

**CLASS II ADMINISTRATIVE UPDATE
APPLICATION FOR OPTIMA BELLE, LLC
FOR PERMIT R13-0882I**

REDACTED APPLICATION

Prepared for:

Optima Belle, LLC
901 W. Dupont Avenue
Belle, West Virginia 25015

Prepared by:

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Project No. 0101-14-0162-005

March 2016

POTESTA

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SECTION I - III
GENERAL APPLICANT INFORMATION



WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

601 57th Street, SE
 Charleston, WV 25304
 (304) 926-0475
www.dep.wv.gov/daq

**APPLICATION FOR NSR PERMIT
 AND
 TITLE V PERMIT REVISION
 (OPTIONAL)**

PLEASE CHECK ALL THAT APPLY TO NSR (45CSR13) (IF KNOWN):

- CONSTRUCTION MODIFICATION RELOCATION
 CLASS I ADMINISTRATIVE UPDATE TEMPORARY
 CLASS II ADMINISTRATIVE UPDATE AFTER-THE-FACT

PLEASE CHECK TYPE OF 45CSR30 (TITLE V) REVISION (IF ANY):

- ADMINISTRATIVE AMENDMENT MINOR MODIFICATION
 SIGNIFICANT MODIFICATION

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS ATTACHMENT S TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant (as registered with the WV Secretary of State's Office): Optima Belle, LLC		2. Federal Employer ID No. (FEIN): 465403006	
3. Name of facility (if different from above): Optima Belle Plant		4. The applicant is the: <input type="checkbox"/> OWNER <input type="checkbox"/> OPERATOR <input checked="" type="checkbox"/> BOTH	
5A. Applicant's mailing address: 901 W. DuPont Avenue Belle, West Virginia 25015		5B. Facility's present physical address: 901 W. DuPont Avenue Belle, West Virginia 25015	
6. West Virginia Business Registration. Is the applicant a resident of the State of West Virginia? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO ⇒ If YES, provide a copy of the Certificate of Incorporation/Organization/Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A . ⇒ If NO, provide a copy of the Certificate of Authority/Authority of L.L.C./Registration (one page) including any name change amendments or other Business Certificate as Attachment A .			
7. If applicant is a subsidiary corporation, please provide the name of parent corporation: No			
8. Does the applicant own, lease, have an option to buy or otherwise have control of the <i>proposed site</i> ? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO ⇒ If YES, please explain: The site is owned and operated by the applicant. ⇒ If NO, you are not eligible for a permit for this source.			
9. Type of plant or facility (stationary source) to be constructed, modified, relocated, administratively updated or temporarily permitted (e.g., coal preparation plant, primary crusher, etc.): Chemical Manufacturing		10. North American Industry Classification System (NAICS) code for the facility: 325199	
11A. DAQ Plant ID No. (for existing facilities only): 039-00663		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): R13-0882I, R30-03900001	

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- ⇒ For **Modifications, Administrative Updates or Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- ⇒ For **Construction or Relocation permits**, please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

I-64 to Belle exit, then Rt. 60 East to Belle exit, turn right onto DuPont Avenue, travel approximately 500 feet and the plant entrance is on the left.

12.B. New site address (if applicable):

Same

12C. Nearest city or town:

Belle

12D. County:

Kanawha

12.E. UTM Northing (KM): 4,232.60

12F. UTM Easting (KM): 451.90

12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:

The facility proposes to manufacture Sodium Tetraphenylborate (STPB).

14A. Provide the date of anticipated installation or change: 05/01/2016

- ⇒ If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: NA

14B. Date of anticipated Start-Up if a permit is granted:

05/01/2016

14C. Provide a **Schedule** of the planned **Installation of/Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:

Hours Per Day 24 Days Per Week 7 Weeks Per Year 52

16. Is demolition or physical renovation at an existing facility involved? YES NO

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (*if known*). A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance (*if known*). Provide this information as **Attachment D**.

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan**, e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to **Plot Plan Guidance**).

- ⇒ Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F**.

23. Provide a **Process Description** as **Attachment G**.

- ⇒ Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H**.

- ⇒ For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I**.

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J**.

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K**.

28. Check all applicable **Emissions Unit Data Sheets** listed below:

<input type="checkbox"/> Bulk Liquid Transfer Operations	<input type="checkbox"/> Haul Road Emissions	<input type="checkbox"/> Quarry
<input type="checkbox"/> Chemical Processes	<input type="checkbox"/> Hot Mix Asphalt Plant	<input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities
<input type="checkbox"/> Concrete Batch Plant	<input type="checkbox"/> Incinerator	<input type="checkbox"/> Storage Tanks
<input type="checkbox"/> Grey Iron and Steel Foundry	<input type="checkbox"/> Indirect Heat Exchanger	

General Emission Unit, specify: STPB production

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L**.

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

<input type="checkbox"/> Absorption Systems	<input type="checkbox"/> Baghouse	<input type="checkbox"/> Flare
<input type="checkbox"/> Adsorption Systems	<input type="checkbox"/> Condenser	<input type="checkbox"/> Mechanical Collector
<input type="checkbox"/> Afterburner	<input type="checkbox"/> Electrostatic Precipitator	<input type="checkbox"/> Wet Collecting System

Other Collectors, specify: Existing permitted control devices are being utilized.

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M**.

30. Provide all **Supporting Emissions Calculations** as **Attachment N**, or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O**.

➤ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and **Example Legal Advertisement** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

YES NO

➤ If YES, identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's "**Precautionary Notice – Claims of Confidentiality**" guidance found in the **General Instructions** as **Attachment Q**.

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

<input type="checkbox"/> Authority of Corporation or Other Business Entity	<input type="checkbox"/> Authority of Partnership
<input type="checkbox"/> Authority of Governmental Agency	<input type="checkbox"/> Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R**.

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned **Responsible Official** / **Authorized Representative**, hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE _____

(Please use blue ink)

DATE: _____

3/24/2016

(Please use blue ink)

35B. Printed name of signee: K. Gene Williams		35C. Title: President
35D. E-mail: gwilliams@optimachem.com	36E. Phone: (912) 384-6330	36F. FAX: Use Email
36A. Printed name of contact person (if different from above): James Hook		36B. Title: EHS&S Manager
36C. E-mail: jhook@optimachem.com	36D. Phone: (304) 949-7152	36E. FAX: Use Email

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- | | |
|--|--|
| <input checked="" type="checkbox"/> Attachment A: Business Certificate | <input checked="" type="checkbox"/> Attachment K: Fugitive Emissions Data Summary Sheet |
| <input checked="" type="checkbox"/> Attachment B: Map(s) | <input checked="" type="checkbox"/> Attachment L: Emissions Unit Data Sheet(s) |
| <input checked="" type="checkbox"/> Attachment C: Installation and Start Up Schedule | <input type="checkbox"/> Attachment M: Air Pollution Control Device Sheet(s) |
| <input checked="" type="checkbox"/> Attachment D: Regulatory Discussion | <input checked="" type="checkbox"/> Attachment N: Supporting Emissions Calculations |
| <input checked="" type="checkbox"/> Attachment E: Plot Plan | <input checked="" type="checkbox"/> Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans |
| <input checked="" type="checkbox"/> Attachment F: Detailed Process Flow Diagram(s) | <input checked="" type="checkbox"/> Attachment P: Public Notice |
| <input checked="" type="checkbox"/> Attachment G: Process Description | <input checked="" type="checkbox"/> Attachment Q: Business Confidential Claims |
| <input checked="" type="checkbox"/> Attachment H: Material Safety Data Sheets (MSDS) | <input type="checkbox"/> Attachment R: Authority Forms |
| <input checked="" type="checkbox"/> Attachment I: Emission Units Table | <input checked="" type="checkbox"/> Attachment S: Title V Permit Revision Information |
| <input checked="" type="checkbox"/> Attachment J: Emission Points Data Summary Sheet | <input checked="" type="checkbox"/> Application Fee |

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY - IF THIS IS A TITLE V SOURCE:

- Forward 1 copy of the application to the Title V Permitting Group and:
- For Title V Administrative Amendments:
 - NSR permit writer should notify Title V permit writer of draft permit,
- For Title V Minor Modifications:
 - Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,
 - NSR permit writer should notify Title V permit writer of draft permit.
- For Title V Significant Modifications processed in parallel with NSR Permit revision:
 - NSR permit writer should notify a Title V permit writer of draft permit,
 - Public notice should reference both 45CSR13 and Title V permits,
 - EPA has 45 day review period of a draft permit.

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

ATTACHMENT A
BUSINESS CERTIFICATE

**WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION
CERTIFICATE**

**ISSUED TO:
OPTIMA BELLE LLC
901 W DUPONT AVE
BELLE, WV 25015-1555**

BUSINESS REGISTRATION ACCOUNT NUMBER: 2298-1773

This certificate is issued on: 05/8/2015

*This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with Chapter 11, Article 12, of the West Virginia Code*

*The person or organization identified on this certificate is registered
to conduct business in the State of West Virginia at the location above.*

This certificate is not transferrable and must be displayed at the location for which issued

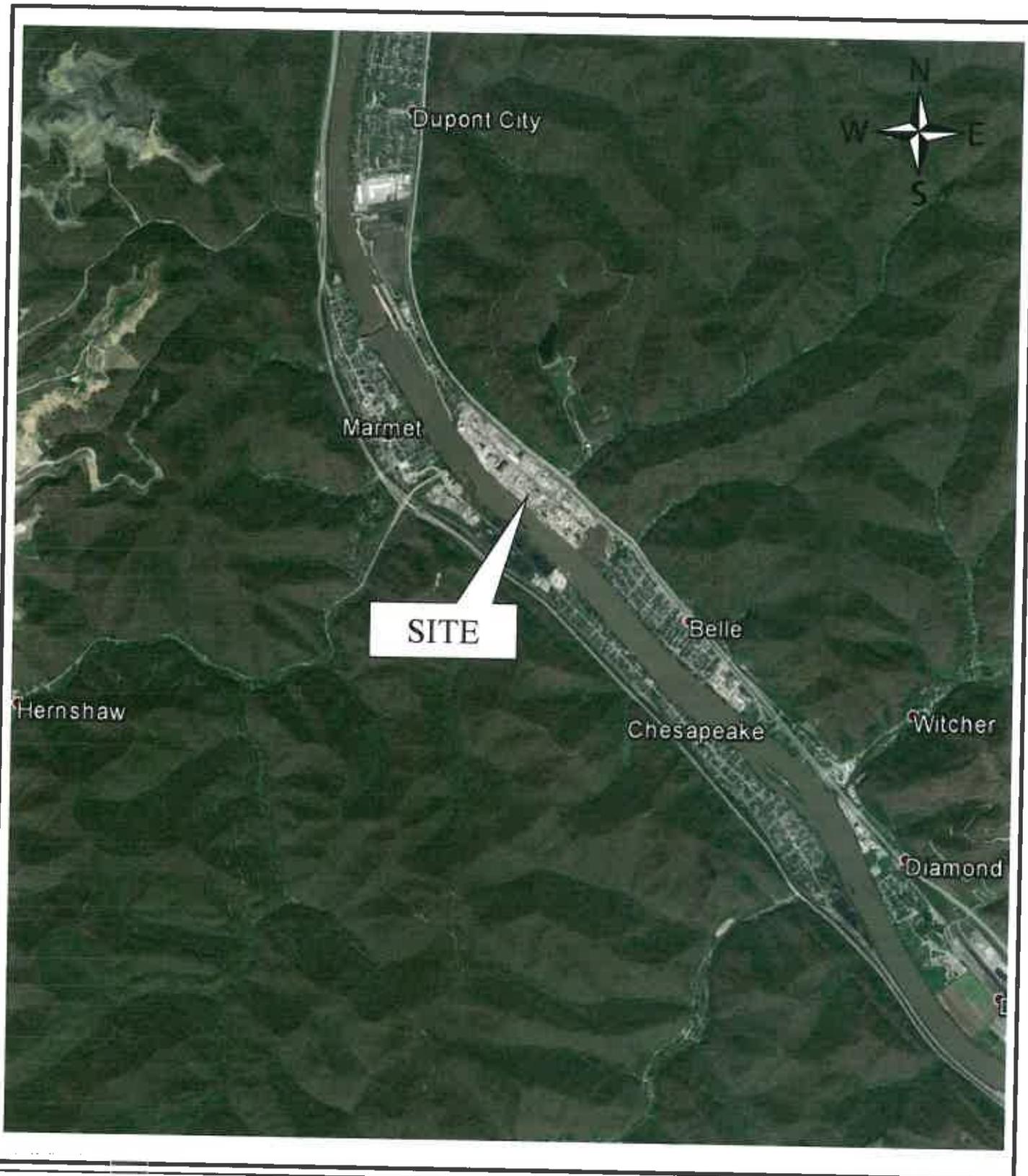
This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.

**TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them.
CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of
this certificate displayed at every job site within West Virginia.**

ATTACHMENT B

AREA MAP



DATE: February 2016

PROJECT NO. 0101-14-0162

MAPPING FOR VISUAL REPRESENTATION ONLY

**SITE LOCATION MAP 1 of 2
OPTIMA BELLE, LLC
BELLE, KANAWHA COUNTY, WV**

NOT TO SCALE



DATE: February 2016

PROJECT NO. 0101-14-0162

MAPPING FOR VISUAL REPRESENTATION ONLY

SITE LOCATION MAP 2 of 2
OPTIMA BELLE, LLC
BELLE, KANAWHA COUNTY, WV

NOT TO SCALE

ATTACHMENT C
INSTALLATION AND START UP SCHEDULE

ATTACHMENT C

SCHEDULE OF INSTALLATION

Optima Belle, LLC (Optima) anticipates startup of operations to begin in May, 2016 and after approval of the permit. The new centrifuge feed tank and new polish filters will be installed after approval of the permit.

ATTACHMENT D
REGULATORY DISCUSSION

ATTACHMENT D

REGULATORY DISCUSSION

The addition of STPB process/manufacturing to this facility does not modify the regulatory basis for the permit. The equipment being utilized to manufacture STPB is mostly existing permitted equipment (except for the centrifuge feed tank and polish filters) with controls which are specified in the permit. No new pollution control equipment will be added.

ATTACHMENT E
PLOT PLAN

ATTACHMENT F
DETAILED PROCESS FLOW DIAGRAM

STPB Process Flow Diagram 1 of 3

REDACTED
Information claimed confidential by
Optima Belle, LLC February 17, 2016.

STPB Process Flow Diagram 2 of 3

REDACTED
Information claimed confidential by
Optima Belle, LLC February 17, 2016.

STPB Process Flow Diagram 3 of 3

REDACTED
Information claimed confidential by
Optima Belle, LLC February 17, 2016.

ATTACHMENT G
PROCESS DESCRIPTION

Process Description – STPB

Sodium tetraphenyl borate (“STPB”), a white powdered solid, is produced from reactions of mixtures which include: trimethyl borate, magnesium, chlorobenzene, tetrahydrofuran, toluene, THF, hexane, methanol, benzene, sulfuric acid, sodium chloride, sodium hydroxide, and water.

STPB is typically used to generate other tetraphenylborate salts or as a precipitating agent in other chemistries.

Process Summary:

Varying amounts of the listed components are charged to nitrogen-blanketed reactors, then agitated for mixing and heated. These mixtures are then combined and react to form the final product. Through decanting, stripping, and drying, the final product is isolated and purified from the reaction mixtures and solvents. Waste materials are loaded to totes and tanker trucks for off-site disposal.

[REDACTED]

[REDACTED]

[REDACTED]

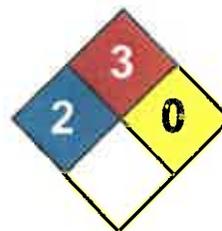
[REDACTED]

[REDACTED]

REDACTED
Information claimed confidential
by Optima Belle, LLC. February 17,

[Redacted text block]

ATTACHMENT H
MATERIAL SAFETY DATA SHEETS (MSDS)



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Chlorobenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chlorobenzene

Catalog Codes: SLC1654

CAS#: 108-90-7

RTECS: CZ0175000

TSCA: TSCA 8(b) inventory: Chlorobenzene

CM#: Not available.

Synonym: Monochlorobenzene

Chemical Name: Not available.

Chemical Formula: C6H5Cl

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chlorobenzene	108-90-7	100

Toxicological Data on Ingredients: Chlorobenzene: ORAL (LD50): Acute: 1110 mg/kg [Rat]. 2300 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, sensitizer, permeator). Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, sensitizer, permeator). **CARCINOGENIC EFFECTS:** Not available. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 638°C (1180.4°F)

Flash Points: CLOSED CUP: 29.44°C (85°F).

Flammable Limits: LOWER: 1.3% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 10 (ppm) TWA: 46 (mg/m³) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Almond-like.

Taste: Not available.

Molecular Weight: 112.56 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 132°C (269.6°F)

Melting Point: -45.6°C (-50.1°F)

Critical Temperature: Not available.

Specific Gravity: 1.1058 (Water = 1)

Vapor Pressure: 8.8 mm of Hg (@ 20°C)

Vapor Density: 3.88 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.2 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:

Soluble in methanol, diethyl ether. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 1110 mg/kg [Rat].

Chronic Effects on Humans: The substance is toxic to kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, sensitizer, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Chlorobenzene : UN1134 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Chlorobenzene Massachusetts RTK: Chlorobenzene TSCA 8(b) inventory: Chlorobenzene SARA 313 toxic chemical notification and release reporting: Chlorobenzene CERCLA: Hazardous substances.: Chlorobenzene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R10- Flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R43- May cause sensitization by skin contact.

HMS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

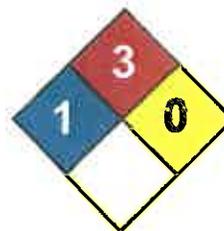
References: Not available.

Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	G

Material Safety Data Sheet

Hexanes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hexanes

Catalog Codes: SLH2335, SLH2032

CAS#: 110-54-3

RTECS: MN9275000

TSCA: TSCA 8(b) inventory: Hexane

CI#: Not applicable.

Synonym:

Chemical Name: Hexane

Chemical Formula: C₆-H₁₄

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hexanes	110-54-3	98.5-99.9

Toxicological Data on Ingredients: Hexane: ORAL (LD50): Acute: 25000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. **MUTAGENIC EFFECTS:** Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to peripheral nervous system, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 225°C (437°F)

Flash Points: CLOSED CUP: -22.5°C (-8.5°F). (TAG)

Flammable Limits: LOWER: 1.15% UPPER: 7.5%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards:

Extremely flammable liquid and vapor. Vapor may cause flash fire.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 500 (ppm) from OSHA (PEL) [United States] Inhalation TWA: 1800 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 176 (mg/m3) from ACGIH (TLV) [United States] SKIN TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 500 STEL: 1000 (ppm) from ACGIH (TLV) [United States] Inhalation TWA: 1760 STEL: 3500 (mg/m3) from ACGIH (TLV) [United States] Inhalation Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Gasoline-like or petroleum-like (Slight.)

Taste: Not available.

Molecular Weight: 86.18g/mole

Color: Clear Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 68°C (154.4°F)

Melting Point: -95°C (-139°F)

Critical Temperature: Not available.

Specific Gravity: 0.66 (Water = 1)

Vapor Pressure: 17.3 kPa (@ 20°C)

Vapor Density: 2.97 (Air = 1)

Volatility: Not available.

Odor Threshold: 130 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.9

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Soluble in diethyl ether, acetone. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Hexane can react vigorously with strong oxidizers (e.g. chlorine, bromine, fluorine)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 25000 mg/kg [Rat]. Acute toxicity of the gas (LC50): 48000 ppm 4 hours [Rat].

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: peripheral nervous system, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects based on animal data. May be tumorigenic based on animal data. May affect genetic material. Passes through the placental barrier in animal.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause mild skin irritation. It can be absorbed through the skin in harmful amounts. Eyes: May cause mild eye irritation. Inhalation: May be harmful if inhaled. Inhalation of vapors may cause respiratory tract irritation. Overexposure may affect, brain, spinal cord, behavior/central and peripheral nervous systems (lightheadness, dizziness, hallucinations, paralysis, blurred vision, memory loss, headache, euphoria, general anesthetic, muscle weakness, numbness of the extremities, asphyxia, unconsciousness and possible death), metabolism, respiration, blood, cardiovascular system, gastrointestinal system (nausea) Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation with abdominal pain and nausea. May also affect the liver, blood, brain, peripheral and central nervous systems. Symptoms of over exposure by ingestion are similar to that of overexposure by inhalation.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Hexane UNNA: 1208 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information**Federal and State Regulations:**

Connecticut hazardous material survey.: Hexanes Illinois toxic substances disclosure to employee act: Hexanes Illinois chemical safety act: Hexanes New York release reporting list: Hexanes Rhode Island RTK hazardous substances: Hexanes Pennsylvania RTK: Hexanes Florida: Hexanes Minnesota: Hexanes Massachusetts RTK: Hexanes Massachusetts spill list: Hexanes New Jersey: Hexanes New Jersey spill list: Hexanes Louisiana spill reporting: Hexanes TSCA 8(b) inventory: Hexanes SARA 313 toxic chemical notification and release reporting: Hexanes CERCLA: Hazardous substances.: Hexanes: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable. R20- Harmful by inhalation. R38- Irritating to skin. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R62- Possible risk of impaired fertility. R65- Harmful: may cause lung damage if swallowed. R67- Vapors may cause drowsiness or dizziness. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S29- Do not empty into drains. S33- Take precautionary measures against static discharges. S36/37- Wear suitable protective clothing and gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets. S62- If swallowed, do not induce vomiting: seek medical advice immediately and show this

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of acids, of moisture. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:

Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:

Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air. Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas which is highly flammable and explosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:

Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Very slightly soluble in hot water. Insoluble in cold water. Insoluble in chromium trioxides, and mineral acids, alkalis. Slightly soluble with decomposition in hot water. Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Violent chemical reaction with oxidizing agents. Reacts with water to create hydrogen gas and heat. Must be kept dry. Reacts with acids to form hydrogen gas which is highly flammable and explosive. Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing. Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing. Inhalation: Low hazard for usual industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect. Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingestion of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Magnesium Rhode Island RTK hazardous substances: Magnesium Pennsylvania RTK: Magnesium Massachusetts RTK: Magnesium Massachusetts spill list: Magnesium New Jersey: Magnesium TSCA 8(b) inventory: Magnesium

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-4: Flammable solid. CLASS B-6: Reactive and very flammable material.

DSCL (EEC):

R11- Highly flammable. R15- Contact with water liberates extremely flammable gases. S7/8- Keep container tightly closed and dry. S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

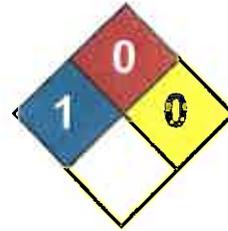
References: Not available.

Other Special Considerations: Not available.

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Sodium chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium chloride

Catalog Codes: SLS3262, SLS1045, SLS3889, SLS1669, SLS3091

CAS#: 7647-14-5

RTECS: VZ4725000

TSCA: TSCA 8(b) inventory: Sodium chloride

CI#: Not applicable.

Synonym: Salt; Sea Salt

Chemical Name: Sodium chloride

Chemical Formula: NaCl

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium chloride	7647-14-5	100

Toxicological Data on Ingredients: Sodium chloride: ORAL (LD50): Acute: 3000 mg/kg [Rat.], 4000 mg/kg [Mouse]. DERMAL (LD50): Acute: >10000 mg/kg [Rabbit]. DUST (LC50): Acute: >42000 mg/m 1 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards:

Electrolysis of sodium chloride in presence of nitrogenous compounds to produce chlorine may lead to formation of explosive nitrogen trichloride. Potentially explosive reaction with dichloromaleic anhydride + urea.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid crystalline powder.)

Odor: Slight.

Taste: Saline.

Molecular Weight: 58.44 g/mole

Color: White.

pH (1% soln/water): 7 [Neutral.]

Boiling Point: 1413°C (2575.4°F)

Melting Point: 801°C (1473.8°F)

Critical Temperature: Not available.

Specific Gravity: 2.165 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in cold water, hot water. Soluble in glycerol, and ammonia. Very slightly soluble in alcohol. Insoluble in Hydrochloric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, high temperatures.

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:

Hygroscopic. Reacts with most nonnoble metals such as iron or steel, building materials (such as cement) Sodium chloride is rapidly attacked by bromine trifluoride. Violent reaction with lithium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Rat.]. Acute dermal toxicity (LD50): >10000 mg/kg [Rabbit]. Acute toxicity of the dust (LC50): >42000 mg/m³ 1 hours [Rat].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Lowest Published Lethal Dose (LDL) [Man] - Route: Oral; Dose: 1000 mg/kg

Special Remarks on Chronic Effects on Humans:

Causes adverse reproductive effects in humans (fetotoxicity, abortion,) by intraplacental route. High intake of sodium chloride, whether from occupational exposure or in the diet, may increase risk of TOXEMIA OF PREGNANCY in susceptible women (Bishop, 1978). Hypertonic sodium chloride solutions have been used to induce abortion in late pregnancy by direct infusion into the uterus (Brown et al, 1972), but this route of administration is not relevant to occupational exposures. May cause adverse reproductive effects and birth defects in animals, particularly rats and mice (fetotoxicity, abortion, musculoskeletal abnormalities, and maternal effects (effects on ovaries, fallopian tubes) by oral, intraperitoneal, intraplacental, intrauterine, parenteral, and subcutaneous routes. While sodium chloride has been used as a negative control in some reproductive studies, it has also been used as an example that almost any chemical can cause birth defects in experimental animals if studied under the right conditions (Nishimura & Miyamoto, 1969). In experimental animals, sodium chloride has caused delayed effects on newborns, has been fetotoxic, and has caused birth defects and abortions in rats and mice (RTECS, 1997). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: Causes eye irritation. Ingestion: Ingestion of large quantities can irritate the stomach (as in overuse of salt tablets) with nausea and vomiting. May affect behavior (muscle spasticity/contraction, somnolence), sense organs, metabolism, and cardiovascular system. Continued exposure may produce dehydration, internal organ congestion, and coma. Inhalation: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sodium chloride

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R40- Possible risks of irreversible effects. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:

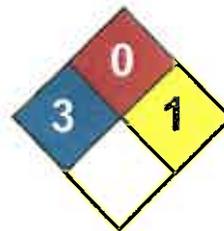
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

Other Special Considerations: Not available.

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Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet

Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide

Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not available

Special Remarks on Fire Hazards:

sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, allyl alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichloroethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontaneously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:

Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aqueous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxide + impure tetrahydrofuran, which can contain peroxides, can

cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:

Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

STEL: 2 (mg/m³) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m³) from OSHA (PEL) [United States] CEIL: 2 (mg/m³) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]

Boiling Point: 1388°C (2530.4°F)

Melting Point: 323°C (613.4°F)

Critical Temperature: Not available.

Specific Gravity: 2.13 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:

Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahydrofuran is very exothermic, a mild explosion being noted on one occasion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, formaldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e. aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead), nitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phosphorus pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

Special Remarks on other Toxic Effects on Humans:**Section 12: Ecological Information**

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information**Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):

R35- Causes severe burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Health	3
Fire	0
Reactivity	2
Personal Protection	

Material Safety Data Sheet

Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H₂-SO₄

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

Toxicological Data on ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m³ 2 hours [Rat]. 320 mg/m³ 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:

Products of combustion are not available since material is non-flammable. However, products of decomposition include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phosphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:

Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentast
I v e r trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picrates, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decomposition.

Section 6: Accidental Release Measures**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 1 STEL: 3 (mg/m³) [Australia] Inhalation TWA: 1 (mg/m³) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m³) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m³) from NIOSH [United States] Inhalation TWA: 1 (mg/m³) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:

270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:

Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:

Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium acetylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thallium (I) azidodithiocarbonate, Zinc chlorate, Zinc iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:

Non-corrosive to lead and mild steel, but dilute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m³ 2 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m³ for 7 hrs.(RTECS) Teratogenicity: neither embryotoxic, fetotoxic, nor teratogenic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:

-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Tetrahydrofuran MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrahydrofuran

Catalog Codes: SLT3136, SLT2254

CAS#: 109-99-9

RTECS: LU5950000

TSCA: TSCA 8(b) inventory: Tetrahydrofuran

CI#: Not available.

Synonym: Tetrahydrofuran stabilized with BHT; THF; Butylene Oxide; Cyclotetramethylene oxide; 1,4-Epoxybutane

Chemical Name: Tetrahydrofuran

Chemical Formula: C₄H₈O

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrahydrofuran	109-99-9	100

Toxicological Data on Ingredients: Tetrahydrofuran: ORAL (LD50): Acute: 1650 mg/kg [Rat]. VAPOR (LC50): Acute: 21000 mg/m 3 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to blood, kidneys, lungs, liver, upper respiratory tract, skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 321°C (609.8°F)

Flash Points: CLOSED CUP: -14.5°C (5.9°F). OPEN CUP: -20°C (-4°F).

Flammable Limits: LOWER: 2% UPPER: 11.8%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. **SMALL FIRE:** Use DRY chemical powder. **LARGE FIRE:** Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapor may travel considerable distance to source of ignition and flash back. May form explosive mixtures with air.

Special Remarks on Explosion Hazards:

Reacts explosively with lithium-aluminum alloys, and Sodium Aluminum Hydride, Potassium hydroxide, Calcium Hydride. It is normally stable, however, prolonged storage, and exposure to air and light may cause formation of unstable explosive peroxides especially when anhydrous and unless it is inhibited against peroxide formation. Explosive in the form of vapor when exposed to heat or flame.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Prolonged exposure to air and light may form unstable explosive peroxides unless it is inhibited against peroxide formation

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 590 STEL: 737 (mg/m³) from ACGIH (TLV) [United States] Inhalation TWA: 200 STEL: 250 (ppm) from ACGIH (TLV) [United States] Inhalation TWA: 590 STEL: 735 (mg/m³) from NIOSH [United States] Inhalation TWA: 200 STEL: 250 (ppm) from NIOSH [United States] Inhalation TWA: 200 STEL: 250 (ppm) from OSHA (PEL) [United States] Inhalation TWA: 590 STEL: 735 (mg/m³) from OSHA (PEL) [United States] Inhalation TWA: 100 STEL: 200 (ppm) [United Kingdom (UK)] Inhalation TWA: 300 STEL: 599 (mg/m³) [United Kingdom (UK)] Inhalation³ Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal. Fruity.

Taste: Pungent.

Molecular Weight: 72.11 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 65°C (149°F) @ 760 mm Hg

Melting Point: -108.3°C (-162.9°F)

Critical Temperature: 267°C (512.6°F)

Specific Gravity: 0.8892 (Water = 1)

Vapor Pressure: 19.3 kPa (@ 20°C)

Vapor Density: 2.5 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 20 ppm - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 0.5$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Easily soluble in diethyl ether, acetone. Partially soluble in cold water. Solubility in water is 30%. Miscible with alcohols, ketones, esters, hydrocarbons, and ethers. Very soluble in benzene, ethanol, and chloroform.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (sparks, flames), light, air, and incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts violently with Bromine. Addition of anhydrous chlorides (hafnium tetrachloride, titanium tetrachloride, and zirconium tetrachloride) directly to tetrahydrofuran will cause a violent exothermic reaction. Also incompatible with Calcium Hydride + heat, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), metal halides, moisture, lithium tetrahydroaluminate, borane, 2-aminophenol + potassium dioxide, sodium tetrahydroaluminate, and 2-aminophenol. Prolonged exposure to air and light may form unstable peroxides especially when anhydrous and unless it is inhibited against peroxide formation.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 1650 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 24000 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: blood, kidneys, lungs, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

It is excreted in mother's milk. May cause cancer based on animal data. No human data found at this point. May cause adverse reproductive effects (fetotoxicity) based on animal data. No human data found at this point. May affect genetic material.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. May be absorbed through skin and cause symptoms similar those of inhalation and ingestion. Eyes: Contact with eyes may cause severe irritation with possible eye burns. Vapors may cause eye irritation. Inhalation: May cause upper respiratory tract (nose, throat) irritation. High concentrations may affect behavior/central nervous system (central nervous system depression/effects characterized by headache, general anesthetic, dizziness, somnolence, muscle weakness, loss of consciousness, and coma), respiration (respiratory stimulation, dyspnea), and gastrointestinal tract (nausea, vomiting). Ingestion: May cause gastrointestinal irritation with nausea, vomiting, and diarrhea, abdominal pain. May also affect the liver and behavior/central nervous system with symptoms similar to inhalation. **Chronic Potential Health Effects:** Skin: Prolonged or repeated skin contact may cause defatting and dermatitis. Eyes: Prolonged or repeated eye contact may cause conjunctivitis. Inhalation: Prolonged or repeated exposure to vapors may affect the liver, kidneys, musculoskeletal system, endocrine system (spleen and thymus), blood, cardiovascular system, thymus, spleen, and lungs (lung damage). Ingestion: Prolonged or repeated exposure from ingestion may affect the blood, and metabolism.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 2160 mg/l 96 hours [Fish (Fathead Minnow)].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Tetrahydrofuran UNNA: 2056 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information**Federal and State Regulations:**

Connecticut hazardous material survey.: Tetrahydrofuran Illinois toxic substances disclosure to employee act: Tetrahydrofuran Illinois chemical safety act: Tetrahydrofuran New York release reporting list: Tetrahydrofuran Rhode Island RTK hazardous substances: Tetrahydrofuran Pennsylvania RTK: Tetrahydrofuran Minnesota: Tetrahydrofuran Massachusetts RTK: Tetrahydrofuran Massachusetts spill list: Tetrahydrofuran New Jersey: Tetrahydrofuran New Jersey spill list: Tetrahydrofuran Louisiana spill reporting: Tetrahydrofuran California Director's List of Hazardous Substances: Tetrahydrofuran TSCA 8(b) inventory: Tetrahydrofuran TSCA 4(a) proposed test rules: Tetrahydrofuran TSCA 8(a) PAIR: Tetrahydrofuran TSCA 8(a) IUR: Tetrahydrofuran TSCA 8(d) H and S data reporting: Tetrahydrofuran: effective data: 3/11/94; sunset date: 6/30/98 CERCLA: Hazardous substances.: Tetrahydrofuran: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable. R19- May form explosive peroxides. R36/37- Irritating to eyes and respiratory system. S16- Keep away from sources of ignition - No smoking. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C₆H₅CH₃ or C₇H₈

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. **SMALL FIRE:** Use DRY chemical powder. **LARGE FIRE:** Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:

Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetroxide; concentrated nitric acid, sulfuric acid + nitric acid; N₂O₄; AgClO₄; BrF₃; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m³) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 2.7$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:

Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Causes mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abrasions. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. **Chronic Potential Health Effects:** Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophosphatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: TRIMETHYL BORATE

TRADE NAMES/SYNONYMS:

BORIC ACID, (H₃BO₃), TRIMETHYL ESTER; METHYL BORATE; TRIMETHYL BORATE (H₃BO₃); BORIC ACID TRIMETHYL ESTER; BORON TRIMETHOXIDE; TRIMETHOXYBORANE; TRIMETHOXYBORINE; TRIMETHOXYBORON; BORIC ACID(H₃BO₃) TRIMETHYL ESTER; METHYL BORATE ((MEO)₃B); TRIMETHYLBORATE; UN 2416; C₃H₉BO₃; 00227178; RTECS ED5600000

CHEMICAL FAMILY: esters, alkyls

CREATION DATE: Jul 31 2001
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TRIMETHYL BORATE
CAS NUMBER: 121-43-7
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=1

EMERGENCY OVERVIEW:

CHANGE IN APPEARANCE: moisture-sensitive

COLOR: colorless

PHYSICAL FORM: liquid

MAJOR HEALTH HAZARDS: eye irritation

PHYSICAL HAZARDS: Extremely flammable liquid and vapor. Vapor may cause flash fire. Contact with water or moist air may generate flammable and/or toxic gases.





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POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: no information is available

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: no information is available

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: same as effects reported in short term exposure

INGESTION:

SHORT TERM EXPOSURE: no information is available

LONG TERM EXPOSURE: no information is available

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large amount is swallowed, get medical attention.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Moderate explosion hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive.

EXTINGUISHING MEDIA: alcohol-resistant foam, carbon dioxide, regular dry chemical, water

Large fires: Use alcohol-resistant foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: 18 F (-8 C)
FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Remove sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Store in a tightly closed container. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

TRIMETHYL BORATE:

No occupational exposure limits established.

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.

Any chemical cartridge respirator with organic vapor cartridge(s).

Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

Any air-purifying respirator with a full facepiece and an organic vapor canister.

For Unknown Concentrations or Immediately Dangerous to Life or Health -



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Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

COLOR: colorless

CHANGE IN APPEARANCE: moisture-sensitive

ODOR: Not available

MOLECULAR WEIGHT: 103.91

MOLECULAR FORMULA: B-(O-C-H₃)₃

BOILING POINT: 153-156 F (67-69 C)

FREEZING POINT: -29 F (-34 C)

VAPOR PRESSURE: Not available

VAPOR DENSITY (air=1): 3.59

SPECIFIC GRAVITY (water=1): 0.915

WATER SOLUBILITY: reacts

PH: Not available

VOLATILITY: Not available

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: alcohol, ether, hexane, isopropylamine, methanol, mineral oils, tetrahydrofuran, organic solvents

10. STABILITY AND REACTIVITY

REACTIVITY: Contact with water or moist air may form flammable and/or toxic gases or vapors.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: acids, oxidizing materials

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.



11. TOXICOLOGICAL INFORMATION

TRIMETHYL BORATE:

IRRITATION DATA: 500 mg eyes-rabbit moderate

TOXICITY DATA: 1980 ul/kg skin-rabbit LD50; 6140 mg/kg oral-rat LD50

LOCAL EFFECTS:

Irritant: eye

ACUTE TOXICITY LEVEL:

Moderately Toxic: dermal absorption

Slightly Toxic: ingestion

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262.
Hazardous Waste Number(s): D001. D003.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Trimethyl borate

ID NUMBER: UN2416

HAZARD CLASS OR DIVISION: 3

PACKING GROUP: II

LABELING REQUIREMENTS: 3



CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME: Trimethyl borate

UN NUMBER: UN2416

CLASS: 3

PACKING GROUP/CATEGORY: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.



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SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):

ACUTE: Yes

CHRONIC: No

FIRE: Yes

REACTIVE: Yes

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65): Not regulated.

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDL): Not determined.

16. OTHER INFORMATION

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ATTACHMENT I
EMISSION UNITS TABLE

**Attachment I
Emission Units Table**
(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID ¹	Emission Point ID ²	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type ³ and Date of Change	Control Device ⁴
002	104.014	Dryer	1977	[REDACTED]	Existing	Incinerator Scrubber
009	104.014	Incinerator	1977	[REDACTED]	Existing	Scrubber
010	104.014	Incinerator Scrubber	1977	[REDACTED]	Existing	None
103	104.014 / 103*	[REDACTED] Storage Tank (repurposed and renamed A Tank)	2002	[REDACTED]	Existing	Incinerator Scrubber / None
114A	104.003A	[REDACTED] Charge Hopper	2005	[REDACTED]	Existing	Dust Collector
201	104.014	Centrifuge	1961	[REDACTED]	Existing	Incinerator Scrubber
202	104.014	[REDACTED] Tank	1988	[REDACTED]	Existing	Incinerator Scrubber
203	104.014	Reactor [REDACTED]	1977	[REDACTED]	Existing	Incinerator
205	104.014	Reactor [REDACTED]	1988	[REDACTED]	Existing	Main Scrubber Incinerator Scrubber
206	104.014	Reactor [REDACTED]	1992	[REDACTED]	Existing	Incinerator
208	104.014	Reactor [REDACTED]	1977	[REDACTED]	Existing	Incinerator Scrubber
208C	104.014	[REDACTED] Condenser	NA	NA	Existing	Incinerator, Scrubber
208P	104.014	[REDACTED] Pump	NA	NA	Existing	Incinerator, Scrubber
209	104.014	Reactor [REDACTED]	1977	[REDACTED]	Existing	Incinerator Scrubber
210	107.022	Product Packout	2005	[REDACTED]	Existing	Dust Collector
219	104.014 / 219	Reactor [REDACTED]	1984	[REDACTED]	Existing / New	Incinerator / None
228	104.014	[REDACTED] Tank	2016	[REDACTED]	New	Incinerator Scrubber
Fugitive	Fugitive	Two (2) Polish Filter (Change Outs)	NA	NA	New	None

1 For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation.
 2 For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.
 3 New, modification, removal
 4 For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.
 Note: PF = Process Fugitive Emissions, OD = Open Dust Emissions

* During operation the tank is controlled. During storage, only when production is not occurring, the tank is uncontrolled.

ATTACHMENT J

EMISSION POINTS DATA SUMMARY SHEET

Attachment J Emission Points Data Summary Sheet STPB

Table 1: Emissions Data

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type ¹	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		Vent Time for Emission Unit (Chemical processes only)		All Regulated Pollutants Chemical Name/CAS ³ (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions ⁴		Maximum Potential Controlled Emissions ⁵		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used ⁶	Emission Concentration ⁷ (ppmv or mg/m ³)
		ID No.	Source	ID No.	Device Type	Short Term ²	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
104.014	Upward Vertical	**	Various	009	Incinerator Scrubber	NA	NA	VOC Benzene Chlorobenzene Hexane Methanol Toluene*	24.71 0.02 0.01 17.62 0.04 4.49	3.50 0.01 0.01 2.71 0.01 0.55	2.85 0.01 0.01 0.87 0.01 0.09	0.08 0.01 0.01 0.02 0.01 0.01	Gas	EE	NA
107.022	Upward Vertical	210	Product Packout	023	Dust Collector	NA	NA	PM PM10 PM2.5	0.06 0.03 0.01	0.01 0.01 0.01	0.06 0.03 0.01	0.01 0.01 0.01	Solid	AP-42	NA
104.003A	Upward Vertical	114A	Reactor #3 Charge Hopper	114	Dust Collector	NA	NA	PM PM10 PM2.5	0.05 0.03 0.01	0.01 0.01 0.01	0.05 0.03 0.01	0.01 0.01 0.01	Solid	AP-42	NA
219	***	219	Mg to Reactor No. 5	NA	NA	NA	NA	PM PM10 PM2.5	0.02 0.01 0.01	0.01 0.01 0.01	0.02 0.01 0.01	0.01 0.01 0.01	Solid	AP-42	NA

* - Includes toluene tank uncontrolled emissions during storage only.

** - Sources venting through this emission point during STPB production: 002, 009, 103, 201, 202, 203, 205 1, 206, 208, 209, 219, and 228

*** - Magnesium is manually charged (personnel dumping Mg) to Reactor No. 5 through the access port at the top of the reactor. When the top is open on the reactor it does not vent to the scrubber and incinerator. This reactor is located within the building and this is a conservative estimate of the emissions associated with the feeding of Mg through the port.

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

¹ Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.
² Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (i.e., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/week).
³ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.
⁴ Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
⁵ Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
⁶ Indicate the method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).
⁷ Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m³) at standard conditions (68 °F

ATTACHMENT K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

Attachment K – Fugitive Emissions Data Summary Sheet

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
<p>1.) Will there be haul road activities?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.</p>
<p>2.) Will there be Storage Piles?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.</p>
<p>3.) Will there be Liquid Loading/Unloading Operations?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.</p>
<p>4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.</p>
<p>5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.</p>
<p>6.) Will there be General Clean-up VOC Operations?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.</p>
<p>7.) Will there be any other activities that generate fugitive emissions?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.</p>
<p>If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."</p>

FUGITIVE EMISSIONS SUMMARY		All Regulated Pollutants ¹ Chemical Name/CAS ¹	Maximum Potential Uncontrolled Emissions ²		Maximum Potential Controlled Emissions ³		Est. Method Used ⁴
			lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	NA						
Unpaved Haul Roads	NA						
Storage Pile Emissions	NA						
Loading/Unloading Operations	NA						
Wastewater Treatment Evaporation & Operations	NA						
Equipment Leaks							
General Clean-up VOC Emissions	Filter Cleaning/Changeout		0.51	0.01	0.51	0.01	EE
	VOC		0.04	0.01	0.04	0.01	
	Toluene Methanol		0.04	0.01	0.04	0.01	
Other	NA						

¹ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.

² Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
³ Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

⁴ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

ATTACHMENT L
EMISSION UNIT DATA SHEETS

REDACTED

Information claimed confidential by Optima
Belle, LLC. January 5, 2016.

**Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL**

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): Various (See Attachment I)

1. Name or type and model of proposed affected source:

STPB production is being proposed for the Small Lots Manufacturing (SLM) Building 216. This process will use the existing permitted equipment that is listed in Attachment I.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

Total Batches Per Year: 15

Single Batch Time: 208.25 hours

Batch Loading:

Chlorobenzene: 3,000 lbs.; Hexane: 2,000 lbs.; Magnesium: 664 lbs.; Phenyl Magnesium Chloride: 100 lbs.; Sodium Chloride: 1,600 lbs.; Sodium Hydroxide (50% aq.): 200 lbs.; Tetrahydrofuran: 7,900 lbs.; Toluene: 24,256 lbs.; Trimethylborate: 545 lbs.; Water: 6,260 lbs.

4. Name(s) and maximum amount of proposed material(s) produced per hour:

Sodium Tetraphenylborate (STPB): 3,450 lbs.

Phenyl Magnesium Chloride: 3,647 lbs.

Magnesium Chloride: 2,428 lbs.

Magnesium Chloride Methoxide: 1,428 lbs.

Benzene: 334 lbs.

Methanol: 510 lbs.

Magnesium Tetraphenylboate (MTPB): 1,988 lbs.

Sodium Hydroxide: 808 lbs.

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

Magnesium Chloride Methoxide + MTPB + Phenyl Magnesium Chloride + Sodium Chloride + Water → Benzene + Magnesium Chloride + Methanol + Sodium Hydroxide + STPB

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): (a) Type and amount in appropriate units of fuel(s) to be burned: N/A			
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash: 			
(c) Theoretical combustion air requirement (ACF/unit of fuel): <div style="display: flex; justify-content: space-between; align-items: center;"> @ °F and psia. </div>			
(d) Percent excess air:			
(e) Type and BTU/hr of burners and all other firing equipment planned to be used: 			
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired: 			
(g) Proposed maximum design heat input: × 10⁶ BTU/hr.			
7. Projected operating schedule:			
Hours/Day	24	Days/Week	7
		Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@	°F and	psia
a. NO _x	lb/hr	grains/ACF
b. SO ₂	lb/hr	grains/ACF
c. CO	lb/hr	grains/ACF
d. PM ₁₀	0.07 lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	24.71 lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
HAPS	22.26 lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
 Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING

None

RECORDKEEPING

Amount of STPB produced

REPORTING

None

TESTING

None

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

This is existing equipment that has been in place for years.

ATTACHMENT N
SUPPORTING EMISSIONS CALCULATIONS

By: JJD
Date: 2/1/2016

Checked By: PEW
Date: 2/17/16

Total Emissions Estimate for a Campaign of STPB
Number of Batches in Process 1 No.
Number of Batches Per Year 15 No.

Calculated Emissions

Emissions	Uncontrolled (1)			Controlled		
	pph (Max Rate)	ppy	tpy	pph (Max Rate)	ppy	tpy (15 batches)
PM	0.13	60.00	0.03	0.13	60.00	0.03
PM10	0.07	60.00	0.03	0.07	60.00	0.03
PM2.5	0.03	60.00	0.03	0.03	60.00	0.03
VOC - Process (1)	24.20	6,974.56	3.49	2.34	98.58	0.049
VOC - Filter Changeout	0.51	7.59	0.0038	0.51	7.59	0.0038
Total VOC	24.71	6,982.15	3.49	2.84	106.17	0.053

HAPS (Process)

Benzene	0.023	5.69	0.0028	0.0048	0.45	0.00022
Chlorobenzene	0.0090	0.15	0.00074	0.00018	0.0030	0.000015
Hexane	17.62	5,424.03	2.71	0.87	31.41	0.016
Methanol	0.043	6.65	0.0033	0.011	1.05	0.00053
Toluene	4.45	1,082.94	0.54	0.057	6.76	0.0034
Toluene*	0.031	20.90	0.0105	0.031	20.90	0.0105
Total	22.18	6,540.36	3.27	0.97	60.58	0.03

HAPS (Filter Changeouts)

Methanol	0.044	0.66	0.00033	0.044	0.66	0.00033
Toluene	0.040	0.60	0.00030	0.040	0.60	0.00030
Total	0.084	1.26	0.00063	0.084	1.26	0.00063

Total HAPS	22.27	6,541.63	3.27	1.06	61.84	0.031
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* Uncontrolled tank storage when process is not in operation.

Requested Permit Limits

Emissions	Uncontrolled (1)			Controlled		
	pph (Max Rate)	ppy	tpy	pph (Max Rate)	ppy	tpy (15 batches)
PM	0.13	60.00	0.03	0.13	60.00	0.03
PM10	0.07	60.00	0.03	0.07	60.00	0.03
PM2.5	0.03	60.00	0.03	0.03	60.00	0.03
VOC - Process (1)	24.20	6,974.56	3.49	2.34	98.58	0.05
VOC - Filter Changeout	0.51	7.59	0.01	0.51	7.59	0.02
Total VOC	24.71	6,982.15	3.50	2.85	106.17	0.08

HAPS (Process)

Benzene	0.02	5.69	0.01	0.01	0.45	0.01
Chlorobenzene	0.01	0.15	0.01	0.01	0.01	0.01
Hexane	17.62	5,424.03	2.71	0.87	31.41	0.02
Methanol	0.04	6.65	0.01	0.01	1.05	0.01
Toluene	4.49	1,103.85	0.55	0.09	27.66	0.01
Total	22.18	6,540.37	3.29	0.99	60.58	0.06

HAPS (Filter Changeouts)

Methanol	0.04	0.66	0.01	0.04	0.66	0.01
Toluene	0.04	0.60	0.01	0.04	0.60	0.01
Total	0.08	1.26	0.02	0.08	1.26	0.02

Total HAPS	22.26	6,541.63	3.31	1.07	61.84	0.08
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Product: STPB (Sodium Tetraphenylborate)
 Process Name: Grignard, Coupling, Quench, Isolation & Drying
 Production Quantity:
 Process Cycle Time: 208.25 hr
 Date: 3/18/2015
 File: N:\Emission Master Files\Optima\STPB\Belle plant\STPB - Feb 2016.emm
 Comments:

Compound	Activities Emitting	Emissions		Percent Removal
		Uncontrolled (lb)	Controlled (lb)	
Air	50	58.54688459	58.54688459	0
Benzene	128	0.37939839	0.029869238	92.12721026
Chlorobenzene	6	0.009910801	0.000198216	98
Hexane	11	361.6019169	2.093938668	99.42092711
Magnesium	78	0	0	
Magnesium Chloride	49	0	0	
Magnesium Chloride Methoxid	11	0	0	
Methanol	128	0.44325335	0.070160628	84.17143865
MTPB	11	0	0	
Nitrogen	152	831.3596472	831.3596472	0
Phenyl Magnesium Chloride	132	0	0	
Sodium Chloride	55	0	0	
Sodium Hydroxide	49	0	0	
Sodium Hydroxide (50%)	153	0	0	
STPB	106	0	0	
Sulfuric Acid	1	0	0	
Tetrahydrofuran	162	30.33981919	3.945189485	86.99666118
Toluene	164	53.98059492	0.432515102	99.19875818
TRI METHYL BORATE	117	0.265216771	0.005461347	97.94079895
Water	164	0.478306116	11.97391441	-2403.399815
Total VOC		446.7548936	6.571871337	

Compound	Process Cycle	Compound Emission		Max Rate (lb/hr)	
	Average (lb/hr)	Hours	Average (lb/hr)	Uncontrolled	Within 1 hour
Air	0.281137501	51.74555556	1.131437936	2.254230962	2.254230962
Benzene	0.00014343	155.7711111	0.000191751	0.022601852	0.004798384
Chlorobenzene	9.51818E-07	15.2	1.30405E-05	0.008952166	0.000179043
Hexane	0.010054928	30.99944444	0.067547619	17.62152317	0.867035411
Magnesium	0	123.7966667	0		0
Magnesium Chloride	0	81.52777778	0		0
Magnesium Chloride Methoxid	0	15.44944444	0		0
Methanol	0.000336906	155.7711111	0.000450408	0.04343845	0.011300434
MTPB	0	15.44944444	0		0
Nitrogen	3.992123156	167.5863889	4.960782631	56.91753302	56.91753302
Phenyl Magnesium Chloride	0	195.5444444	0		0
Sodium Chloride	0	93.62777778	0		0
Sodium Hydroxide	0	81.52777778	0		0
Sodium Hydroxide (50%)	0	193.9391667	0		0
STPB	0	154.2755556	0		0
Sulfuric Acid	0	1	0		0
Tetrahydrofuran	0.018944487	198.8397222	0.019841053	2.052114614	1.399130092
Toluene	0.002076903	199.6894444	0.002165939	4.454057935	0.056596839
TRI METHYL BORATE	2.6225E-05	146.2716667	3.7337E-05	0.184713566	0.003694271
Water	0.057497788	200.6877778	0.059664393	0.081440595	0.797590007
Total VOC	0.031557605	756.2708333	0.090209811	24.20268818	2.339040203

- (1) Process Cycle Average = Compound emission quantity / Total process cycle time in hours.
- (2) Compound Emission Average = Compound emission quantity / Compound emission time in hours.

Classification	Activities Emitting	Emissions		Emissions
		Uncontrolled (lb)	Controlled (lb)	Percent Removal
All Emissions	202	1337.404948	908.4577789	32.07309573
Acid	0	0	0	
Acid Gases	0	0	0	
Asbestos	0	0	0	
Base	0	0	0	
Biological	0	0	0	
CATEGORY I	0	0	0	
ASBESTOS	0	0	0	
BIOLOGICAL	0	0	0	
Cr(+6)	0	0	0	
DIOXIN	0	0	0	
HAP-PARTICULATE	0	0	0	
METAL	0	0	0	
OTHER PARTICULATE	0	0	0	
RADIONUCLIDE	0	0	0	
CATEGORY II	0	0	0	
HAP-VOC	0	0	0	
OTHER VOC	0	0	0	
CATEGORY III	0	0	0	
ACID	0	0	0	
HAP-ACID	0	0	0	
CATEGORY IV	0	0	0	
CATEGORY V (CO)	0	0	0	
CATEGORY VI (NOx)	0	0	0	
CATEGORY VII (SO2)	0	0	0	
CATEGORY VIII	0	0	0	
CO	0	0	0	
CR+6	0	0	0	
DioxIn	0	0	0	
ETG	0	0	0	
EVOS	0	0	0	
Gas	0	0	0	
HAP	164	416.4150744	2.626681852	99.36921547
Benzene	128	0.37939839	0.029869238	92.12721026
Chlorobenzene	6	0.009910801	0.000198216	98
Hexane	11	361.6019169	2.093938668	99.42092711
Methanol	128	0.44325335	0.070160628	84.17143865
Toluene	164	53.98059492	0.432515102	99.19875818
Hydrogen	0	0	0	
LOC	0	0	0	
Metal	0	0	0	
NOx	0	0	0	
Particulate	0	0	0	
Pb	0	0	0	
PM10	0	0	0	
Radionuclide	0	0	0	
SO2	0	0	0	
TSP	0	0	0	
TVOS	0	0	0	
VCM	0	0	0	
VOC	166	446.7548936	6.571871337	98.52897608
Benzene	128	0.37939839	0.029869238	92.12721026
Chlorobenzene	6	0.009910801	0.000198216	98
Hexane	11	361.6019169	2.093938668	99.42092711
Methanol	128	0.44325335	0.070160628	84.17143865
Tetrahydrofuran	162	30.33981919	3.945189485	86.99666118
Toluene	164	53.98059492	0.432515102	99.19875818
Unclassified	202	890.6500547	901.8859075	-1.261533957
Air	50	58.54688459	58.54688459	0
Magnesium	78	0	0	
Magnesium Chloride	49	0	0	
Magnesium Chloride Metho	11	0	0	
MTPB	11	0	0	
Nitrogen	152	831.3596472	831.3596472	0
Phenyl Magnesium Chloride	132	0	0	
Sodium Chloride	55	0	0	
Sodium Hydroxide	49	0	0	
Sodium Hydroxide (50%)	153	0	0	
STPB	106	0	0	
Sulfuric Acid	1	0	0	
TRI METHYL BORATE	117	0.265216771	0.005461347	97.94079895
Water	164	0.478306116	11.97391441	-2403.399815

Classification	Process Cycle	Emission		Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1 hour
All Emissions	4.362342276	217.2311111	4.181987443	53.51084189
Acid	0	0	0	0
Acid Gases	0	0	0	0
Asbestos	0	0	0	0
Base	0	0	0	0
Biological	0	0	0	0
CATEGORY I	0	0	0	0
ASBESTOS	0	0	0	0
BIOLOGICAL	0	0	0	0
Cr(+6)	0	0	0	0
DIOXIN	0	0	0	0
HAP-PARTICULATE	0	0	0	0
METAL	0	0	0	0
OTHER PARTICULATE	0	0	0	0
RADIONUCLIDE	0	0	0	0
CATEGORY II	0	0	0	0
HAP-VOC	0	0	0	0
OTHER VOC	0	0	0	0
CATEGORY III	0	0	0	0
ACID	0	0	0	0
HAP-ACID	0	0	0	0
CATEGORY IV	0	0	0	0
CATEGORY V (CO)	0	0	0	0
CATEGORY VI (NOx)	0	0	0	0
CATEGORY VII (SO2)	0	0	0	0
CATEGORY VIII	0	0	0	0
CO	0	0	0	0
CR+6	0	0	0	0
Dioxin	0	0	0	0
ETG	0	0	0	0
EVOS	0	0	0	0
Gas	0	0	0	0
HAP	0.012613118	199.6894444	0.013153834	0.886358159
Hydrogen	0	0	0	0
LOC	0	0	0	0
Metal	0	0	0	0
NOx	0	0	0	0
Particulate	0	0	0	0
Pb	0	0	0	0
PM10	0	0	0	0
Radionuclide	0	0	0	0
SO2	0	0	0	0
TSP	0	0	0	0
TVOS	0	0	0	0
VCM	0	0	0	0
VOC	0.031557605	200.1394444	0.032836462	1.398538483
Unclassified	4.33078467	217.2311111	4.151734542	53.50238714

(1) Process Cycle Average = Classification emission quantity / Total process cycle time in hours.

(2) Emission Average = Classification emission quantity / Classification emission time in hours.

Vessel	Vent ID	Device # 1	Device # 1 Temp (°C)	Device # 2	Device # 2 Temp (°C)	Device # 3	Device # 3 Temp (°C)
Drum							
Drums							
New GLS Receiver Belle							
New GLS Receiver Belle		Condenser RX-2 Hast C	-10	Incinerator Belle	1000	SCB-01	50
New GLS Receiver Belle		Condenser RX-2 Hast C	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
RX-1 Belle							
RX-1 Belle		Condenser RX-5 Hast C	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
RX-1 Belle		Condenser RX-6 STPB	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
RX-2 Belle							
RX-2 Belle		Condenser RX-2 Hast C	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
RX-3 Belle							
RX-3 Belle		Condenser RX-3 Hast	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
RX-5 Belle							
RX-5 Belle		Condenser RX-5 Hast	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
RX-6 Belle							
RX-6 Belle		Condenser RX-6 STP	-10	Incinerator Belle	1000	Scrubber Incinerator Belle	30
Totes							
Virtual Centrifuge Belle		Incinerator Belle	1000	Scrubber Incinerator Belle	30		
Virtual Dryer Belle		Incinerator Belle	1000	Scrubber Incinerator Belle	30		
Virtual MLDT Belle		Incinerator Belle	1000	Scrubber Incinerator Belle	30		
Virtual New GLS Receiver Belle		Incinerator Belle	1000	Scrubber Incinerator Belle	30		
Virtual Tanker		Incinerator Belle	1000	Scrubber Incinerator Belle	30		
Virtual Wet Cake Bin Belle		Incinerator Belle	1000	Scrubber Incinerator Belle	30		

Uncontrolled Emissions

Process: Grignard, Coupling, Quench, Isolation & Drying Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Air	Benzene	Chlorobenzene	Hexane	Magnesium	Magnesium Chloride	Magnesium Chloride Methoxide	Methanol	MTPB
1		RX-1 Belle									
2		RX-1 Belle									
3		RX-1 Belle			8.95E-03						
4		RX-1 Belle			0						
6		RX-5 Belle					0				
6		RX-1 Belle			0						
7		RX-5 Belle					0				
8		RX-5 Belle					0				
9		RX-5 Belle					0				
10		RX-5 Belle					0				
11		RX-5 Belle					0				
12		RX-5 Belle					0				
13		RX-5 Belle					0				
14		RX-1 Belle									
14		RX-5 Belle			9.25E-04		0				
15		RX-1 Belle									
16		RX-5 Belle			3.34E-05		0				
17		RX-5 Belle			0		0				
18		RX-5 Belle					0				
19		RX-5 Belle					0				
20		RX-5 Belle					0				
21		RX-5 Belle					0				
21		RX-6 Belle					0				
22		RX-6 Belle					0				
23		RX-6 Belle					0				
24		RX-6 Belle					0				
25		RX-6 Belle					0				
25		Drum					0				
26		RX-1 Belle									
27		RX-1 Belle									
28		RX-1 Belle									
29		RX-1 Belle									
30		RX-6 Belle					0				
31		RX-6 Belle					0				
32		RX-1 Belle									
32		RX-6 Belle					0				
33		RX-6 Belle					0				
34		RX-1 Belle									
35		RX-6 Belle					0	0			0
36		RX-3 Belle									
37		RX-3 Belle									
38		RX-3 Belle									
39		RX-3 Belle									
40		RX-6 Belle					0	0			0
40		RX-3 Belle					0	0			0
41		RX-3 Belle					0	0			0
42		RX-3 Belle					0	0			0
43		RX-3 Belle		0			0	0		0	0
44		RX-3 Belle		0			0	0		0	0
45		RX-3 Belle		0			0	0		0	0
45		RX-2 Belle		1.03E-02						1.10E-02	
46		RX-3 Belle		8.34E-03			0	0		9.42E-03	
47		RX-3 Belle		4.16E-04			0	0		1.11E-03	
48		RX-3 Belle		9.28E-05			0	0		2.46E-04	
49		RX-3 Belle		0			0	0		0	
50		RX-3 Belle		0			0	0		0	
51		RX-3 Belle		0			0	0		0	
51		RX-2 Belle		2.98E-03						3.33E-03	
52		RX-3 Belle		0			0	0		0	
52		Totes		8.21E-04			0	0		4.19E-03	
53		RX-3 Belle		8.23E-04			0	0		8.63E-03	
54		RX-3 Belle		2.13E-04			0	0		5.19E-04	
55		RX-3 Belle		4.62E-04			0	0		5.76E-04	
56		RX-3 Belle		8.23E-04			0	0		1.63E-02	
57		RX-3 Belle		2.19E-04			0	0		2.43E-04	
58		RX-6 Belle									
58		RX-3 Belle		1.03E-06			0	0	0	1.67E-07	0
59		RX-6 Belle									
60		RX-6 Belle									
61		RX-6 Belle					0	0			0
62		RX-6 Belle					0	0			0
62		RX-3 Belle		5.83E-11			0	0	0	7.88E-09	0
63		RX-3 Belle		1.94E-08			0	0	0	1.76E-06	0
64		RX-3 Belle		0			0	0	0	0	0
65		RX-3 Belle		0			0	0	0	0	0
66		RX-3 Belle		0			0	0	0	0	0
67		RX-3 Belle		0			0	0	0	0	0
67		RX-2 Belle		7.80E-03						1.85E-02	
68		RX-2 Belle		0						0	
69		RX-3 Belle		4.45E-04			0	0		1.17E-03	
70		RX-3 Belle		9.48E-05			0	0		2.52E-04	
71		RX-3 Belle		0			0	0		0	
72		RX-3 Belle		0			0	0		0	
73		RX-3 Belle		0			0	0		0	
73		RX-2 Belle		2.35E-03						4.94E-03	
74		RX-3 Belle		0			0	0		0	
74		Totes		8.25E-04			0	0		4.22E-03	
75		RX-3 Belle		8.43E-04			0	0		8.83E-03	
76		RX-2 Belle		0						0	
77		RX-2 Belle									
77		RX-3 Belle		1.55E-02			0	0		3.46E-02	
78		RX-3 Belle		2.23E-02			0	0		2.48E-02	
79		RX-3 Belle		0			0	0		0	

Activity	Recipe Step	Vessel	Air	Benzene	Chlorobenzene	Hexane	Magnesium	Magnesium Chloride	Magnesium Chloride Methoxide	Methanol	MTPB
80		RX-3 Belle		0			0	0		0	
81		RX-3 Belle		0			0	0		0	
81		Totes		4.32E-04			0	0		1.21E-03	
82		RX-3 Belle		0			0	0		0	
83		RX-3 Belle		0			0	0		0	
83		Totes		1.35E-04			0	0		2.19E-04	
84		RX-2 Belle		0			0	0		0	
86		RX-3 Belle		0			0	0		0	
85		RX-2 Belle		1.91E-02			0	0		2.03E-02	
86		New GLS Receiver Belle		0			0	0		0	
87		RX-2 Belle		2.01E-03			0	0		2.14E-03	
88		RX-2 Belle	1.7654	1.18E-02			0	0		1.56E-02	
89		RX-2 Belle	0	0			0	0		0	
89		New GLS	0.82085	3.55E-03			0	0		6.08E-03	
90		RX-2 Belle		0			0	0		0	
91		RX-2 Belle	0.22309	1.05E-03			0	0		1.41E-03	
92		RX-2 Belle	0	0			0	0		0	
92		New GLS	0.82185	3.63E-03			0	0		6.13E-03	
93		RX-2 Belle	0.22692	1.11E-03			0	0		1.47E-03	
94		RX-2 Belle	0	0			0	0		0	
94		New GLS	0.82321	3.73E-03			0	0		6.19E-03	
95		RX-2 Belle	0.23126	1.18E-03			0	0		1.54E-03	
96		RX-2 Belle	0	0			0	0		0	
96		New GLS	0.81844	4.02E-03			0	0		6.60E-03	
97		RX-2 Belle	0.23613	1.26E-03			0	0		1.61E-03	
98		New GLS Receiver Belle		0			0	0		0	
98		New GLS Receiver Belle		0			0	0		0	
99		Totes		4.63E-03			0	0		1.11E-02	
100		New GLS Receiver Belle		0			0	0		0	
101		RX-2 Belle	0	0			0	0		0	
101		New GLS	0.83874	4.33E-03			0	0		6.91E-03	
102		RX-2 Belle	0.23906	1.31E-03			0	0		1.64E-03	
103		RX-2 Belle	0	0			0	0		0	
103		New GLS	0.83867	4.37E-03			0	0		6.91E-03	
104		RX-2 Belle	0.23873	1.30E-03			0	0		1.59E-03	
105		RX-2 Belle	0	0			0	0		0	
105		New GLS	0.84168	4.44E-03			0	0		6.95E-03	
106		RX-2 Belle	0.23838	1.28E-03			0	0		1.53E-03	
107		RX-2 Belle	0	0			0	0		0	
107		New GLS	0.84426	4.51E-03			0	0		6.98E-03	
108		RX-2 Belle	0.48033	2.48E-03			0	0		2.89E-03	
109		New GLS Receiver Belle		0			0	0		0	
110		New GLS Receiver Belle		0			0	0		0	
110		Totes		4.80E-03			0	0		1.13E-02	
111		New GLS Receiver Belle		0			0	0		0	
112		RX-2 Belle	0	0			0	0		0	
112		New GLS	1.7464	1.12E-02			0	0		1.55E-02	
113		RX-2 Belle	0.47813	2.28E-03			0	0		2.51E-03	
114		RX-2 Belle	0	0			0	0		0	
114		New GLS	1.663	1.09E-02			0	0		1.47E-02	
115		RX-2 Belle	0.47588	2.01E-03			0	0		2.07E-03	
116		New GLS Receiver Belle		0			0	0		0	
117		New GLS Receiver Belle		0			0	0		0	
117		Totes		4.75E-03			0	0		1.08E-02	
118		New GLS Receiver Belle		0			0	0		0	
119		RX-2 Belle	0	0			0	0		0	
119		New GLS	1.7072	1.14E-02			0	0		1.41E-02	
120		RX-2 Belle	0.47376	1.70E-03			0	0		1.61E-03	
121		RX-2 Belle	0	0			0	0		0	
121		New GLS	1.7136	1.10E-02			0	0		1.32E-02	
122		RX-2 Belle	0.47194	1.38E-03			0	0		1.19E-03	
123		New GLS Receiver Belle		0			0	0		0	
124		New GLS Receiver Belle		0			0	0		0	
124		Totes		4.53E-03			0	0		9.82E-03	
125		New GLS Receiver Belle		0			0	0		0	
126		RX-2 Belle	0	0			0	0		0	
126		New GLS	1.7813	1.07E-02			0	0		1.05E-02	
127		RX-2 Belle	0.47049	1.09E-03			0	0		8.43E-04	
128		RX-2 Belle	0	0			0	0		0	
128		New GLS	1.7848	1.00E-02			0	0		9.61E-03	
129		RX-2 Belle	0.4694	8.38E-04			0	0		5.79E-04	
130		New GLS Receiver Belle		0			0	0		0	
131		New GLS Receiver Belle		0			0	0		0	
131		Totes		4.17E-03			0	0		8.70E-03	
132		New GLS Receiver Belle		0			0	0		0	
133		RX-2 Belle	0	0			0	0		0	
133		New GLS	1.017	4.33E-03			0	0		3.33E-03	
134		RX-2 Belle	0.46863	6.36E-04			0	0		3.89E-04	
135		RX-2 Belle	0	0			0	0		0	
136		New GLS	1.02	4.02E-03			0	0		2.99E-03	
136		New GLS Receiver Belle		0			0	0		0	
137		New GLS Receiver Belle		0			0	0		0	
137		Totes		3.77E-03			0	0		7.63E-03	
138		RX-2 Belle	0	0			0	0		0	
139		RX-2 Belle	0	0			0	0		0	
140		RX-2 Belle	0	0			0	0		0	
140		Virtual New GLS Receiver Belle		2.26E-02			0	0		8.07E-03	
141		Virtual New GLS Receiver Belle		0			0	0		0	
142		Virtual New GLS Receiver Belle		0			0	0		0	
143		Virtual New GLS Receiver Belle		0			0	0		0	
143		Virtual Centrifuge Belle		5.82E-03			0	0		1.91E-03	
144		Virtual Centrifuge Belle		0			0	0		0	
144		Virtual MLDT Belle		6.03E-03			0	0		1.98E-03	
145		Virtual Centrifuge Belle		6.27E-04		1.7426	0	0		2.06E-04	
146		Virtual Centrifuge Belle		0		0	0	0		0	
146		Virtual MLDT Belle		6.99E-04		0.43119	0	0		2.30E-04	
147		Virtual Centrifuge Belle		1.46E-04		1.2924	0	0		4.81E-05	
148		Virtual Centrifuge Belle		0		0	0	0		0	
148		Virtual MLDT Belle		5.79E-04		0.54478	0	0		1.80E-04	
149		Virtual Tanker		1.14E-02		1.4935	0	0		3.73E-03	
149		Virtual Centrifuge Belle		0		0	0	0		0	
150		Virtual Wet Cake Bin		7.91E-05		0.65285	0	0		2.60E-05	
151		Virtual Wet Cake Bin Belle		0		0	0	0		0	
151		Virtual Dryer Belle		1.55E-04		1.28	0	0		5.09E-05	
152		Virtual Dry		32.2774		6.83E-02	0	0		1.77E-02	
153		Virtual Dry		0		0	0	0		0	
153		Drums		2.10E-04		1.7341	0	0		6.90E-05	

Activity	Recipe Step	Vessel	Nitrogen	Phenyl Magnesium Chloride	Sodium Chloride	Sodium Hydroxide	Sodium Hydroxide (60%)	STPB	Sulfuric Acid	Tetrahydrofuran	Toluene	TRI METHYL BORATE	Water
1		RX-1 Belle	1.504								2.23E-02		
2		RX-1 Belle	0.13039							1.04E-02	3.16E-04		
3		RX-1 Belle	3.2773							3.61E-02	2.23E-02		
4		RX-1 Belle	0							0	0		
5		RX-5 Belle	2.7706										
6		RX-1 Belle	0							0	0		
7		RX-5 Belle	0										
8		RX-5 Belle	30.9039										
9		RX-5 Belle	0.55014	0						5.12E-02	2.16E-04		
10		RX-5 Belle	7.4393	0						0.71004	2.87E-04		
11		RX-5 Belle	0.2796	0						2.22E-02	7.08E-04		
12		RX-5 Belle	0.19507	0						1.86E-02	8.25E-06		
13		RX-5 Belle	8.8749	0						0.8466	4.15E-04		
14		RX-1 Belle	0										
14		RX-5 Belle	8.3396	0						0.77084	2.07E-03		
16		RX-1 Belle	0.42254							1.67E-02			
16		RX-1 Belle	0										
16		RX-5 Belle	0.18281	0						1.65E-02	7.44E-05		
17		RX-5 Belle	0	0						0	0		
18		RX-5 Belle	0.19507	0						1.81E-02	8.13E-05		
19		RX-5 Belle	6.5666	0						0.61079	2.72E-03		
20		RX-5 Belle	0	0						0	0		
21		RX-5 Belle	0										
21		RX-6 Belle	11.6106	0						1.0827	4.38E-03		
22		RX-6 Belle	0.78029	0						7.28E-02	2.95E-04		
23		RX-6 Belle	0	0						0	0		
24		RX-6 Belle	0	0						0	0		
25		RX-6 Belle	0	0						0	0		
25		Drum	0.70776	0						0.56447	1.64E-02		
26		RX-1 Belle	1.6322									7.05E-02	
27		RX-1 Belle	3.9557								8.24E-03	0.1142	
28		RX-1 Belle	0								0	0	
29		RX-1 Belle	0								0	0	
30		RX-6 Belle	21.8062	0						2.0119	6.82E-03		
31		RX-6 Belle	12.6006	0						1.1731	5.05E-03		
32		RX-1 Belle	0										
32		RX-6 Belle	8.3963	0						0.68996	6.37E-03	7.86E-02	
33		RX-6 Belle	0	0						0	0	0	
34		RX-1 Belle	8.9535										
35		RX-6 Belle	0	0									
36		RX-3 Belle	3.7684										6.56E-03
37		RX-3 Belle	0.39855		0								1.07E-02
38		RX-3 Belle	93.6348		0								0.16268
39		RX-3 Belle	0		0								0
40		RX-6 Belle	0	0						0	0		
40		RX-3 Belle	7.281		0					0.65364	6.25E-03		4.99E-05
41		RX-3 Belle	0.78029		0					3.97E-02	1.03E-03		5.14E-04
42		RX-3 Belle	0	0	0					0	0		0
43		RX-3 Belle	0	0	0	0				0	0		0
44		RX-3 Belle	0	0	0	0				0	0		0
45		RX-3 Belle	0	0	0	0				0	0		0
45		RX-2 Belle	9.5572		0					0.55702	2.24E-02		
46		RX-3 Belle	23.4087		0	0				0.51309	1.22E-02		5.16E-03
47		RX-3 Belle	6.6867		0	0				3.45E-02	3.20E-02		3.99E-04
48		RX-3 Belle	1.5606		0	0				5.45E-03	4.87E-03		4.49E-04
49		RX-3 Belle	0		0	0				0	0		0
50		RX-3 Belle	0		0	0				0	0		0
51		RX-3 Belle	0		0	0				0	0		0
51		RX-2 Belle	3.8004		0					0.17958	2.53E-02		
52		RX-3 Belle	0		0	0				0	0		0
52		Totes	5.0097		0	0				4.43E-02	5.64E-02		6.37E-03
53		RX-3 Belle	32.8383		0	0				1.77E-02	0.18432		2.62E-02
54		RX-3 Belle	4.6732		0	0				8.31E-03	5.47E-03		7.29E-03
56		RX-3 Belle	2.8184		0	0				1.77E-02	3.17E-02		4.03E-03
56		RX-3 Belle	93.6348		0	0				1.77E-02	0.18432		0.12902
57		RX-3 Belle	1.5806		0	0				1.29E-02	1.13E-02		1.12E-03
58		RX-6 Belle	0										
58		RX-3 Belle	7.281	0		0				0.65364	6.25E-03		4.99E-05
60		RX-6 Belle	48.1251										
60		RX-6 Belle	1.5114							1.3985			
61		RX-6 Belle	0							0	0	0	
62		RX-6 Belle	0							0	0	0	
62		RX-3 Belle	0.46331	0	0	0				4.09E-02	4.52E-04	3.33E-04	2.97E-06
63		RX-3 Belle	4.6817		0	0				0.23819	6.22E-03	4.03E-05	3.08E-03
64		RX-3 Belle	0	0	0	0				0	0	0	0
65		RX-3 Belle	0	0	0	0				0	0	0	0
66		RX-3 Belle	0	0	0	0				0	0	0	0
67		RX-3 Belle	0	0	0	0				0	0	0	0
67		RX-2 Belle	9.7546		0	0				0.49676	1.82E-02	8.28E-05	4.26E-03
68		RX-2 Belle	0		0	0				0	0	0	0
69		RX-3 Belle	7.0766		0	0				3.89E-02	3.38E-02	5.72E-06	4.19E-04
70		RX-3 Belle	1.5806		0	0				5.54E-03	4.85E-03	9.43E-07	4.48E-04
71		RX-3 Belle	0		0	0				0	0	0	0
72		RX-3 Belle	0		0	0				0	0	0	0
73		RX-3 Belle	0		0	0				0	0	0	0
73		RX-2 Belle	3.8557		0	0				0.15643	1.72E-02	1.29E-05	1.38E-03
74		RX-3 Belle	0		0	0				0	0	0	0
74		Totes	4.926		0	0				4.43E-02	5.54E-02	7.70E-06	6.26E-03
75		RX-3 Belle	32.8381		0	0				1.80E-02	0.18446	4.00E-06	2.62E-02
76		RX-2 Belle	0		0	0				0	0	0	0
77		RX-2 Belle	0										
77		RX-3 Belle	22.7525		0	0				0.94587	5.77E-02	8.05E-05	1.24E-02
78		RX-3 Belle	29.6857		0	0				1.2887	9.50E-02	1.11E-04	1.43E-02
79		RX-3 Belle	0		0	0				0	0	0	0

Activity	Recipe Step	Vessel	Nitrogen	Phenyl Magnesium Chloride	Sodium Chloride	Sodium Hydroxide	Sodium Hydroxide (80%)	STPB	Sulfuric Acid	Tetrahydrofuran	Toluene	TRI METHYL BORATE	Water
80		RX-3 Belle	0	0	0	0	0	0		0	0	0	0
81		RX-3 Belle	0	0	0	0	0	0		0	0	0	0
81		Totes	2.6093	0	0	0	0	0		2.33E-02	2.93E-02	2.04E-06	3.30E-03
82		RX-3 Belle	0	0	0	0	0	0		0	0	0	0
83		RX-3 Belle	0	0	0	0	0	0		0	0	0	0
83		Totes	0.49615	0	0	0	0	0		7.29E-03	5.06E-03	6.39E-07	6.24E-04
84		RX-2 Belle	0										
85		RX-3 Belle	0										
85		RX-2 Belle	22.4818	0				0		1.0278	0.10353	9.01E-05	
86		New GLS	4.7117										
87		RX-2 Belle	1.0584	0				0		0.10841	1.09E-02	9.50E-06	
88		RX-2 Belle	0	0				0		0.96351	2.06E-02	7.42E-05	
89		RX-2 Belle	0	0				0		0	0	0	
89		New GLS	0							0.51882	1.60E-03	3.29E-05	
90		RX-2 Belle	0	0				0		0	0	0	
91		RX-2 Belle	0	0				0		8.71E-02	3.64E-03	6.67E-06	
92		RX-2 Belle	0	0				0		0	0	0	
92		New GLS	0							0.51589	2.21E-03	3.30E-05	
93		RX-2 Belle	0	0				0		8.77E-02	3.80E-03	6.85E-06	
94		RX-2 Belle	0	0				0		0	0	0	
94		New GLS	0							0.51259	2.66E-03	3.31E-05	
95		RX-2 Belle	0	0				0		8.83E-02	3.98E-03	7.04E-06	
96		RX-2 Belle	0	0				0		0	0	0	
96		New GLS	0							0.50099	3.41E-03	3.39E-05	
97		RX-2 Belle	0	0				0		8.88E-02	4.19E-03	7.25E-06	
98		New GLS	0							0	0	0	
99		New GLS	0							0	0	0	
99		Totes	5.8632	0	0	0	0	0		0.37031	1.36E-02	2.88E-05	7.50E-03
100		New GLS	6.4925										
101		RX-2 Belle	0	0				0		0	0	0	
101		New GLS	0							0.50561	4.35E-03	3.51E-05	
102		RX-2 Belle	0	0				0		8.71E-02	4.61E-03	7.27E-06	
103		RX-2 Belle	0	0				0		0	0	0	
103		New GLS	0							0.49997	5.14E-03	3.49E-05	
104		RX-2 Belle	0	0				0		8.17E-02	5.34E-03	6.96E-06	
105		RX-2 Belle	0	0				0		0	0	0	
105		New GLS	0							0.49356	6.10E-03	3.49E-05	
106		RX-2 Belle	0	0				0		7.59E-02	6.13E-03	6.81E-06	
107		RX-2 Belle	0	0				0		0	0	0	
107		New GLS	0							0.48646	7.20E-03	3.48E-05	
108		RX-2 Belle	0	0				0		0.13828	1.45E-02	1.23E-05	
109		New GLS	0							0	0	0	
110		New GLS	0							0	0	0	
110		Totes	5.8542	0	0	0	0	0		0.36409	1.43E-02	2.90E-05	7.48E-03
111		New GLS	6.4925										
112		RX-2 Belle	0	0				0		0	0	0	
112		New GLS	0							0.91653	2.52E-02	7.24E-05	
113		RX-2 Belle	0	0				0		0.11312	1.79E-02	1.05E-05	
114		RX-2 Belle	0	0				0		0	0	0	
114		New GLS	0							0.80048	3.32E-02	6.61E-05	
116		RX-2 Belle	0	0				0		8.82E-02	2.15E-02	8.52E-06	
118		New GLS	0							0	0	0	
117		New GLS	0							0	0	0	
117		Totes	5.8549	0	0	0	0	0		0.32862	1.98E-02	2.71E-05	7.47E-03
118		New GLS	6.4925										
119		RX-2 Belle	0	0				0		0	0	0	
119		New GLS	0							0.7155	4.82E-02	6.21E-05	
120		RX-2 Belle	0	0				0		6.57E-02	2.47E-02	6.58E-06	
121		RX-2 Belle	0	0				0		0	0	0	
121		New GLS	0							0.66433	5.60E-02	5.82E-05	
122		RX-2 Belle	0	0				0		4.68E-02	2.74E-02	4.86E-06	
123		New GLS	0							0	0	0	
124		New GLS	0							0	0	0	
124		Totes	5.8666	0	0	0	0	0		0.28821	2.66E-02	2.44E-05	7.46E-03
126		New GLS	6.4925										
126		RX-2 Belle	0	0				0		0	0	0	
126		New GLS	0							0.47664	8.78E-02	4.55E-05	
127		RX-2 Belle	0	0				0		3.24E-02	2.96E-02	3.47E-06	
128		RX-2 Belle	0	0				0		0	0	0	
128		New GLS	0							0.43185	9.46E-02	4.16E-05	
129		RX-2 Belle	0	0				0		2.18E-02	3.11E-02	2.41E-06	
130		New GLS	0							0	0	0	
131		New GLS	0							0	0	0	
131		Totes	5.8827	0	0	0	0	0		0.24929	3.30E-02	2.14E-05	7.44E-03
132		New GLS	6.4925										
133		RX-2 Belle	0	0				0		0	0	0	
133		New GLS	0							0.13961	6.93E-02	1.44E-05	
134		RX-2 Belle	0	0				0		1.44E-02	3.23E-02	1.64E-06	
136		RX-2 Belle	0	0				0		0	0	0	
138		New GLS	0							0.1251	7.17E-02	1.30E-05	
138		New GLS	0							0	0	0	
137		New GLS	0							0	0	0	
137		Totes	5.8707	0	0	0	0	0		0.21628	3.88E-02	1.88E-05	7.44E-03
138		RX-2 Belle	0	0				0		0	0	0	
139		RX-2 Belle	0	0				0		0	0	0	
140		RX-2 Belle	0	0				0		0	0	0	
140		Virtual New	16.9124	0						0.19488	4.4541	2.82E-05	
141		Virtual New	0	0						0	0	0	
142		Virtual New	0	0						0	0	0	
143		Virtual New	0	0						0	0	0	
143		Virtual Car	19.881	0						5.93E-02	1.0637	7.84E-06	
144		Virtual Car	0	0						0	0	0	
144		Virtual ML	20.5994	0						6.15E-02	1.1021	8.12E-06	
146		Virtual Car	3.0974	0						6.39E-03	0.1146	8.44E-07	
146		Virtual Car	0	0						0	0	0	
146		Virtual ML	2.3266	0						7.13E-03	0.12777	8.42E-07	
147		Virtual Car	2.3299	0						1.49E-03	2.68E-02	1.97E-07	
148		Virtual Car	0	0						0	0	0	
148		Virtual ML	2.0026	0						5.90E-03	0.10576	7.80E-07	
149		Virtual ML	0							0	0	0	
149		Virtual Tar	43.729	0						0.1157	2.0743	1.53E-05	
150		Virtual Car	0	0						0	0	0	
150		Virtual We	2.4368	0						8.06E-04	1.44E-02	1.06E-07	
151		Virtual We	0	0						0	0	0	
151		Virtual Dry	4.7777	0						1.58E-03	2.83E-02	2.08E-07	
152		Virtual Dry	0	0						0.36617	42.6071	5.98E-05	
163		Virtual Dry	0	0						0	0	0	
163		Drums	6.4675	0						2.14E-03	3.84E-02	2.31E-07	

Controlled Emissions

Process: Grignard, Coupling, Quench, Isolation & Drying Emissions reported in Pounds.

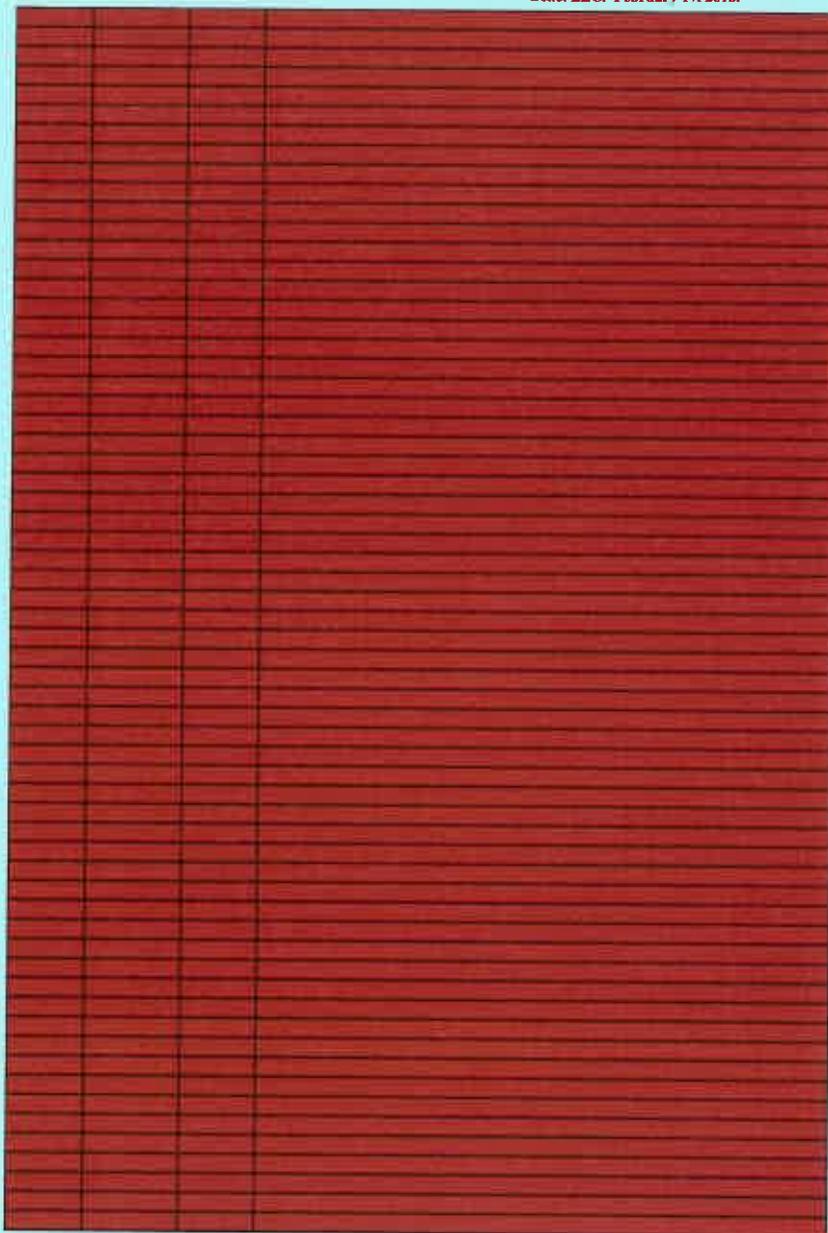
Activity	Recipe Step	Vessel	Air	Benzene	Chlorobenzene	Hexane	Magnesium	Magnesium Chloride	Magnesium Chloride Methoxide	Methanol	MTPB
1		RX-1 Belle									
2		RX-1 Belle									
3		RX-1 Belle			1.79E-04						
4		RX-1 Belle			0						
5		RX-5 Belle					0				
6		RX-1 Belle			0						
7		RX-5 Belle					0				
8		RX-5 Belle					0				
9		RX-5 Belle					0				
10		RX-5 Belle					0				
11		RX-5 Belle					0				
12		RX-5 Belle					0				
13		RX-5 Belle					0				
14		RX-1 Belle					0				
14		RX-5 Belle			1.85E-05		0				
15		RX-1 Belle									
16		RX-1 Belle									
16		RX-5 Belle			6.67E-07		0				
17		RX-5 Belle					0				
18		RX-5 Belle					0				
19		RX-5 Belle					0				
20		RX-5 Belle					0				
21		RX-5 Belle					0				
21		RX-5 Belle					0				
22		RX-5 Belle					0				
23		RX-5 Belle					0				
24		RX-5 Belle					0				
25		RX-5 Belle					0				
25		Drum					0				
26		RX-1 Belle									
27		RX-1 Belle									
28		RX-1 Belle									
30		RX-5 Belle					0				
31		RX-5 Belle					0				
32		RX-1 Belle									
32		RX-5 Belle					0				
33		RX-5 Belle					0				
34		RX-1 Belle									
35		RX-5 Belle					0		0		0
36		RX-3 Belle									
37		RX-3 Belle									
38		RX-3 Belle									
39		RX-3 Belle									
40		RX-5 Belle					0		0		0
40		RX-3 Belle					0		0		0
41		RX-3 Belle					0		0		0
42		RX-3 Belle					0		0		0
43		RX-3 Belle		0			0	0		0	
44		RX-3 Belle		0			0	0		0	
45		RX-3 Belle		0			0	0		0	
45		RX-2 Belle		1.03E-06						1.10E-05	
46		RX-3 Belle		8.34E-06						9.42E-06	
47		RX-3 Belle		4.16E-07			0	0		1.11E-06	
48		RX-3 Belle		9.29E-08			0	0		2.46E-07	
49		RX-3 Belle		0			0	0		0	
60		RX-3 Belle		0			0	0		0	
51		RX-3 Belle		0			0	0		0	
51		RX-2 Belle		2.98E-06						3.33E-06	
52		RX-3 Belle		0			0	0		0	
52		Totes		8.21E-04			0	0		4.19E-03	
53		RX-3 Belle		8.23E-07			0	0		8.63E-06	
54		RX-3 Belle		2.19E-07			0	0		5.19E-07	
55		RX-3 Belle		4.62E-04			0	0		5.76E-04	
56		RX-3 Belle		8.23E-07			0	0		1.63E-05	
57		RX-3 Belle		2.19E-07			0	0		2.43E-07	
58		RX-6 Belle									
58		RX-3 Belle		0			0	0	0	1.67E-10	0
59		RX-6 Belle									
60		RX-6 Belle									
61		RX-6 Belle					0		0		0
62		RX-6 Belle					0		0		0
62		RX-3 Belle		0			0	0	0	0	0
63		RX-3 Belle		0			0	0	0	1.76E-09	0
64		RX-3 Belle		0			0	0	0	0	0
65		RX-3 Belle		0			0	0	0	0	0
66		RX-3 Belle		0			0	0	0	0	0
67		RX-3 Belle		0			0	0	0	0	0
67		RX-2 Belle		7.80E-08			0	0		1.65E-05	
68		RX-2 Belle		0						0	
69		RX-3 Belle		4.45E-07			0	0		1.17E-06	
70		RX-3 Belle		9.48E-08			0	0		2.52E-07	
71		RX-3 Belle		0			0	0		0	
72		RX-3 Belle		0			0	0		0	
73		RX-3 Belle		0			0	0		0	
73		RX-2 Belle		2.35E-06			0	0		4.94E-06	
74		RX-3 Belle		0			0	0		0	
74		Totes		8.25E-04			0	0		4.22E-03	
75		RX-3 Belle		8.43E-07			0	0		8.83E-06	
76		RX-2 Belle		0			0	0		0	
77		RX-2 Belle		0			0	0		0	
77		RX-3 Belle		1.55E-05			0	0		3.46E-05	
78		RX-3 Belle		2.23E-05			0	0		2.46E-05	
79		RX-3 Belle		0			0	0		0	

Activity	Recipe Step	Vessel	Air	Benzene	Chlorobenzene	Hexane	Magnesium	Magnesium Chloride	Magnesium Chloride Methoxide	Methanol	MTPB
80		RX-3 Belle		0							
81		RX-3 Belle		0			0	0		0	
81		Totes		4.32E-04			0	0		0	
82		RX-3 Belle		0			0	0		1.21E-03	
83		RX-3 Belle		0			0	0		0	
83		Totes		1.35E-04			0	0		2.19E-04	
84		RX-2 Belle									
85		RX-3 Belle									
85		RX-2 Belle		1.91E-05							
86		New GLS Receiver Belle								2.03E-05	
87		RX-2 Belle		2.01E-08							
88		RX-2 Belle	1.7654	1.18E-05						2.14E-08	
89		RX-2 Belle	0	0						1.55E-05	
89		New GLS	0.82085	3.55E-06						0	
90		RX-2 Belle		0						6.08E-08	
91		RX-2 Belle	0.22309	1.05E-06						0	
92		RX-2 Belle	0	0						1.41E-08	
92		New GLS	0.82185	3.63E-06						0	
93		RX-2 Belle	0.22692	1.11E-06						8.13E-08	
94		RX-2 Belle	0	0						1.47E-08	
94		New GLS	0.82321	3.73E-06						0	
95		RX-2 Belle	0.23126	1.18E-06						9.19E-06	
96		RX-2 Belle	0	0						1.54E-08	
96		New GLS	0.81844	4.02E-06						0	
97		RX-2 Belle	0.23813	1.26E-06						6.50E-08	
98		New GLS Receiver Belle								1.61E-06	
99		New GLS Receiver Belle								0	
99		Totes		4.63E-03			0	0		1.11E-02	
100		New GLS Receiver Belle									
101		RX-2 Belle	0	0						0	
101		New GLS	0.83874	4.33E-06						8.91E-08	
102		RX-2 Belle	0.23908	1.31E-06						1.64E-08	
103		RX-2 Belle	0	0						0	
103		New GLS	0.83967	4.37E-06						8.91E-06	
104		RX-2 Belle	0.23873	1.30E-06						1.58E-06	
105		RX-2 Belle	0	0						0	
105		New GLS	0.84198	4.44E-06						6.95E-06	
106		RX-2 Belle	0.23838	1.28E-06						1.53E-06	
107		RX-2 Belle	0	0						0	
107		New GLS	0.84428	4.51E-06						6.88E-08	
108		RX-2 Belle	0.48033	2.48E-06						2.89E-06	
109		New GLS Receiver Belle								0	
110		New GLS Receiver Belle									
110		Totes		4.80E-03			0	0		1.13E-02	
111		New GLS Receiver Belle									
112		RX-2 Belle	0	0						0	
112		New GLS	1.7484	1.12E-05						1.55E-05	
113		RX-2 Belle	0.47813	2.28E-06						2.51E-06	
114		RX-2 Belle	0	0						0	
114		New GLS	1.863	1.09E-05						1.47E-05	
115		RX-2 Belle	0.47588	2.01E-06						2.07E-06	
116		New GLS Receiver Belle								0	
117		New GLS Receiver Belle									
117		Totes		4.75E-03			0	0		1.08E-02	
118		New GLS Receiver Belle									
119		RX-2 Belle	0	0						0	
119		New GLS	1.7072	1.14E-05						1.41E-05	
120		RX-2 Belle	0.47378	1.70E-06						1.61E-06	
121		RX-2 Belle	0	0						0	
121		New GLS	1.7136	1.10E-05						1.32E-05	
122		RX-2 Belle	0.47194	1.38E-06						1.19E-06	
123		New GLS Receiver Belle								0	
124		New GLS Receiver Belle									
124		Totes		4.53E-03			0	0		9.82E-03	
125		New GLS Receiver Belle									
126		RX-2 Belle	0	0						0	
126		New GLS	1.7813	1.07E-05						1.05E-05	
127		RX-2 Belle	0.47049	1.09E-06						8.43E-07	
128		RX-2 Belle	0	0						0	
128		New GLS	1.7848	1.00E-05						9.61E-06	
129		RX-2 Belle	0.4694	8.38E-07						5.79E-07	
130		New GLS Receiver Belle								0	
131		New GLS Receiver Belle									
131		Totes		4.17E-03			0	0		8.70E-03	
132		New GLS Receiver Belle									
133		RX-2 Belle	0	0						0	
133		New GLS	1.017	4.33E-06						3.33E-06	
134		RX-2 Belle	0.48883	6.35E-07						3.89E-07	
135		RX-2 Belle	0	0						0	
135		New GLS	1.02	4.02E-06						2.99E-06	
136		New GLS Receiver Belle								0	
137		New GLS Receiver Belle									
137		Totes		3.77E-03			0	0		7.63E-03	
138		RX-2 Belle	0	0						0	
139		RX-2 Belle	0	0						0	
140		RX-2 Belle									
140		Virtual New GLS Recei		2.28E-05						8.07E-06	
141		Virtual New GLS Recei		0						0	
142		Virtual New GLS Recei		0						0	
143		Virtual New GLS Receiver Belle									
143		Virtual Centrifuge Belle		5.82E-06						1.91E-06	
144		Virtual Centrifuge Belle		0						0	
144		Virtual MLDT Belle		8.03E-06						1.88E-06	
145		Virtual Centrifuge Belle		6.27E-07		1.74E-03				2.08E-07	
146		Virtual Centrifuge Belle		0		0				0	
146		Virtual MLDT Belle		6.98E-07		4.31E-04				2.30E-07	
147		Virtual Centrifuge Belle		1.46E-07		1.29E-03				4.81E-08	
148		Virtual Centrifuge Belle		0		0				0	
148		Virtual MLDT Belle		5.79E-07		5.45E-04				1.90E-07	
149		Virtual Tanker		1.14E-05		1.49E-03				3.79E-08	
150		Virtual Centrifuge Belle		7.91E-08		6.53E-04				2.60E-08	
151		Virtual Wet Cake Bin B									
151		Virtual Dryer Belle		1.55E-07		1.28E-09				5.08E-08	
152		Virtual Dry	32.2774	6.83E-05		0.35243				1.77E-05	
153		Virtual Dry	0	0						0	
153		Drums		2.10E-04		1.7341				8.90E-06	

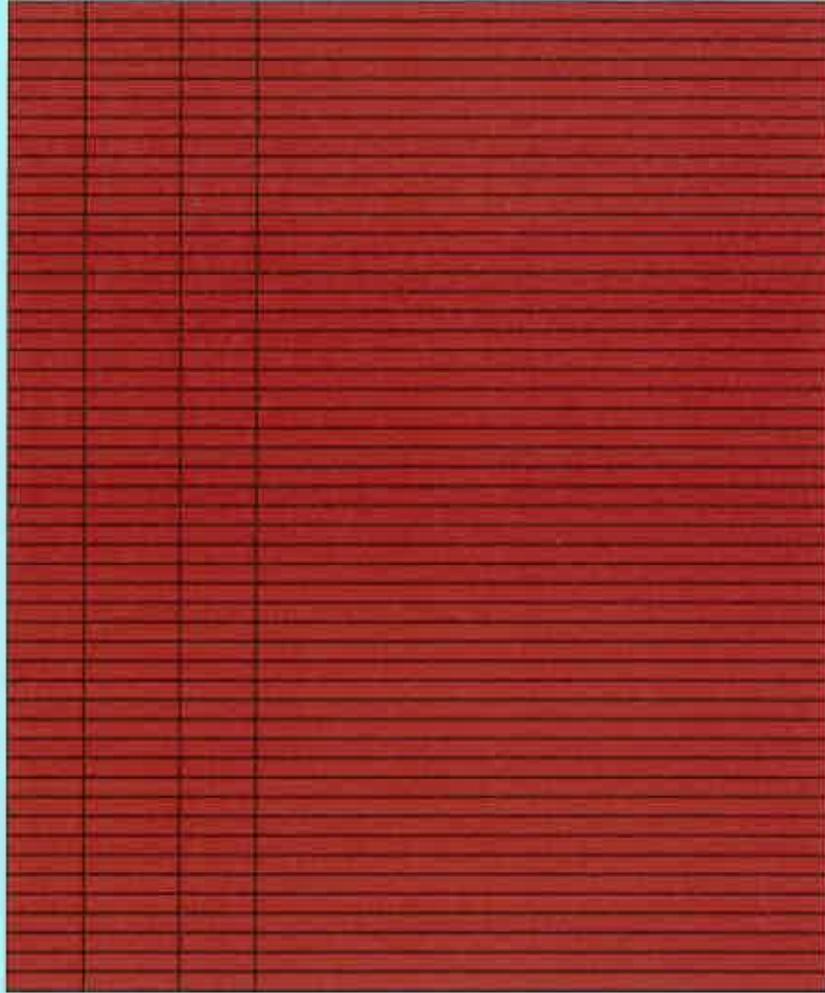
Activity	Recipe Step	Vessel	Nitrogen	Phanyl Magnesium Chloride	Sodium Chloride	Sodium Hydroxide	Sodium Hydroxide (50%)	STPB	Sulfuric Acid	Tetrahydrofuran	Toluene	TRI METHYL BORATE	Water
1		RX-1 Belle	1.604				0				2.23E-05		2.19E-02
2		RX-1 Belle	0.13039				0				3.16E-07		1.87E-03
3		RX-1 Belle	3.2773				0			1.04E-05	2.23E-05		4.70E-02
4		RX-1 Belle	0				0			3.61E-05	2.23E-05		4.70E-02
5		RX-5 Belle	2.7706				0			0	0		
6		RX-1 Belle	0				0			0	0		
7		RX-5 Belle	0				0			0	0		
8		RX-5 Belle	30.9039				0						
9		RX-5 Belle	0.55014	0			0						0.44339
10		RX-5 Belle	7.4363	0			0			5.12E-05	2.16E-07		7.89E-03
11		RX-5 Belle	0.2798	0			0			7.10E-04	2.87E-07		0.10974
12		RX-5 Belle	0.19507	0			0			2.22E-05	7.08E-07		4.01E-03
13		RX-5 Belle	8.8749	0			0			1.88E-05	8.25E-09		2.80E-03
14		RX-1 Belle	0				0			8.47E-04	4.15E-07		0.12794
14		RX-5 Belle	8.3396	0			0			7.71E-04	2.07E-06		0.11966
15		RX-1 Belle	0.42254				0			1.67E-05			6.06E-03
16		RX-1 Belle	0				0						0
16		RX-5 Belle	0.18281	0			0			1.65E-05	7.44E-08		2.62E-03
17		RX-5 Belle	0	0			0			0	0		0
18		RX-5 Belle	0.19507	0			0			1.81E-05	8.13E-08		2.80E-03
19		RX-5 Belle	8.5666	0			0			6.11E-04	2.72E-06		9.42E-02
20		RX-5 Belle	0	0			0			0	0		0
21		RX-5 Belle	0				0						0
21		RX-5 Belle	11.9109	0			0			1.08E-03	4.38E-06		0.19550
22		RX-5 Belle	0.78029	0			0			7.28E-05	2.95E-07		1.12E-02
23		RX-6 Belle	0	0			0			0	0		0
24		RX-6 Belle	0	0			0			0	0		0
25		RX-6 Belle	0	0			0			0	0		0
25		Drum	0.70779	0			0			0.58447	1.64E-02		1.41E-03
26		RX-1 Belle	1.8322				0					2.28E-03	2.34E-02
27		RX-1 Belle	3.9857				0					2.28E-03	5.69E-02
28		RX-1 Belle	0				0				8.24E-06	0	0
29		RX-1 Belle	0				0				0	0	0
30		RX-6 Belle	21.6062	0			0			2.01E-03	8.82E-08		0.31001
31		RX-6 Belle	12.6006	0			0			1.17E-03	5.08E-06		0.18079
32		RX-1 Belle	0				0						0
32		RX-6 Belle	8.3983	0			0			6.90E-04	6.37E-06	1.57E-03	0.12048
33		RX-6 Belle	0	0			0			0	0	0	0
34		RX-1 Belle	8.9535	0			0			0	0	0	0
35		RX-6 Belle	0	0			0			0	0	0	0.12846
36		RX-3 Belle	3.7684				0			0	0		5.41E-02
37		RX-3 Belle	0.39855				0						1.07E-02
38		RX-3 Belle	93.6348				0						1.3434
39		RX-3 Belle	0				0						0
40		RX-6 Belle	0	0			0						0
40		RX-3 Belle	7.281	0			0			5.54E-04	6.25E-08		0.10447
41		RX-3 Belle	0.78029	0			0			3.97E-05	1.03E-09		1.12E-02
42		RX-3 Belle	0	0			0			0	0		0
43		RX-3 Belle	0	0			0			0	0		0
44		RX-3 Belle	0	0			0			0	0		0
45		RX-3 Belle	0	0			0			0	0		0
45		RX-2 Belle	9.5572				0			0	0		0
46		RX-3 Belle	23.4087	0			0			5.67E-04	2.24E-05		0.13712
47		RX-3 Belle	6.8887	0			0			5.13E-04	1.22E-05		0.33596
48		RX-3 Belle	1.5806	0			0			3.45E-05	3.20E-05		9.59E-02
49		RX-3 Belle	0	0			0			5.45E-06	4.87E-06		2.24E-02
50		RX-3 Belle	0	0			0			0	0		0
51		RX-3 Belle	0	0			0			0	0		0
51		RX-2 Belle	3.8004	0			0			1.80E-04	2.53E-05		5.48E-02
52		RX-3 Belle	0	0			0			0	0		0
52		Totes	5.0097				0			4.43E-02	5.64E-02		6.37E-03
53		RX-3 Belle	32.8363	0			0			1.77E-05	1.84E-04		0.47115
54		RX-3 Belle	4.6732	0			0			8.31E-06	5.47E-06		6.70E-02
55		RX-3 Belle	2.8184	0			0			1.77E-02	3.17E-02		4.03E-03
56		RX-3 Belle	63.9348	0			0			1.77E-05	1.84E-04		1.3434
57		RX-3 Belle	1.5606	0			0			1.29E-05	1.13E-05		2.24E-02
58		RX-6 Belle	0				0						0
58		RX-3 Belle	7.281	0			0			6.54E-04	6.26E-06		0.10447
59		RX-6 Belle	48.1251				0						0.89047
60		RX-6 Belle	1.5114				0			1.3985			0
61		RX-6 Belle	0				0			0	0		0
62		RX-6 Belle	0				0			0	0		0
62		RX-3 Belle	0.48331	0			0			4.09E-05	4.52E-07	8.87E-06	8.85E-03
63		RX-3 Belle	4.8817	0			0			2.38E-04	6.22E-06	6.05E-07	6.72E-02
64		RX-3 Belle	0	0			0			0	0		0
65		RX-3 Belle	0	0			0			0	0		0
66		RX-3 Belle	0	0			0			0	0		0
67		RX-3 Belle	0	0			0			0	0		0
67		RX-2 Belle	9.7546				0			0	0		0
68		RX-2 Belle	0				0			4.97E-04	1.62E-05	1.68E-08	0.13985
69		RX-3 Belle	7.0788	0			0			0	0		0
70		RX-3 Belle	1.6606	0			0			3.89E-05	3.38E-05	1.14E-07	0.10153
71		RX-3 Belle	0	0			0			5.54E-06	4.85E-06	1.89E-08	2.24E-02
72		RX-3 Belle	0	0			0			0	0		0
73		RX-3 Belle	0	0			0			0	0		0
73		RX-2 Belle	3.8567	0			0			1.58E-04	1.72E-05	2.67E-07	5.53E-02
74		RX-3 Belle	0	0			0			0	0		0
74		Totes	4.926				0			4.43E-02	5.54E-02	7.70E-06	6.26E-03
75		RX-3 Belle	32.8381	0			0			1.80E-05	1.84E-04	9.00E-08	0.47114
76		RX-2 Belle	0				0			0	0		0
77		RX-2 Belle	0				0			0	0		0
77		RX-3 Belle	22.7525	0			0			9.46E-04	5.77E-05	1.61E-06	0.32645
78		RX-3 Belle	29.8857	0			0			1.29E-03	9.50E-05	2.22E-08	0.42692
79		RX-3 Belle	0	0			0			0	0		0

Activity	Recipe Step	Vessel	Nitrogen	Phenyl Magnesium Chloride	Sodium Chloride	Sodium Hydroxide	Sodium Hydroxide (50%)	STPB	Sulfuric Acid	Tetrahydrofuran	Toluene	TRI METHYL BORATE	Water
80		RX-3 Belle	0	0	0	0	0	0					
81		RX-3 Belle	0	0	0	0	0	0					
82		Totes	2.6093	0	0	0	0	0					
83		RX-3 Belle	0	0	0	0	0	0		2.33E-02	2.93E-02	2.04E-06	3.30E-03
84		RX-3 Belle	0	0	0	0	0	0					
85		Totes	0.49615	0	0	0	0	0					
86		RX-2 Belle	0	0	0	0	0	0		7.29E-03	5.08E-03	6.39E-07	6.24E-04
87		RX-2 Belle	0	0	0	0	0	0					
88		New GLS	22.4818	0	0	0	0	0		1.03E-03	1.04E-04	1.80E-06	0.32256
89		New GLS	4.7117	0	0	0	0	0					6.76E-02
90		RX-2 Belle	1.0584	0	0	0	0	0		1.06E-04	1.09E-05	1.90E-07	1.52E-02
91		RX-2 Belle	0	0	0	0	0	0		9.64E-04	2.06E-05	1.48E-06	2.45E-02
92		New GLS	0	0	0	0	0	0					0
93		RX-2 Belle	0	0	0	0	0	0		5.19E-04	1.80E-06	6.69E-07	1.14E-02
94		RX-2 Belle	0	0	0	0	0	0					0
95		New GLS	0	0	0	0	0	0		8.71E-05	3.64E-06	1.33E-07	3.10E-03
96		RX-2 Belle	0	0	0	0	0	0					0
97		RX-2 Belle	0	0	0	0	0	0		5.16E-04	2.21E-06	6.69E-07	1.14E-02
98		New GLS	0	0	0	0	0	0		8.77E-05	3.80E-06	1.37E-07	3.16E-03
99		RX-2 Belle	0	0	0	0	0	0					0
100		New GLS	0	0	0	0	0	0		5.13E-04	2.68E-06	6.81E-07	6.83E-02
101		RX-2 Belle	0	0	0	0	0	0		8.83E-05	3.98E-06	1.41E-07	3.21E-03
102		New GLS	0	0	0	0	0	0					0
103		RX-2 Belle	0	0	0	0	0	0		5.01E-04	3.41E-06	6.78E-07	1.14E-02
104		New GLS	0	0	0	0	0	0		6.88E-05	4.19E-06	1.45E-07	3.28E-03
105		Totes	5.8632	0	0	0	0	0					
106		New GLS	6.4825	0	0	0	0	0		0.37031	1.36E-02	2.89E-06	7.50E-03
107		RX-2 Belle	0	0	0	0	0	0					9.32E-02
108		New GLS	0	0	0	0	0	0					0
109		RX-2 Belle	0	0	0	0	0	0		5.08E-04	4.35E-06	7.01E-07	1.16E-02
110		RX-2 Belle	0	0	0	0	0	0		8.71E-05	4.61E-06	1.45E-07	3.32E-03
111		New GLS	0	0	0	0	0	0					0
112		RX-2 Belle	0	0	0	0	0	0		5.00E-04	5.14E-06	6.88E-07	1.17E-02
113		New GLS	0	0	0	0	0	0		8.17E-05	5.34E-06	1.39E-07	3.31E-03
114		RX-2 Belle	0	0	0	0	0	0					0
115		New GLS	0	0	0	0	0	0		4.94E-04	6.10E-06	6.97E-07	1.17E-02
116		RX-2 Belle	0	0	0	0	0	0		7.69E-05	6.13E-06	1.32E-07	3.31E-03
117		New GLS	0	0	0	0	0	0					0
118		RX-2 Belle	0	0	0	0	0	0		4.86E-04	7.20E-06	6.96E-07	1.17E-02
119		New GLS	0	0	0	0	0	0		1.38E-04	1.45E-05	2.47E-07	6.66E-03
120		New GLS	0	0	0	0	0	0					0
121		Totes	5.8642	0	0	0	0	0		0.36409	1.43E-02	2.90E-06	7.48E-03
122		New GLS	6.4825	0	0	0	0	0					9.32E-02
123		RX-2 Belle	0	0	0	0	0	0					0
124		New GLS	0	0	0	0	0	0		8.17E-04	2.52E-06	1.45E-06	2.42E-02
125		RX-2 Belle	0	0	0	0	0	0		1.13E-04	1.79E-05	2.10E-07	6.63E-03
126		New GLS	0	0	0	0	0	0					0
127		RX-2 Belle	0	0	0	0	0	0		8.00E-04	3.32E-05	1.32E-06	2.31E-02
128		New GLS	0	0	0	0	0	0		8.82E-05	2.15E-05	1.70E-07	6.60E-03
129		New GLS	0	0	0	0	0	0					0
130		Totes	5.8649	0	0	0	0	0		0.32862	1.99E-02	2.71E-06	7.47E-03
131		New GLS	6.4825	0	0	0	0	0					9.32E-02
132		RX-2 Belle	0	0	0	0	0	0					0
133		New GLS	0	0	0	0	0	0					0
134		RX-2 Belle	0	0	0	0	0	0		7.16E-04	4.52E-06	1.24E-06	2.37E-02
135		RX-2 Belle	0	0	0	0	0	0		6.57E-05	2.47E-06	1.32E-07	6.57E-03
136		New GLS	0	0	0	0	0	0					0
137		RX-2 Belle	0	0	0	0	0	0		6.64E-04	5.60E-05	1.16E-06	2.38E-02
138		New GLS	0	0	0	0	0	0		4.68E-05	2.74E-05	8.73E-08	6.55E-03
139		Totes	5.8666	0	0	0	0	0					0
140		New GLS	6.4825	0	0	0	0	0		0.28821	2.66E-02	2.44E-06	7.46E-03
141		RX-2 Belle	0	0	0	0	0	0					9.32E-02
142		New GLS	0	0	0	0	0	0					0
143		RX-2 Belle	0	0	0	0	0	0		4.77E-04	8.78E-05	9.10E-07	2.47E-02
144		RX-2 Belle	0	0	0	0	0	0		3.24E-05	2.96E-05	6.84E-06	6.53E-03
145		New GLS	0	0	0	0	0	0					0
146		RX-2 Belle	0	0	0	0	0	0		4.32E-04	9.46E-06	6.31E-07	2.48E-02
147		New GLS	0	0	0	0	0	0		2.18E-05	3.11E-05	4.82E-06	6.51E-03
148		New GLS	0	0	0	0	0	0					0
149		Totes	5.8627	0	0	0	0	0		0.24929	3.30E-02	2.14E-05	7.44E-03
150		New GLS	6.4825	0	0	0	0	0					9.32E-02
151		RX-2 Belle	0	0	0	0	0	0					0
152		New GLS	0	0	0	0	0	0		1.40E-04	6.83E-05	2.69E-07	1.41E-02
153		RX-2 Belle	0	0	0	0	0	0		1.44E-05	3.23E-05	3.28E-08	6.50E-03
154		New GLS	0	0	0	0	0	0					0
155		RX-2 Belle	0	0	0	0	0	0		1.29E-04	7.17E-05	2.81E-07	1.42E-02
156		New GLS	0	0	0	0	0	0					0
157		Totes	5.8707	0	0	0	0	0		0.21628	3.86E-02	1.88E-05	7.44E-03
158		RX-2 Belle	0	0	0	0	0	0					0
159		RX-2 Belle	0	0	0	0	0	0					0
160		RX-2 Belle	0	0	0	0	0	0					0
161		Virtual Net	16.9124	0	0	0	0	0		1.95E-04	4.46E-03	5.64E-07	0.24287
162		Virtual Net	0	0	0	0	0	0					0
163		Virtual Net	0	0	0	0	0	0					0
164		Virtual Net	0	0	0	0	0	0					0
165		Virtual Cel	19.881	0	0	0	0	0		5.83E-05	1.06E-03	1.57E-07	0.28625
166		Virtual Cel	0	0	0	0	0	0					0
167		Virtual ML	20.5994	0	0	0	0	0					0
168		Virtual Cel	3.0974	0	0	0	0	0		6.15E-05	1.10E-03	1.62E-07	0.29555
169		Virtual Cel	0	0	0	0	0	0		6.39E-08	1.15E-04	1.69E-08	4.44E-02
170		Virtual ML	2.3266	0	0	0	0	0					0
171		Virtual Cel	2.3289	0	0	0	0	0		7.13E-06	1.28E-04	1.88E-08	3.34E-02
172		Virtual Cel	0	0	0	0	0	0		1.49E-06	2.68E-05	3.93E-08	3.34E-02
173		Virtual ML	2.0026	0	0	0	0	0					0
174		Virtual ML	0	0	0	0	0	0		5.60E-06	1.06E-04	1.66E-06	2.87E-02
175		Virtual Tak	43.729	0	0	0	0	0					0
176		Virtual Cel	0	0	0	0	0	0		1.16E-04	2.07E-03	3.09E-07	0.62742
177		Virtual Wg	2.4368	0	0	0	0	0					0
178		Virtual Wg	0	0	0	0	0	0		8.08E-07	1.44E-05	2.12E-09	3.50E-02
179		Virtual Dn	4.7777	0	0	0	0	0					0
180		Virtual Dn	0	0	0	0	0	0		1.58E-06	2.83E-06	4.15E-09	6.86E-02
181		Virtual Dn	0	0	0	0	0	0		3.66E-04	4.26E-02	1.20E-08	0.44984
182		Drums	6.4675	0	0	0	0	0					0
183										2.14E-03	3.84E-02	2.31E-07	

REDACTED
Information claimed confidential by Optima
Belle, LLC. February 17, 2016.



REDACTED
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Belle, LLC. February 17, 2016.



Product: STPB
 Process Name: Toluene Tank
 Production Quantity:
 Process Cycle Time: 8783.9997 hr
 Date: 1/6/2016
 File: C:\Users\Public\Documents\Emission Master\STPB - Toluene Tank.emm
 Comments:

Process Operations - Toluene Tank

Compound	Activities Emitting	Emissions		Emissions Controlled (lb)	Emissions Percent Removal
		Uncontrolled (lb)			
Nitrogen	1	3903.95237		3903.95237	1.11022E-14
Toluene	1	273.2354201		0.27323542	99.9

Compound	Process Cycle	Compound Emission	Compound Emission	Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1 hour
Nitrogen	0.444439036	8783.999722	0.444439036	0.444439036
Toluene	3.1106E-05	8783.999722	3.1106E-05	3.1106E-05

Storage Only - Toluene Tank

Compound	Pounds/Day	Days/Year	Pounds/Year	Emissions	
				Uncontrolled (lb/hr)	Uncontrolled (tpy)
Toluene (3)	0.746544889	28	20.9032569	0.031106037	0.010451628

- (1) Process Cycle Average = Compound emission quantity / Total process cycle time in hours.
- (2) Compound Emission Average = Compound emission quantity / Compound emission time in hours.
- (3) When tank is storing toluene and the process is not in operation the tank will be uncontrolled since the incinerator will not be operating. Maximum time expected to have the tank uncontrolled while storing toluene is used with the uncontrolled emissions in pounds per hour to estimate yearly uncontrolled storage emissions in tons per year.

Classification	Activities Emitting	Emissions		Emissions Percent Removal
		Uncontrolled (lb)	Controlled (lb)	
All Emissions	1	4177.18779	3904.225606	6.534592133
Acid	0	0	0	
Acid Gases	0	0	0	
Asbestos	0	0	0	
Base	0	0	0	
Biological	0	0	0	
CO	0	0	0	
Company List	0	0	0	
CR+6	0	0	0	
Dioxin	0	0	0	
ETG	0	0	0	
EVOS	0	0	0	
Exclude	0	0	0	
Gas	0	0	0	
HAP	1	273.2354201	0.27323542	99.9
Toluene	1	273.2354201	0.27323542	99.9
Hydrogen	0	0	0	
LOC	0	0	0	
Metal	0	0	0	
NOx	0	0	0	
Other	0	0	0	
Particulate	0	0	0	
Pb	0	0	0	
PM10	0	0	0	
PM2.5	0	0	0	
Radionuclide	0	0	0	
SO2	0	0	0	
TSP	0	0	0	
TVOS	0	0	0	
VCM	0	0	0	
VOC	1	273.2354201	0.27323542	99.9
Toluene	1	273.2354201	0.27323542	99.9
Unclassified	1	3903.95237	3903.95237	1.11022E-14
Nitrogen	1	3903.95237	3903.95237	1.11022E-14

Classification	Process Cycle	Emission		Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1 hour
All Emissions	0.444470142	8783.999722	0.444470142	0.444470142
Acid	0	0	0	0
Acid Gases	0	0	0	0
Asbestos	0	0	0	0
Base	0	0	0	0
Biological	0	0	0	0
CO	0	0	0	0
Company List	0	0	0	0
CR+6	0	0	0	0
Dioxin	0	0	0	0
ETG	0	0	0	0
EVOS	0	0	0	0
Exclude	0	0	0	0
Gas	0	0	0	0
HAP	3.1106E-05	8783.999722	3.1106E-05	3.1106E-05
Hydrogen	0	0	0	0
LOC	0	0	0	0
Metal	0	0	0	0
NOx	0	0	0	0
Other	0	0	0	0
Particulate	0	0	0	0
Pb	0	0	0	0
PM10	0	0	0	0
PM2.5	0	0	0	0
Radionuclide	0	0	0	0
SO2	0	0	0	0
TSP	0	0	0	0
TVOS	0	0	0	0
VCM	0	0	0	0
VOC	3.1106E-05	8783.999722	3.1106E-05	3.1106E-05
Unclassified	0.444439036	8783.999722	0.444439036	0.444439036

- (1) Process Cycle Average = Classification emission quantity / Total process cycle time in hours.
(2) Emission Average = Classification emission quantity / Classification emission time in hours.

Vessel	Vent ID	Device # 1	Device # 1 Temp (°C)
ISO Tank		Incinerator (Bldg 216)	1500

Uncontrolled Emissions

Process: Toluene Tank

Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Nitrogen	Toluene
1		ISO Tank	3903.95	273.235

Controlled Emissions

Process: Toluene Tank

Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Nitrogen	Toluene
1		ISO Tank	3903.95	0.27324

Activity	Recipe Step	Type	Activity Title
1		Storage	Toluene Storage

Optima Belle, LLC
 STPB
 PM Drop Emissions

Description: Particulate emissions are generated through the drop of solid materials into process vessels.

Basis: AP-42 Equation 13.2.4-3 is used to generate emissions from this operation. No control factor for the building enclosure and dust collector is being claimed at this time without guidance from the WVDEP.

Compound	Number of Batches	Pounds per Batch (lb)	Tons per Campaign (ton)	U (mph)	M (%)	Emissions (lb/ton)			Emissions (lb/hr)			Emissions (tpy)		
						PM	PM10	PM2.5	PM	PM10	PM2.5	PM	PM10	PM2.5
Sodium Chloride	15	1600	12	7.0	0.25	0.0674	0.0319	0.0048	0.05	0.03	0.01	0.01	0.01	0.01
Magnesium	15	664	4.98	7.0	0.25	0.0674	0.0319	0.0048	0.02	0.01	0.01	0.01	0.01	0.01
Sodium Tetraphenyl Borate	15	1816.79	13.63	7.0	0.25	0.0674	0.0319	0.0048	0.06	0.03	0.01	0.01	0.01	0.01
Total Emissions									0.13	0.07	0.03	0.03	0.03	0.03

(1) WVDEP allows for 7 mph to be claimed for wind speed.

From AP-42:

$$E = k(0.0092) \left(\frac{U}{3}\right)^{1.6} \left(\frac{M}{2}\right)^{1.6} \text{ (pounds (lb)/hour)}$$

where:

- E = emission factor
- k = particle size multiplier (dimensionless)
- U = mean wind speed, meters per second (m/s) (miles per hour) (mph)
- M = material moisture content (%)

From AP-42:

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) for Equation 13				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.052*

* Multiplier for < 2.5 µm taken from Reference 14

**Optima Belle, LLC
STPB Emissions
Filter Changeouts**

Process: The polish filters are opened to atmosphere for cleaning. This is expected to occur every batch.

Basis: It is assumed that the liquids have been removed from the vessel after blowout, and that the vapor space is full of nitrogen and tetrahydrofuran.

Equation: $PV = nRT$

Item	Value	Value	Unit	Source
Filter Size	0.606	0.606	m3	Equipment
Temperature	23.15	23.15	°C	Min. Temp for Antoine's
Temperature	296.3	296.3	K	-
Mass THF	3535	3535	lb	
Mass Water	1165	1165	lb	
Mass Toluene	2950	2950	lb	
Mass Methanol	252	252	lb	
MW THF	72.11	72.11	lb/lb-mol	
MW Water	18.02	18.02	lb/lb-mol	
MW Toluene	92.14	92.14	lb/lb-mol	
MW Methanol	32.04	32.04	lb/lb-mol	
Mol Frac THF	0.32	0.32	-	
Mol Frac Water	0.42	0.42	-	
Mol Frac Toluene	0.21	0.21	-	
Mol Frac Methanol	0.05	0.05		
MW Mixture	51.47	51.47	g/mol	
VP THF	19.93	19.93	kPa	NIST
VP Water	2.83	2.83	kPa	NIST
VP Toluene	3.46	3.46	kPa	NIST
VP Methanol	15.37	15.37		
VP Mixture	9.06	9.06	kPa	
R	8.314	8.314	J / K * mol	Constant
n	2.2295	2.2295	mol	Calculated
n for THF	1.5649	1.5649		Calculated
n for water	0.2934	0.2934		Calculated
n for Toluene	0.1774	0.1774		Calculated
n for Methanol	0.1938	0.1938		Calculated
MW	51.47	51.47	g/mol	-
Conversion	0.0022	0.0022	lb/g	-
Total Mass Emitted	0.25	0.25	lb	-
THF Emitted	0.18	0.18	lb	-
Water Emitted	0.03	0.03	lb	-
Toluene Emitted	0.02	0.02	lb	-
Methanol Emitted	0.02	0.02	lb	-
Estimated Time	1		hr	-
Total Hourly Emissions	0.51		lb/hr	-
THF Hourly Emissions	0.36		lb/hr	-
Water Hourly Emissions	0.07		lb/hr	-
Toluene Hourly Emissions	0.04		lb/hr	-
Methanol Hourly Emissions	0.04		lb/hr	-
Number of Changes	15		changes/yr	-
Total VOC Emissions	7.59		lb/yr	-
THF Yearly Emissions	5.33		lb/yr	-
Water yearly Emissions	1.00		lb/yr	-
Toluene Yearly Emissions	0.60		lb/yr	-
Methanol Yearly Emissions	0.66		lb/yr	-
VOC	0.004		tpy	-
THF	0.003		tpy	-
Water	0.0005		tpy	-
Toluene	0.0003		tpy	-
Methanol	0.0003		tpy	-

ATTACHMENT O

**MONITORING/RECORDKEEPING/REPORTING/TESTING
PLANS**

ATTACHMENT O

MONITORING/RECORDKEEPING/ REPORTING/TESTING PLANS

Optima Belle, LLC plans to follow the monitoring, recordkeeping, reporting, and testing required by the issued permit.

ATTACHMENT P
PUBLIC NOTICE

ATTACHMENT P

Public Notice

AIR QUALITY PERMIT NOTICE

Notice of Application

Notice is given that Optima Chemical Group, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Regulation 13 Permit Class II Administrative Update to operate the facility on W. DuPont Avenue near Belle, Kanawha County, West Virginia. The latitude and longitude coordinates are: 38.239659 and -81.551886.

The applicant estimates the potential to discharge the following Regulated Air Pollutants from the facility will be: VOC of 0.08 tons per year (tpy), PM of 0.03 tpy, PM10 of 0.03 tpy, PM2.5 of 0.03 tpy, Benzene of 0.01 tpy, Chlorobenzene of 0.01 tpy, Hexane of 0.02 tpy, Methanol of 0.01 tpy, Toluene of 0.01 tpy, and total HAPs of 0.08 tpy.

Startup of operation is planned to begin on or about the 1st day of May, 2016. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, Extension 1250, during normal business hours.

Dated this the **(PLEASE INSERT DAY)** day of April, 2016.

By: Optima Belle, LLC
K. Gene Williams
President
901 W. DuPont Avenue
Belle, West Virginia 25015

ATTACHMENT Q
BUSINESS CONFIDENTIAL CLAIMS

Precautionary Notice Claims of Confidentiality

The person submitting this information may assert that some or all of the information submitted is entitled to confidential treatment as provided by West Virginia Legislative Rule 45CSR31, entitled Confidential Information. Information covered by such a claim will be disclosed by the Division of Air Quality (DAQ) only to the extent, and by means of the procedures, set forth in 45CSR31. Please contact the West Virginia Secretary of State's Office at 304/558-6000 to obtain a copy of 45CSR31 in order to ensure that all required procedures are followed.

Information concerning the types and amounts of air pollutants discharged as that term is defined in WVCSR §45-31-2.4, shall not be claimed as confidential.

Any claim of confidentiality shall be made in accordance with the requirements of 45CSR31 and must accompany the information at the time it is submitted to the DAQ. **If no claim of confidentiality is made at the time of submission or is not made in accordance with the requirements of 45CSR31, the DAQ may make the information available to the public without further notice.**

Included below are procedures to be followed in submitting information claimed as confidential. This information is intended to assist a person with claiming confidential information and is not meant to relieve a person of his/her obligation to review the provisions of 45CSR31 and to comply with such rule. The procedures are as follows:

1. Indicate clearly the items of information claimed confidential by marking each page with the term Claimed Confidential, with the date of such claim of confidentiality. With the exception of documents of a size greater than 8½" x 14", information claimed confidential must be submitted on colored paper.
2. Include a cover document which justifies the claim of confidentiality in accordance with the specific criteria under WVCSR §45-31-4.1. A sample cover document is attached for your information and use. The cover document will be available for public disclosure and must include the following information:
 - (a) The identity of the person making the submission of information claimed confidential;
 - (b) The reason for the submission of information;
 - (c) The name, an address in the State of West Virginia and telephone number of the designee who shall be contacted in accordance with 45CSR31;
 - (d) Identification of each segment of information within each page that is submitted as confidential and the justification for each segment claimed confidential, including the criteria under WVCSR 45-31-4.1;

- (e) The period of time for which confidential treatment is desired (e.g., until a certain date, until the occurrence of a specified event or permanently); and,
 - (f) Signature of a responsible official or an authorized representative of such person.
3. At the same time as the information claimed confidential is submitted to the DAQ on colored paper, a complete set of the information, including the cover document previously required under paragraph 2, must be submitted on white paper with the information claimed to be confidential blacked or whited out and the words Redacted Copy Claim of Confidentiality marked clearly on each such page, so that the information is suitable for public disclosure. In the case of drawings and blueprints, mark each page with the words Redacted Copy Claim of Confidentiality, include the title or legend of the drawing, and black or white out the information claimed confidential. The redacted page may be 8½" x 11" in size.
4. In the case of a permit application or supplemental information to an application, DAQ requires an applicant to submit three (3) copies of the application. Of those three (3) copies, one (1) must be a complete set of the application containing the information claimed confidential on colored paper and two (2) must be redacted copies. The DAQ reserves the right, however, to request additional copies of the information containing the confidential material.

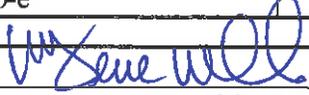
Attachment

Attachment Q Business Confidential Claim

Company Name	Optima Belle, LLC	Responsible Official		
Company Address	900 W. DuPont Avenue	Confidential Information Designee in State of WV	Name	K. Gene Williams
	Belle, WV 25015		Title	President
			Address	200 Willacoochee Highway Douglas, GA 31535
Person/Title Submitting Confidential Information	K. Gene Williams President		Phone	(912) 384-5101
		Fax	(912) 384-6330	

Reason for Submittal Of Confidential Information : R13 Class II Administrative Update

Identification of Confidential Information	Rationale for Confidential Claim 45CSR31-4.1a-e	Confidential Treatment Time Period
<ul style="list-style-type: none"> -Equipment design and capacity information -Process descriptions -Process flow diagrams -Site Map 	<p>a. Information initially claimed confidential by E.I. Dupont De Nemours and Company, Inc. and The Chemours Company FC, LLC. Information continues to be confidential under Optima Belle, LLC. The claim has not expired by its term, or been waived or withdrawn. The confidential information should continue to be maintained as such for an indefinite time period.</p> <p style="text-align: right;">See attached for b-e</p>	<p>Permanent</p>

Responsible Official Signature:	
Responsible Official Title:	President
Date Signed:	03/24/16

NOTE: Must be signed and dated in **BLUE INK.**

Rationale for Confidentiality Claim (Cont.)

b. Information claimed confidential is not available to the general public. Within the company, Optima Belle, LLC (Optima) distributes technical information on a need-to-know basis and has used its business confidentiality policy to prevent inadvertent dissemination of information. This policy includes:

- * Marking of business confidential documents,
- * Limited distribution of documents,
- * Shredding of confidential documents before disposal.

Employees are aware of the competitive nature of their business and are trained in guarding confidential information.

c. Information revealing the process technology in this submittal is not reasonably obtainable by persons other than Optima employees who need to know. To maintain the confidentiality of such information, Optima employees involved with confidential information sign a confidentiality agreement.

d. There is no statute that has been reviewed that requires disclosure of information claimed to be confidential.

e. Optima claims business confidentiality protection for the information submitted since disclosure would allow competent engineers within a competitor's company to determine the manner or process by which Optima produces this product and would provide competitors information without paying for technology or conducting research and development necessary to obtain the technology.

ATTACHMENT S

TITLE V PERMIT REVISION INFORMATION

Attachment S

Title V Permit Revision Information

1. New Applicable Requirements Summary	
Mark all applicable requirements associated with the changes involved with this permit revision:	
<input type="checkbox"/> SIP	<input type="checkbox"/> FIP
<input checked="" type="checkbox"/> Minor source NSR (45CSR13)	<input type="checkbox"/> PSD (45CSR14)
<input type="checkbox"/> NESHAP (45CSR15)	<input type="checkbox"/> Nonattainment NSR (45CSR19)
<input type="checkbox"/> Section 111 NSPS (Subpart(s) _____)	<input type="checkbox"/> Section 112(d) MACT standards (Subpart(s) _____)
<input type="checkbox"/> Section 112(g) Case-by-case MACT	<input type="checkbox"/> 112(r) RMP
<input type="checkbox"/> Section 112(i) Early reduction of HAP	<input type="checkbox"/> Consumer/commercial prod. reqts., section 183(e)
<input type="checkbox"/> Section 129 Standards/Reqts.	<input type="checkbox"/> Stratospheric ozone (Title VI)
<input type="checkbox"/> Tank vessel reqt., section 183(f)	<input type="checkbox"/> Emissions cap 45CSR§30-2.6.1
<input type="checkbox"/> NAAQS, increments or visibility (temp. sources)	<input type="checkbox"/> 45CSR27 State enforceable only rule
<input type="checkbox"/> 45CSR4 State enforceable only rule	<input type="checkbox"/> Acid Rain (Title IV, 45CSR33)
<input type="checkbox"/> Emissions Trading and Banking (45CSR28)	<input type="checkbox"/> Compliance Assurance Monitoring (40CFR64) ⁽¹⁾
<input type="checkbox"/> NO _x Budget Trading Program Non-EGUs (45CSR1)	<input type="checkbox"/> NO _x Budget Trading Program EGUs (45CSR26)
<p>⁽¹⁾ If this box is checked, please include Compliance Assurance Monitoring (CAM) Form(s) for each Pollutants Specific Emission Unit (PSEU) (See Attachment H to Title V Application). If this box is not checked, please explain why Compliance Assurance Monitoring is not applicable:</p>	
2. Non Applicability Determinations	
<p>List all requirements, which the source has determined not applicable to this permit revision and for which a permit shield is requested. The listing shall also include the rule citation and a rationale for the determination.</p>	

Permit Shield Requested (not applicable to Minor Modifications)

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

3. Suggested Title V Draft Permit Language

Are there any changes involved with this Title V Permit revision outside of the scope of the NSR Permit revision? Yes No If Yes, describe the changes below.

Also, please provide **Suggested Title V Draft Permit language** for the proposed Title V Permit revision (including all applicable requirements associated with the permit revision and any associated monitoring /recordkeeping/ reporting requirements), OR attach a marked up pages of current Title V Permit. Please include appropriate citations (Permit or Consent Order number, condition number and/or rule citation (e.g. 45CSR§7-4.1)) for those requirements being added / revised.

4. Active NSR Permits/Permit Determinations/Consent Orders Associated With This Permit Revision

Permit or Consent Order Number	Date of Issuance	Permit/Consent Order Condition Number
R13-0882I	03/04/2016	CO-R21-97-31
	/ /	

5. Inactive NSR Permits/Obsolete Permit or Consent Orders Conditions Associated With This Revision

Permit or Consent Order Number	Date of Issuance	Permit/Consent Order Condition Number
R13-0882 (previous versions)	Various	None
	/ /	

6. Change in Potential Emissions

Pollutant	Change in Potential Emissions (+ or -), TPY
VOC	0.08
PM/PM10/PM2.5	0.03/0.03/0.03
Benzene	0.01
Chlorobenzene	0.01
Hexane	0.02
Methanol	0.02
Toluene	0.02

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

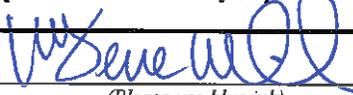
7. Certification For Use Of Minor Modification Procedures (Required Only for Minor Modification Requests)

Note: This certification must be signed by a responsible official. Applications without a signed certification will be returned as incomplete. The criteria for allowing the use of Minor Modification Procedures are as follows:

- i. Proposed changes do not violate any applicable requirement;
- ii. Proposed changes do not involve significant changes to existing monitoring, reporting, or recordkeeping requirements in the permit;
- iii. Proposed changes do not require or change a case-by-case determination of an emission limitation or other standard, or a source-specific determination for temporary sources of ambient air quality impacts, or a visibility increment analysis;
- iv. Proposed changes do not seek to establish or change a permit term or condition for which there is no underlying applicable requirement and which permit or condition has been used to avoid an applicable requirement to which the source would otherwise be subject (synthetic minor). Such terms and conditions include, but are not limited to a federally enforceable emissions cap used to avoid classification as a modification under any provision of Title I or any alternative emissions limit approved pursuant to regulations promulgated under § 112(j)(5) of the Clean Air Act;
- v. Proposed changes do not involve preconstruction review under Title I of the Clean Air Act or 45CSR14 and 45CSR19;
- vi. Proposed changes are not required under any rule of the Director to be processed as a significant modification;

Notwithstanding subparagraph 45CSR§30-6.5.a.1.A. (items i through vi above), minor permit modification procedures may be used for permit modifications involving the use of economic incentives, marketable permits, emissions trading, and other similar approaches, to the extent that such minor permit modification procedures are explicitly provided for in rules of the Director which are approved by the U.S. EPA as a part of the State Implementation Plan under the Clean Air Act, or which may be otherwise provided for in the Title V operating permit issued under 45CSR30.

Pursuant to 45CSR§30-6.5.a.2.C., the proposed modification contained herein meets the criteria for use of Minor permit modification procedures as set forth in Section 45CSR§30-6.5.a.1.A. The use of Minor permit modification procedures are hereby requested for processing of this application.

(Signed):		Date:	03 / 24 / 16
	(Please use blue ink)		(Please use blue ink)
Named (typed):	K. Gene Williams	Title:	President

Note: Please check if the following included (if applicable):

- | | |
|--------------------------|---|
| <input type="checkbox"/> | Compliance Assurance Monitoring Form(s) |
| <input type="checkbox"/> | Suggested Title V Draft Permit Language |

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.