosed the letter report addendum certifying the adequacy of the upgrades made to the West-Side Aquifer Treatment System, stamped by a professional engineer registered in the State of California. Per your request of August 13, 2001, this addendum provides additional information and calculations. It is my understanding that this is the last information required for the Regional Water Quality Control Board to issue conditional approval for operation of the West Side Aquifers Treatment System. Please provide your conditional approval by August 17, 2001.

If you have questions or comments, please contact Ms. Andrea Muckerman in any of the following ways:

Ms. Andrea Muckerman  
BRAC Environmental Coordinator  
Southwest Division  
Naval Facilities Engineering Command  
BRAC Operations Office  
1230 Columbia Street, Suite 1100  
San Diego, CA 92101-8517

Telephone (619) 532-0911  
Facsimile (619) 532-0995

[muckermanam@efdswnavfac.navy.mil](mailto:muckermanam@efdswnavfac.navy.mil)

Sincerely,

ANDREA MUCKERMAN  
BRAC Environmental Coordinator,  
By direction of the Commander

Enclosure: 1. Certification Report Addendum

5090  
Ser 06CH.MP/0840  
August 16, 2001

Copy to: (w/encl)  
Ms. Carmen White  
U.S. Environmental Protection Agency  
Region 9  
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San Francisco, CA 94105

Ms. Adriana Constantinescu  
Regional Water Quality Control Board  
San Francisco Bay Region  
1515 Clay Street, Suite 1400  
Oakland, CA 94612

ROICC-SFBA Moffett Federal Airfield  
Attention: Mr. Gary J. Munekawa  
(Ph: 650-603-9834)  
Building 107  
Moffett Field, CA 94035

Don Chuck  
M/S 218-1  
National Aeronautics and Space Administration  
Ames Research Center  
Moffett Field, CA 94035

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Santa Clara Valley Water District  
5750 Almaden Expressway  
San Jose, CA 95118

5090  
Ser 06CH.MP/0840  
August 16, 2001

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Email/NPDESCert Rept Addendum Transmittal Ltr.doc

N00296.000298  
MOFFETT FIELD  
SSIC NO. 5090.3

CERTIFICATION REPORT FOR THE  
WEST-SIDE AQUIFERS TREATMENT SYSTEM  
UPGRADES

DATED 06 AUGUST 2001

IS FILED AS ADMINISTRATIVE RECORD NO.  
**N00296.000286**



## FOSTER WHEELER ENVIRONMENTAL CORPORATION

August 16, 2001  
FWSD-RACII-01-0306  
DO No. 0090

Ms. Andrea Muckerman  
BRAC Environmental Coordinator  
Southwest Division  
Naval Facilities Engineering Command  
BRAC Operations Office  
1230 Columbia Street, Suite 1100  
San Diego, CA 92101-8517

**Subject: Addendum to West-Side Aquifers Treatment System (WATS) Upgrade  
Operation and Maintenance (O&M) Certification Report,  
Moffett Federal Airfield (MFA), Moffett Field, California**

Reference: SWDIV Contract No. N44255-95-D-6030, DO No. 0090,  
Engineering Field Activities Northwest Remedial Action Contract  
for Sites in Southern California, Arizona, New Mexico, and Southern Nevada

Dear Ms. Muckerman:

Per the request by Mr. Farhad Azimzadeh at Regional Water Quality Control Board (RWQCB), this addendum is being provided to supplement the letter dated August 6, 2001, 'Certification Report for the West-Side Aquifers Treatment System Upgrades, Moffett Federal Airfield' from Ms. A. Muckerman, US Navy to Mr. F. Azimzadeh, RWQCB. This addendum includes a performance calculation for the modified granular activated carbon (GAC) system and Material Safety Data Sheets (MSDSs) for the GAC and all the chemical additives in use at WATS.

In accordance with the National Pollution Discharge Elimination System (NPDES) Self-Monitoring Program, the modified WATS has undergone an initial run (July 18, 2001), followed by a 5-day start-up run (July 20 through 25, 2001) to ensure compliance with discharge limits. Based on the analytical results from both start-up phases, the treated effluent from the modified system conforms to the NPDES discharge limits for volatile organic compounds (VOCs), as specified in Order No. 99-051 General Waste Discharge Requirements for: Discharge or Reuse of Extracted and Treated Groundwater Resulting From the Cleanup of Groundwater Polluted by Volatile Organic Compounds, and Rescission of Order No. 94-087.

The upgrade to WATS entailed retrofitting the system to allow further polishing of the Air Stripper effluent through the GAC system. Two additional GAC vessels were added to the system to accommodate the original treatment system's design flow rate of 120 gpm.



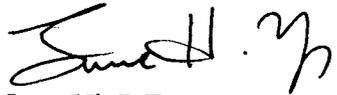
Consequently, there are now two parallel GAC trains in operation and each train is comprised of a lead and a lag GAC vessel. Please refer to the Attachment 1 GAC Calculation for the estimated treatment performance.

WATS utilizes ozone and hydrogen peroxide in the oxidation process to oxidize and degrade volatile organic compounds. In addition, an anti-scalant agent is injected into the Air Stripper influent to prevent scaling in the system. These chemicals have been in use since the system start-up under RWQCB's authorization letter dated October 20, 1998, 'Authorization to Discharge Treated Groundwater' File No. 2189.8009 and 1210.48 (FA), which was issued to the US Navy before the system modification. Corresponding MSDSs are included in the Attachment 2. No additives other than the previously used chemicals have been introduced to the modified WATS. As a part of the upgrades, a coconut shell based carbon was provided to the GAC system to enhance the removal of water-soluble organic compounds such as acetone. The MSDS for this carbon is also included in the Attachment 2.

By submission of this addendum, Foster Wheeler Environmental certifies that the WATS was upgraded in order to ensure that the treated effluent conforms to the NPDES Self-Monitoring Program discharge limits as specified in Order No. 99-051. If you have any questions, please do not hesitate to contact me at 949-756-7559.

Sincerely,

Foster Wheeler Environmental Corporation



June Yi, P.E.  
Project Engineer

## ATTACHMENTS

Attachment 1 – Granular Activated Carbon (GAC) Calculation

Attachment 2 – Material Safety Data Sheet (MSDS)

Ozone MSDS

Hydrogen Peroxide (50%) MSDS

Granular Activated Carbon MSDS



cc: Pete Everds, Project Manager  
Craig O'Rourke, Environmental Compliance  
Jayne Fitzgerald, EATS/WATS Compliance Reviewer  
Connie Weingardt, Technical Lead  
FWENC Project File, San Diego



**ATTACHMENT 1**

**GRANULAR ACTIVATED CARBON (GAC)  
CALCULATION**

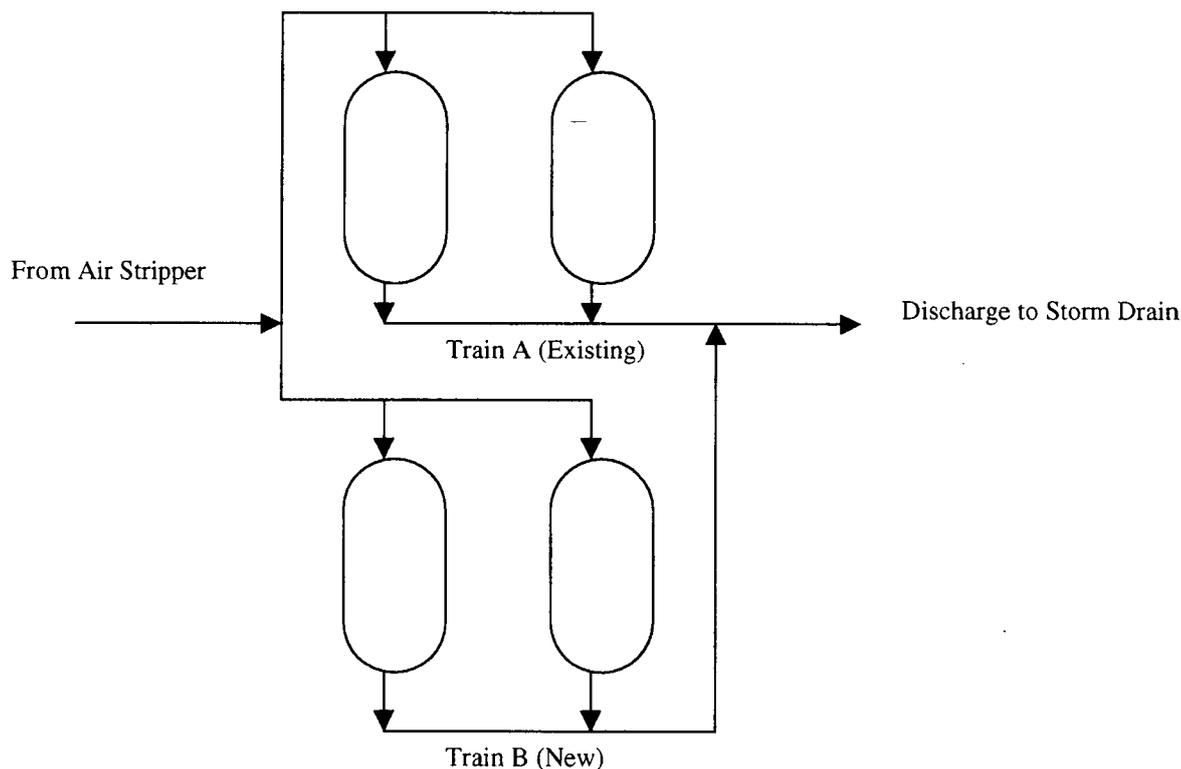
**Project:** WATS Upgrade O&M Certification Report  
**DCN No.:** FWSD-RACII-01-0306  
**Project No:** 2384.090E.1801.21000  
**Subject:** Granular Activated Carbon (GAC) Sizing & Performance Calculation  
**By:** JHY **Date:** 8/14/2001  
**Check By:** VH **Date:** 8/15/2001  
**Rev.** 0

**Criteria**

The existing GAC system has been modified to include a new GAC train composed of two vessels in a lead-lag series. Therefore, there are two GAC trains in parallel now.

The carbon manufacturer recommends empty bed contact time (EBCT) of 10 minutes minimum and a loading rate of 3-9 gpm/sq.ft.

The purpose of this calculation is to verify the size of the GAC system (including both the existing and the new vessels) by calculating the EBCT and the loading rate based on the normal and maximum design flowrates. Also, using the manufacturer's isotherm data, a theoretical exhaustion rate for carbon can be estimated.



**Basis**

- 1 GAC - Barnebey & Sutcliffe Coconut Shell GAC Type PE
- 2 GAC Density = 0.48 g/cm<sup>3</sup> = 30 lb/cu. ft. = 4 lb/gal
- 3 Train A size (volume occupied by GAC per vessel) ID = 4.5 ft IH = 5 ft
- 4 Train B size (volume occupied by GAC per vessel) ID = 4 ft IH = 7 ft
- 5 Maximum flowrate = 120 gpm total = 60 gpm per each GAC train
- 6 Normal flowrate = 80 gpm total = 40 gpm per each GAC train

### Assumptions

- 1 Based on the analytical data prior to the WATS upgrade, the highest concentration for acetone at the Air Stripper effluent was 48 ppb. The WATS has been modified to direct the flow from the air stripper to the GAC system. Therefore, assume 48 ppb as the maximum acetone concentration for the GAC influent.
- 2 Based on the analytical data collected during the start-up phase after the WATS upgrade, the average inlet concentration of acetone to GAC was 14 ppb. Other volatile organic compounds were mostly ND (below detection limit). Therefore, assume 14 ppb as the average acetone concentration for the GAC influent.
- 3 Continuous 7 days 24 hr operation.
- 4 The manufacturer developed an isotherm data using MtBE. Refer to the attached isotherm graph. Since Acetone is water-soluble and is as difficult to adsorb as MtBE organic compound, use the available MtBE data to estimate the carbon exhaustion rate as recommended by the manufacturer. Use a safety factor of 2.  
However, during the initial phase of the operation, the GAC system needs to be carefully monitored to obtain the actual data to predict carbon exhaustion rate.

### Calculation

#### 1. Calculate EBCT for maximum and normal flowrates.

##### 1A. GAC Train A

$$\begin{aligned} \text{Each Vessel Vol} &= \text{IH (ft)} \times \text{ID}^2 \text{ (ft}^2\text{)} / 4 \times 3.14 \times 7.48 \text{ (gal/ft}^3\text{)} \\ &= 595 \text{ gal} \\ \text{Total Train A Vol} &= 1189 \text{ gal} \end{aligned}$$

$$\begin{aligned} \text{EBCT for Maximum flow} &= \text{Total Train Vol (gal)} / \text{Maximum Flowrate (gal/min)} \\ &= \mathbf{20 \text{ minutes}} \end{aligned}$$

$$\begin{aligned} \text{EBCT for Normal flow} &= \text{Total Train Vol (gal)} / \text{Normal Flowrate (gal/min)} \\ &= \mathbf{30 \text{ minutes}} \end{aligned}$$

**Therefore, Train A is sized greater than the recommended EBCT of 10 minutes.**

##### 2A. GAC Train B

$$\begin{aligned} \text{Each Vessel Vol} &= \text{IH (ft)} \times \text{ID}^2 \text{ (ft}^2\text{)} / 4 \times 3.14 \times 7.48 \text{ (gal/ft}^3\text{)} \\ &= 658 \text{ gal} \\ \text{Total Train A Vol} &= 1315 \text{ gal} \end{aligned}$$

$$\begin{aligned} \text{EBCT for Maximum flow} &= \text{Total Train Vol (gal)} / \text{Maximum Flowrate (gal/min)} \\ &= \mathbf{22 \text{ minutes}} \end{aligned}$$

$$\begin{aligned} \text{EBCT for Normal flow} &= \text{Total Train Vol (gal)} / \text{Normal Flowrate (gal/min)} \\ &= \mathbf{33 \text{ minutes}} \end{aligned}$$

**Therefore, Train B is sized greater than the recommended EBCT of 10 minutes.**

**2. Calculate the surface loading rate.**

**2A. GAC Train A**

Loading Rate = flowrate (gpm) / surface area (ft<sup>2</sup>)

Maximum loading rate = **3.8 gpm/ft<sup>2</sup>**

Normal loading rate = **2.5 gpm/ft<sup>2</sup>**

**Therefore, Train A is sized for the lower range of the recommended loading rate (3-9 gpm/ft<sup>2</sup>). This will enhance the carbon performance in removing contaminants.**

**2B. GAC Train B**

Loading Rate = flowrate (gpm) / surface area (ft<sup>2</sup>)

Maximum loading rate = **4.8 gpm/ft<sup>2</sup>**

Normal loading rate = **3.2 gpm/ft<sup>2</sup>**

**Therefore, Train B is sized for the lower range of the recommended loading rate (3-9 gpm/ft<sup>2</sup>). This will enhance the carbon performance in removing contaminants.**

**3. Estimate the theoretical carbon consumption (exhaustion) rate. Note Assumption 4.**

**Worst Case: Maximum flowrate at maximum acetone concentration**

**Normal Case 1: Normal flowrate at normal acetone concentration**

**Normal Case 2: Normal flowrate at maximum acetone concentration**

Worst Case: Acetone (lb) to be removed per day

60 gpm x 60 min/hr x 24 hr/day x 8.34 lb/gal x 48E-9 = 0.034588 lb/day

Normal Case 1: Acetone (lb) to be removed per day

40 gpm x 60 min/hr x 24 hr/day x 8.34 lb/gal x 14E-9 = 0.006725 lb/day

Normal Case 2: Acetone (lb) to be removed per day

40 gpm x 60 min/hr x 24 hr/day x 8.34 lb/gal x 48E-9 = 0.023058 lb/day

Per the attached MtBE isotherm graph, carbon capacity is 0.6 mg/g at 48 ppb.

At 14 ppb, carbon capacity is 0.25 mg/g.

**Therefore, using a safety factor of 2,**

Carbon Capacity at 48 ppb: 0.3 mg/g

Carbon Capacity at 14 ppb: 0.125 mg/g

**3A. GAC Train A**

Carbon Mass = Vol occupied by carbon per vessel x carbon density x 2 vessels  
= 4756 lb

Carbon consumption rate = acetone to be removed (lb/day) / carbon capacity (mg/g/1000)  
= 115 lb/day (60 gpm, 48 ppb) Worst Case  
= 54 lb/day (40 gpm, 14 ppb) Normal Case 1  
= 77 lb/day (40 gpm, 48 ppb) Normal Case 2

Estimated days of operation before carbon change-out  
= **41 days** (60 gpm, 48 ppb) Worst Case  
= **88 days** (40 gpm, 14 ppb) Normal Case 1  
= **62 days** (40 gpm, 48 ppb) Normal Case 2

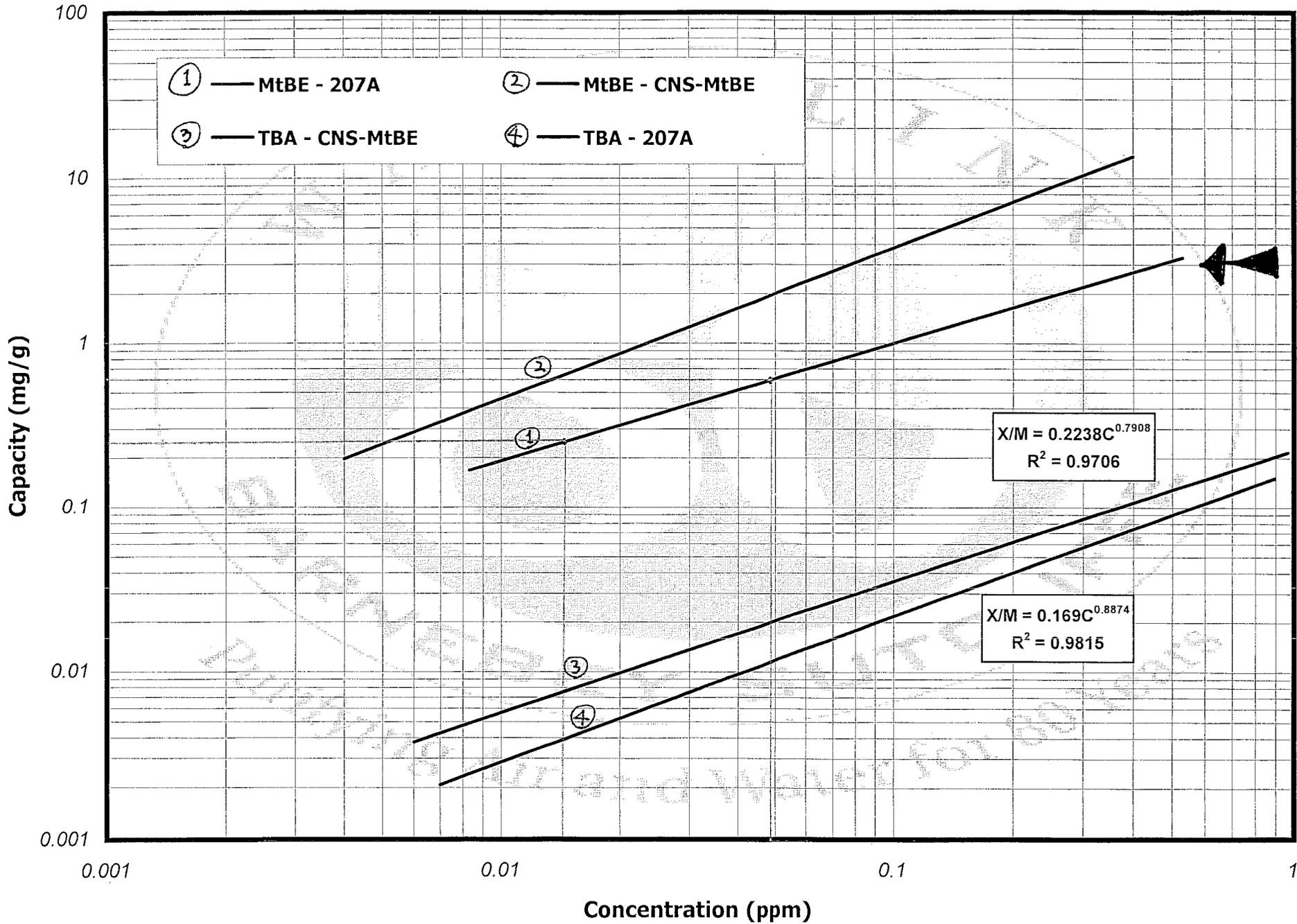
**3B. GAC Train B**

Carbon Mass = Vol occupied by carbon per vessel x carbon density x 2 vessels  
= 5261 lb

Using the carbon consumption rates calculated in 3A,  
Estimated days of operation before carbon change-out  
= **46 days** (60 gpm, 48 ppb) Worst Case  
= **98 days** (40 gpm, 14 ppb) Normal Case 1  
= **68 days** (40 gpm, 48 ppb) Normal Case 2

**Note that these values used a safety factor of 2 to MtBE isotherm data.  
The GAC system needs to be carefully monitored at the field to accurately predict  
the carbon consumption rate.**

# MtBE and TBA Adsorption Isotherm at 77 oF



8/15/2001

Provided by Barnebey + Sutcliffe Corporation

**ATTACHMENT 2**  
**MATERIAL SAFETY DATA SHEETS**  
**(MSDS)**

**OZONE (MSDS)**

# MATERIAL SAFETY DATA SHEET

*Effective Date: 06/01/00*

**Product: Ozone**

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## 1. Product Identification

**Synonyms:** Triatomic oxygen

**CAS No.:** 10028-15-6

**Molecular Weight:** 48.0

**Chemical Formula:** O<sub>3</sub>

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## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ozone gas	10028-15-6	1 - 15%	Yes

---

## 3. Hazards Identification

### Emergency Overview

Highly reactive, can explode on contact with organic substances, especially strong reducing agents.

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.

### Potential Health Effects

---

**Inhalation:** Causes dryness of the mouth, coughing, and irritates the nose, throat, and chest. May cause difficulty in breathing, headache, and fatigue. The characteristic sharp, irritating odor is readily detectable at low concentrations (0.01 to 0.05 ppm).

**Skin:** Absorption through intact skin is not expected.

**Eye Contact:** Ozone is an irritant to the eyes causing pain, lacrimation, and general inflammation.

**Ingestion:** Not a route of exposure.

**Aggravation of Pre-existing Conditions:**

Ozone may increase sensitivity to bronchoconstrictors including allergens.

---

## 4. First Aid Measures

**Inhalation:**

Remove to fresh air; if breathing is difficult a trained person should administer oxygen. If respiration stops, give mouth-to-mouth resuscitation. Get medical attention.

**Ingestion:**

Not an expected route of exposure.

**Skin Contact:**

Wash skin thoroughly with soap and water.

**Eye Contact:**

Immediately flush eyes with large amounts of water for at least 15 minutes, while forcibly holding eyelids apart to ensure flushing of the entire eye surface. If irritation, pain, or other symptoms persist seek medical attention.

**Acute:**

May cause irritation of skin, eyes, and mucous membranes of the respiratory tract. Drowsiness, dizziness, headache, and fatigue have been associated with exposure.

**Chronic:**

Long term health effects are not expected from exposures to ozone. A partial tolerance appears to develop with repeated exposures.

---

## 5. Fire Fighting Measures

**Flash Point:**

N/D

**Auto ignition Temperature:**

N/D

**Flammable Limits in air, % by volume - Upper: N/D Lower: N/D**

**Extinguishing Media:**

Use extinguishing media suitable for surrounding fires.

**Unusual Fire and Explosion Hazard:** None expected. Since ozone is highly unstable and decomposes under all conditions and is not encountered except at very small levels in the immediate vicinity where formed.

---

## 6. Accidental Release Measures

Evacuate danger area. Consult an expert. Ventilation. If ozone is a liquid or solid, allow material to evaporate and provide sufficient ventilation to dilute and disperse small amounts into the outside atmosphere. Dispose of waste in accordance with Federal, State, and local regulations. Reportable quantity = 1 pound.

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## 7. Handling and Storage

Unstable gas (liquid or solid phases are even more unstable). Ozone should be contained within a chemically compatible piping system.

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.

---

## 8. Exposure Controls/Personal Protection

### Exposure Guidelines:

OSHA PEL:

0.1 ppm PEL/TLV

### Ventilation Requirements:

General exhaust recommended. Avoid working with ozone generating equipment in enclosed spaces.

### Specific Personal Protective Equipment

#### Respiratory:

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 ANSUI/ASTM E591-77 for appropriate respirator selection ).

Positive pressure air line with mask or self-contained breathing apparatus should

be available for emergency use.

**Eye:**

Not necessary

**Gloves:**

Not necessary.

**Other Clothing and Equipment:**

Not necessary.

---

## 9. Physical and Chemical Properties

**Appearance:**

Black particulate solid, pellet, or powder.

**Specific Gravity (H<sub>2</sub>O=1):**

2.144 g/L

**Molecular Weight:**

48.00

**Boiling Point:**

-111.9°C

**Melting Point:**

-192.7°C

**Vapor Pressure:**

N/A

**Evaporation Rate (BuAc=1):**

N/A

**Vapor Density (Air=1):**

1.7

**Solubility in H<sub>2</sub>O % by Weight:**

0.49

**Appearance and Odor:**

Colorless to bluish gas with a characteristic pungent odor.

---

## 10. Stability and Reactivity

**Stability:**

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.

**Hazardous Decomposition Products:**

Reactive singlet oxygen.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Ozone is a powerful oxidizing agent and reacts with all oxidizable materials, both organic and inorganic. Some reactions are highly explosive. Alkenes, benzene and other aromatic compounds, rubber, dicyanogen, bromine diethyl ether, dinitrogen tetroxide, nitrogen trichloride, hydrogen bromide, and tetrafluorohydrazine.

**Conditions to Avoid:**

Incompatibles.

---

## 11. Toxicological Information

Ozone is extremely irritating to the upper and lower respiratory tract. The characteristic odor is readily detectable at low concentrations ( 0.02 ppm to 0.05 ppm). 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.

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## 12. Ecological Information

**Environmental Fate:**

No information found.

**Environmental Toxicity:**

No information found.

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## 13. Disposal Considerations

Do not dispose of ozone off gas to atmosphere without properly designed off gas destruct unit. State and local disposal regulations may differ from federal disposal regulations.

---

## 14. Transport Information

**Proper Shipping Name:**

N/A

**Hazard Class:**

N/A  
**Identification Number:**  
N/A  
**Packing Group:**  
N/A

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## 15. Regulatory Information

**SARA TITLE III:**

N/A

**TSCA:**

The ingredients of this product are on the TSCA Inventory List.

**OSHA:**

Nonhazardous according to definitions of health hazard and physical hazard provided in the Hazard Communication Standard (29 CFR 1910.1200)

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## 16. Other Information

**Label Hazard Warning:**

HIGHLY REACTIVE. OZONE GAS AFFECTS THE RESPIRATORY SYSTEM.

**Label Precautions:**

Keep away from heat, sparks and flame. Avoid contact with eyes, skin and clothing. Avoid breathing. Use with adequate ventilation.

**Label First Aid:**

If inhaled, remove to fresh air. Get medical attention for any breathing difficulty.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

Pure. New 16 section MSDS format, all sections have been revised.

**Disclaimer:**

\*\*\*\*\*

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\*\*\*\*\*

**HYDROGEN PEROXIDE (50%)  
(MSDS)**

GREAT WESTERN CHEMICAL -- HYDROGEN PEROXIDE 50% - HYDROGEN PEROXIDE, REAGENT  
MATERIAL SAFETY DATA SHEET  
NSN: 6810013534876  
Manufacturer's CAGE: GREAT  
Part No. Indicator: A  
Part Number/Trade Name: HYDROGEN PEROXIDE 50%

=====  
General Information  
=====

Item Name: HYDROGEN PEROXIDE, REAGENT  
Company's Name: GREAT WESTERN CHEMICAL CO  
Company's Street: 808 SW 15TH AVE  
Company's City: PORTLAND  
Company's State: OR  
Company's Country: 5S  
Company's Zip Code: 97205  
Company's Emerg Ph #: 503-228-2600/800-424-9300 (CHEMTREC)  
Company's Info Ph #: 503-228-2600  
Record No. For Safety Entry: 001  
Tot Safety Entries This Stk#: 003  
Status: SE  
Date MSDS Prepared: 20MAY91  
Safety Data Review Date: 09AUG94  
Supply Item Manager: CX  
MSDS Preparer's Name: ED DOHENY  
Preparer's Company: GREAT WESTERN CHEMICAL CO  
MSDS Serial Number: BTDDJ  
Specification Number: UNKNOWN  
Hazard Characteristic Code: D1  
Unit Of Issue: DR  
Unit Of Issue Container Qty: 500 ML  
Type Of Container: DRUM

=====  
Ingredients/Identity Information  
=====

Proprietary: NO  
Ingredient: HYDROGEN PEROXIDE (SARA III)  
Ingredient Sequence Number: 01  
Percent: 50 MIN  
NIOSH (RTECS) Number: MX0900000  
CAS Number: 7722-84-1  
OSHA PEL: 1 PPM  
ACGIH TLV: 1 PPM; 9394  
Other Recommended Limit: NONE RECOMMENDED

=====  
Physical/Chemical Characteristics  
=====

Appearance And Odor: CLEAR, COLORLESS LIQUID WITH A SLIGHTLY PUNGENT,  
IRRITATING ODOR.  
Boiling Point: 237F,114C  
Melting Point: -62F,-52C  
Specific Gravity: 1.195 @58F  
Solubility In Water: COMPLETE.  
pH: 3-5  
Autoignition Temperature: N/A

=====  
Fire and Explosion Hazard Data  
=====

Flash Point: N/A  
Lower Explosive Limit: N/A  
Upper Explosive Limit: N/A  
Extinguishing Media: WATER, FOAM, CARBON DIOXIDE, AND DRY CHEMICALS.  
Special Fire Fighting Proc: WHEN FIRE FIGHTING WEAR FULL PROTECTIVE

EQUIPMENT, INCLUDING SELF-CONTAINED BREATHING APPARATUS.  
 Unusual Fire And Expl Hazrds: MAY PRODUCE HAZ FUMES/HAZ DECOMP PRODUCTS.  
 STRONG OXIDIZER!CONTACT W/FLAMM/COMBUST VAPORS & ORG MATLS MAY INITIATE  
 FIRE OR POSSIBLY AN EXPLOSION.SUPPORT COMUBST.

=====  
 Reactivity Data  
 =====

Stability: YES  
 Cond To Avoid (Stability): HOT STORAGE.  
 Materials To Avoid: ORGANICS OR OTHER FLAMM & COMBUSTIBLE MATL, CATALYTIC  
 METALS, REDUCING AGENTS, & OTHER OXIDIZERS.  
 Hazardous Decomp Products: DECOMPOSITION PRODUCES HEAT, STEAM, & LARGE  
 VOLUMES OF OXYGEN.  
 Hazardous Poly Occur: NO  
 Conditions To Avoid (Poly): NONE.

=====  
 Health Hazard Data  
 =====

LD50-LC50 Mixture: NOT ESTABLISHED ON THIS PRODUCT.  
 Route Of Entry - Inhalation: YES  
 Route Of Entry - Skin: YES  
 Route Of Entry - Ingestion: YES  
 Health Haz Acute And Chronic: ACUTE:HARMFUL IF INHALED OR SWALLOWED.  
 CAUSES SEVERE EYE & SKIN IRRITATION OR BURNS. CHRONIC:REPEATED EXPOUSRE MAY  
 LEAD TO DERMATITIS WITH DESTRUCTION OF TISSUES, OTHERWISE SAME AS FOR  
 OVEREXPOSURE.  
 Carcinogenicity - NTP: NO  
 Carcinogenicity - IARC: NO  
 Carcinogenicity - OSHA: NO  
 Explanation Carcinogenicity: PER MSDS MATL NOT MFG TO HAVE KNOWN  
 CARCINOGEN OR REPRODUCTIVE TOXIN.EXTREMELY SM AMTS MAY BE PRESENT FROM GEN  
 EVIR SOUR  
 Signs/Symptoms Of Overexp: CAUSES SEVERE EYE & SKIN IRRIT OR BURBS.  
 HARMFUL IF SWALLOWED OR INHALED.  
 Med Cond Aggravated By Exp: NONE SPECIFIED BY MFG.  
 Emergency/First Aid Proc: EYE:IMMED FLUSH W/PLENTY OF CLEAN RUNNING WATER  
 @ LEAST 15MINS LIFTING EYELIDS.CALL DR IMMED. SKIN:IMMED FLUSH W/ PLENTY OF  
 CLEAN RUNNING WATER @ LEAST 15MIN WHILE REMOVING CONTAMIN CLOTH/ SHOES.IF  
 IRRIT OCCURS GET MED ATTN. INGEST:DO NOT INDUCE VOMIT.IMMED DRINK LG  
 QUANTIY OF MILK OR WATER.CALL DR.INHAL:IMMED REMOVE TO FRESH AIR.NOT BREATH  
 GIVE ART RESP(MOUTH-TO-MOUTH).BREATH DIFFI GIVE OXY.CALL DR

=====  
 Precautions for Safe Handling and Use  
 =====

Steps If Matl Released/Spill: REMOVE IGNI SOURCES.CONTAIN SPILL.SM:DILUTE  
 W/WATER.THEN ADD DRY MATL TO CONTAIN.WEAR RECOMMENDED PROTECTIVE EQPMT &  
 EXPLOSION-PROOF EQPMT TO REMOVE BULK OF LIQ.DILUTE REMAINDER W/WATER.THEN  
 ADD DRY MATL TO ABOSRB.PICKUP & CONTAINERIZE.FLUSH W/WATER.  
 Neutralizing Agent: WATER.  
 Waste Disposal Method: PRODUCT IF DISPOSED AS SHIPPED MEETS EPA CRITERIA  
 OF HAZ WASTE AS SPECIFIED IN 40CFR261 ON BASIS OF IGNITABILITY.DISPOSE OF  
 PRODUCT IN LICENSED HAZ WASTE DISPOSAL FACILITY IAW ALL APPLICABLE LAWS.  
 COLLECT RINSATES FROM SPILLS FOR DISPOSAL OR SEWER,APP  
 Precautions-Handling/Storing: STORE IN COOL, WELL-VENTILATED AREA AWAY  
 FROM HEAT & OXIDIZABLE ORGANIC MATERIALS, TIGHTLY CLOSED WHEN NOT IN USE.  
 KEEP OUT OF REACH OF CHILDREN.  
 Other Precautions: WHEN EMPTY RINSE WELL CONTAINER W/WATER BEFORE  
 DISPOSAL,RETURN TO MFG OR ANY OTHER INDUSTRIAL USE.DON'T ALLOW MATL TO  
 STAND IN OPEN CONTAINER AS WATER EVAPORATION CAN OCCUR & MAY CONCEN  
 PEROXIDE CONTENT TO PT BECOMES SHOCK SENSIT & EXPLODE.

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 Control Measures  
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Respiratory Protection: IF THE OSHA-PEL IS EXCEEDED A NIOSH-APPROVED

RESPIRATOR WITH SUPPLIED AIR OR A SCBA IS REQUIRED.  
 Ventilation: LOCAL EXHAUST REQUIRED.MECHANICAL(GEN) AS A SUPPLEMENT TO THE LOCAL EXHAUST SYSTEM.  
 Protective Gloves: RUBBER OR SYNTHETIC RUBBER.  
 Eye Protection: CHEMICAL GOGGLES & FULL FACE SHIELD.  
 Other Protective Equipment: RUBBER OR PVC SLIKER SUITE, RUBBER BOOTS, EYEWASH, SAFETY SHOWER.  
 Work Hygienic Practices: WASH HANDS AFTER HANDLING. AVOID EYE/SKIN/CLOTH CONTACT.WASH CONTAM CLOTH/SHOE PRIOR TO REUSE.  
 Suppl. Safety & Health Data: FOOD GRADE PRODUCTS ARE NOT FOR REPACKAGING. FOOD GRADE HYDROGEN PEROXIDE IS APPROVED BY FDA & USDA FOR CERTAIN INDUSTRIAL APPLICATIONS. IT IS NOT APPROVED FOR ANY THERAPEUTIC PURPOSE.

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 Transportation Data  
 =====

Trans Data Review Date: 94221  
 DOT PSN Code: HMG  
 DOT Proper Shipping Name: HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS  
 DOT Class: 5.1  
 DOT ID Number: UN2014  
 DOT Pack Group: II  
 DOT Label: OXIDIZER, CORROSIVE  
 IMO PSN Code: IIL\_\_\_  
 IMO Proper Shipping Name: HYDROGEN PEROXIDE, AQUEOUS SOLUTION,  
 IMO Regulations Page Number: 5151  
 IMO UN Number: 2014  
 IMO UN Class: 5.1  
 IMO Subsidiary Risk Label: CORROSIVE  
 IATA PSN Code: NUG  
 IATA UN ID Number: 2014  
 IATA UN Class: 5.1  
 IATA Subsidiary Risk Class: 8  
 AFI PSN Code: NUG  
 AFI Basic Pac Ref: NOT ACCEPTED  
 Additional Trans Data: PER MSDS DOT SHIPPING CLASSIFICATION: HYDROGEN PEROXIDE SOLUTION (40-52% PEROXIDE), OXIDIZER UN2014.

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 Disposal Data  
 =====

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 Label Data  
 =====

Label Required: YES  
 Technical Review Date: 09AUG94  
 Label Status: F  
 Common Name: HYDROGEN PEROXIDE 50%  
 Chronic Hazard: NO  
 Signal Word: WARNING!  
 Acute Health Hazard-Moderate: X  
 Contact Hazard-Moderate: X  
 Fire Hazard-None: X  
 Reactivity Hazard-None: X  
 Special Hazard Precautions: STRONG OXIDIZER! FOR INDUSTRIAL USE ONLY. HARMFUL IF INHAL/INGEST. CAUSES SEVERE EYE & SKIN IRRIT OR BURNS. REPEATED EXPOUSRE MAY LEAD TO DERM W/DESTRUCTION OF TISSUES.TARGET ORGANS:EYE/SKIN/ TISSUES. 1ST AID:EYE:IMMED FLUSH W/PLENTY OF CLEAN RUNNING WATER @ LEAST 15MINS LIFTING EYELIDS.CALL DR IMMED. SKIN:IMMED FLUSH W/PLENTY OF CLEAN RUNNING WATER @ LEAST 15MIN WHILE REMOVING CONTAMIN CLOTH/SHOES.IF IRRIT OCCURS GET MED ATTN. INGEST:DO NOT INDUCE VOMIT.IMMED DRINK LG QUANTIY OF MILK OR WATER.CALL DR.INHAL:IMMED REMOVE TO FRESH AIR.NOT BREATH GIVE ART RESP(MOUTH-TO-MOUTH).BREATH DIFFI GIVE OXY.CALL DR  
 Protect Eye: Y  
 Protect Skin: Y  
 Protect Respiratory: Y

Label Name: GREAT WESTERN CHEMICAL CO  
Label Street: 808 SW 15TH AVE  
Label City: PORTLAND  
Label State: OR  
Label Zip Code: 97205  
Label Country: 5S  
Label Emergency Number: 503-228-2600

**GRANULAR ACTIVATED CARBON  
(MSDS)**

**MATERIAL SAFETY DATA SHEET**

Barnebey & Sutcliffe Corporation  
 835 North Cassady Avenue, P.O. Box 2526  
 Columbus, Ohio 43216  
 Phone: (614) 258-9501 Fax: (614) 258-3464  
 Emergency Phone Number: (614) 258-4744

**Section I - PRODUCT NAME**  
 Activated Carbon Type : PE

**Section II - HAZARDOUS INGREDIENTS**

<u>Name</u>	<u>CAS Number</u>	<u>% By Weight</u>
1. Carbon Activated Carbon (Non-Regulated)	7440-44-0	100
2.		
3.		
4.		

(ACGIH, OSHA and other TLV are not applicable for activated carbon.)

**Caution:** Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state and federal regulations.

**SECTION III - PHYSICAL DATA**

Boiling Point (°F) : N/A	Specific Gravity (water=1) : 1.9-2.2
Vapor Pressure : N/A	Packing Density (g/cc) : 0.4-0.8
Solubility In Water : N/A	pH : N/A
Appearance & Odor : Black granular or powder odorless	

**SECTION IV - FIRE & EXPLOSION HAZARD DATA**

Flash Point : N/A	LEL : N/A	Ignition Temperature (°C) : 350
Flammable Limits : N/A	UEL : N/A	
Extinguishing Media : Flood with plenty of water or inert gas, such as N <sub>2</sub> and CO <sub>2</sub>		
Special Fire Fighting Procedure: None		

**SECTION V - REACTIVITY**

Stability : Stable
Hazardous Polymerization : Will not occur
Hazardous Decomposition : CO may be generated in the event of fire

Condition To Avoid : Contact with strong oxidizers, such as ozone, liquid oxygen, chlorine, permanganate and ketone may cause a bed fire.

Incompatibility : Avoid contact with high concentration of ketone in air or liquid. (Contact Barnebey & Sutcliffe for further information.)

#### SECTION VI - HEALTH HAZARD DATA

Carcinogenicity : N/A                      Skin : N/A                      Ingestion : N/A  
 Acute or Chronic : N/A                      NTP : N/A                      IARC Monograph : N/A  
 Inhalation : Dust may be inhaled                      OSHA : N/A

Signs & Symptoms of Exposure : Slight irritation of eyes and nose may result from contact with carbon fines  
 Medical Conditions Generally Aggravated By Exposure : N/A

#### SECTION VII - EMERGENCY & FIRST AID PROCEDURE

Skin : N/A                      Ingestion : N/A                      Inhalation : N/A  
 Eye : Flush with plenty of water at least for 15 minutes

Follow-up with physician exam if necessary.

#### SECTION VIII - SAFE HANDLING & STORAGE

Protective Gloves : Rubber Gloves                      Protective Clothing : Not required  
 Eye Protection : Safety Glasses                      Respirator Protection: A NIOSH approved particulate filter  
 Ventilation : Local & Mechanical exhaust recommended  
 Storage & Handling : Avoid generation of dust and fines during handling

#### SECTION IX - SPILL OR LEAK PROCEDURE

Notify EPA if Product Spills : Report in accordance with local, state and federal regulations  
 Cleaning Procedure : Sweep up unused carbon and discard in refuse container or repackage for further use.

#### SECTION X - OTHER OPERATIONAL INSTRUCTIONS

Prepared By : Chuck Hegenberger

Date : June 1999

BARNEBEY & SUTCLIFFE MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON