



205-1
08/02/05

Others talk about recycling - we just do it!

Waste Licensing Section
Environmental Protection Agency,
Johnstown Castle Estate,
Wexford.

July 4th, 2005.

Your Ref: 205-1
Our Ref: MOC/epa/Crag/03

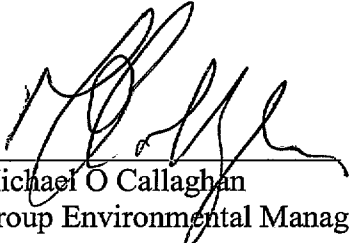
Re: Article 14 Notice / Waste licence application 205-1..

Dear Sir/Madam,

Please find enclosed an original and three copies of information requested under Article 14 notice concerning the above referenced waste licence application as received on June 13th 2005. This submission is accompanied by sixteen copies of the requested information in electronic searchable PDF format on CD-ROM.

I trust that the above is to the satisfaction of the Agency.

Yours sincerely


Michael O Callaghan
Group Environmental Manager

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Nationwide Collection Service:

Dublin Knockmitten Lane, sales 00 353 01 450 8865 | Limerick: Galvone Ind Est., tel 00 353 61 403333
Western Ind Est, service 00 353 01 450 9977 | Limerick City, fax 00 353 61 430999
Dublin 12 Ireland fax 00 353 01 419 6882 | Ireland



email sales@greyhoundwaste.com www.greyhoundwaste.com

Registered in Ireland 131376

**Response to Article 14(2)(b)(ii) notice.
Application Ref No.: 205.**

Question 1 - Subsection (a), (b), and (c).

Quantity and EWC codes of wastes arising from the proposed conversion of waste vegetable oil to bio-diesel.

Waste	EWC Code	Quantity	Disposal/Recovery
Solid non-organic contaminants in collected UCO	19 12 12	20 m ³ / annum	Landfill
Organic contaminants & Filter Cake	19 12 12	32 m ³ / annum	Composting Facility
Water separated from UCO	16 10 02	48 m ³ / annum	Sewer
Wash water from vessel and plant washing	16 10 02	1000m ³ /annum	Sewer
Wash Water containing soap, KOH and potassium sulphate salt	16 08 06	76 m ³ / annum	Solution is to be applied to agricultural land as fertiliser.

Note: Quantity of waste based on acceptance of 480 cubic meters of UCO per annum.

Response to Article 14(2)(b)(ii) notice.

Application Ref No.: 205.

Question 1 - Subsection (d).

2. Complete Table 1.10 of the application form for each raw material, substance or preparation to be utilised in the activity to include, as a minimum, "Aironaut" and the detergent to be used in the truck wash.

Note: Additional data for Table 1.10 specific to the proposed conversion of waste vegetable oil to biodiesel.

Material	Usage	MSDS
Sodium Hydroxide	Catalyst for BioDiesel Plant	Attached – 3 pages
Potassium Hydroxide	Catalyst for BioDiesel Plant	Attached – 3 pages
Sulphuric Acid	Reagent and Catalyst for BioDiesel Plant	Attached – 8 pages
Methanol	Reagent for BioDiesel Plant	Attached – 4 pages
Hydrochloric Acid	Neutralising agent for BioDiesel products, Glycerine and wash water	Attached – 9 pages

Copies of MSDS sheets attached.

Response to Article 14(2)(b)(ii) notice.

Application Ref No.: 205.

Question 2

Section L3 Financial provision, with reference to determination in relation to the matter specified in paragraph (d) of Section 40(4) of the Waste Management Acts, 1996 to 2003.

(a) Confirmation of the firm financial standing of Greyhound Recycling and Recovery is given by:

- (1) Enclosed GRR Company Accounts 2003-04 as reported to the Companies Registration Office.
- (2) Bank Reference (AIB Naas Road).

(b) Greyhound Recycling and Recovery has never been convicted of an offence under the Waste Management Act, 1996 to 2003.

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Response to Article 14(2)(b)(ii) notice.

Application Ref No.: 205.

Question 3

Information in relation to the requirements of Article 12 (1)(n) of the Waste Management (Licensing) Regulations, having regard to the conversions of waste vegetable oil to bio-diesel.

Ref: Prevention and recovery of Wastes

1. Suppliers of Used Cooking Oil (UCO) will be advised to keep UCO free from contaminants such as water, solid foods, plastic packaging and other general wastes. They will be offered financial incentives for conforming to purity standards laid down under contract with ourselves.
2. UCO received by our facility will undergo immediate purification and pasteurisation to limit the formation of Free Fatty Acids. Free Fatty Acids reduce the percentage yield in the BioDiesel process and hence increase the volume of waste products.
3. UCO will be filtered using wood dust as a filtering agent. The resulting filter cake will constitute of wood dust and solid food waste particles. The Filter cake which will constitute almost entirely of organic material will be directed to a suitable composting facility.
4. The Glycerol By-product will contain a large portion of unused methanol. Typically twice as much methanol as is required is added to the initial reaction to ensure a high BioDiesel yield. The unused fraction remains in the glycerol where it can be removed by distillation under vacuum. The methanol will then be recycled back into process.
5. The catalyst and soaps are separated from the BioDiesel by a three stage washing process. The water in these wash stages will be rotated in a counter current flow to the BioDiesel. Therefore reducing the quantity of water required to wash the BioDiesel by as much as 50%.
6. Unchanged catalyst in the wash water will be removed by settling the water in large settling tanks. A large portion of the catalyst settles to the top where it will be collected, purified, dried and re-used.
7. Remaining water which will contain potassium sulphate salt will be applied to agricultural land as a fertiliser.

**Response to Article 14(2)(b)(ii) notice.
Application Ref No.: 205.
Question 4**

Section G - Remediation, decommissioning, restoration, and aftercare.

**DECOMMISSIONING AND AFTERCARE PLAN FOR GREYHOUND
RECYCLING & RECOVERY LIMITED, KNOCKMITTEN LANE FACILITY.**

The proposed activities on site will involve the processing of collected waste materials and the transfer of this material to appropriately licensed recovery, recycling or disposal facilities. Other activities on site will include business activities such as administration, sales and marketing, and fleet management. The site infrastructure and facilities consist of a 50,000 sq ft warehouse with surrounding concrete yard containing a dual weighbridge and office units. The fuel storage facilities will be outside the processing building and contained in a integral bund. All waste processing will be carried out inside the warehouse building.

1. DECOMMISSIONING

In the event of the planned or enforced cessation of the licensed activities on the site it is proposed that the following be undertaken:

Foundations & Buildings: The site infrastructure will be kept intact and that the industrial status will be maintained. The pre-fabricated buildings that are utilised as the traffic office and administration office are easily demountable and amenable to sale and movement off-site if required. The main warehouse is a large galvanised structure and intact represents a valuable industrial unit. The site and building will be sold or otherwise employed as appropriate.

Equipment: The waste processing equipment will be valued and sold, relocated or scrapped, depending on the most efficient and cost effective method.

Waste: All waste will be transferred for recovery/disposal to other Greyhound Recycling & Recovery owned and operated premises or to other licensed facilities to be agreed with the Agency. Greyhound Recycling and Recovery operate three permitted/licensed facilities that are approved for the acceptance and handling of some or all of those waste types currently handled at the licensed facility. Residual segregated recyclables have a intrinsic value and will be sold for maximum return.

Water: The truck wash chamber, interceptors and any excess water in the spill deck and fuel storage bunds will be emptied by licensed subcontractors

and disposed of to licensed/permitted sites with the agreement of the Agency.

Fuel & Chemicals: The fuel tanks will be emptied at time of decommissioning of the site. Unused chemicals will be returned to the suppliers. In the event of a planned closure fuel stocks would run down in advance of closure. In the event of enforced closure fuel stocks would be transferred to other GRR facilities or returned to suppliers.

2. AFTERCARE

Once waste management activities have ceased and the site has been vacated an aftercare service will be provided by Greyhound Recycling & Recovery Limited to ensure the decommissioning measures are completed and that the facility does not represent a nuisance to the environment and surrounds.

As part of the aftercare programme it is proposed that a *Report of Completion* concerning the decommissioning of the site will be submitted to the EPA within six months of cessation of site activities. This will include:

- (i) Signed statement of completion of the works proposed indicating the exact completion date of each measure.
- (ii) Details on the type, quantity and final destination of all materials moved off-site.
- (iii) Indicate arrangements made for future use of the site and assets.

Maintenance

The site will be monitored at regular intervals over a period after the decommissioning of the site to ensure no spillages or contamination has occurred. In the event of spillages the site monitoring personnel must rectify any damages. The grounds and landscape features will be maintained on a regular basis.

Pest Control

It is proposed that visits from Greyhound Recycling & Recovery's Pest Control Contractors will be continued for a period of six months after cessation of waste acceptance so as to ensure that residual pest infestation is controlled after closure of the Greyhound Recycling & Recovery site.

License Requirements

The decommissioning and aftercare arrangements agreed with the Agency will be discontinued in the event that the EPA decides the Company's license must be surrendered prematurely.

Notification

Where practicable all customers, licensing authorities (including EPA), local residents, local authorities and service contractors will be given advanced notification of the plans for the closure of the Greyhound Recycling & Recovery site in Knockmitten Lane. In the event of a sudden enforced or unplanned closure of the facility retrospective notification would be given to all of the above as soon as is practicable.

Cost of Decommissioning

It is the assessment of the Company that the cost of decommissioning will be incurred primarily in the removal off-site of residual waste materials.

The known financial liabilities associated with the decommissioning and aftercare are short term (execution in less than 1 year). Owing to the nature of the current activity and history of the site and infrastructure, the extent of unknown liabilities that may occur during the future operating life of the facility, is expected to be negligible.

It is proposed that the cost of decommissioning and aftercare will be met through the selective sale of site assets (processing plant and equipment, transportation plant and site buildings and land). It is the assessment of the company that the significant asset base of the company will ensure sufficient financial resource is available to cover both known and unknown liabilities that may be associated with the decommissioning.

The Public / Products liability element of the Greyhound Recycling and Recovery insurance policy covers stock of processed material which may require disposal following an enforced cessation (e.g. fire, regulatory, financial factors). In addition, Greyhound Recycling and Recovery hold fire insurance that provides cover for buildings, plant and stock of recyclable materials in the event of fire-enforced closure.

Cost of Restoration

As it is the intention of the Company to retain the existing infrastructure intact, and as the licensed activity has not altered or impacted on the natural or built environment, it is the assessment of the company that there will be no restoration costs associated with decommissioning the facility.

Cost of Aftercare

In the event of decommissioning of the facility, as proposed, all environment emissions and impacts associated with the licensed activity will be eliminated. The aftercare, as proposed, is aimed maintaining the commercial suitability and appearance of the site and infrastructure. The cost of aftercare is not expected to be significant.

If necessary the cost of decommissioning and aftercare of the licensed facility will be funded from the sale of site assets including processing equipment and fleet and longer term by the rental or sale of the site.

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Response to Article 13

Application Ref No.: 205.

Greyhound BioDiesel Plant - Design & Process.

Overview:

The proposed a BioDiesel processing plant will accept 480 m³ / annum of UCO from existing and potential customers and Sustainable Resource Recovery Facility in Clondalkin, Co. Dublin.

All process additives and reagents will be purchased from approved vendors based on specifications advised to us by our technical experts. All storage and process vessels and equipment will be constructed from stainless steel or other suitable material. All storage tanks will be properly banded in accordance with BS 8007.

The Methanol Storage vessel will be suitably rated. The methanol storage vessel will be suitably positioned to allow gravity feed to the methoxide tank. This is to minimise energy requirement and to simplify its conveyance. Methanol will be delivered into the storage tank by the delivery vehicle pump.

The plant will be designed and constructed to maximise energy efficiency. All vessels will be lagged and the entire process flow will be driven by an initial pump which will achieve sufficient head to allow the entire process flow to occur by gravity. The entire BioDiesel facility will be contained in an enclosure suitable for a Mineral Oil Tax Warehouse, which is acceptable to the Revenue Commissioner.

The following plant description and included diagram represents what Greyhound wish to construct. However as we continue with our technical examination of current technology the actual process and/or plant may vary.

1. UCO Reception

UCO will be accepted at the facility in numbered 120L barrels and bulk collection vehicles (as required for a waste collection permit). Each delivery will be assessed against strict acceptance guidelines relating to the purity of the UCO and the extent of contaminants.

The UCO will pass through a 5mm grate into the reception tank. The 5mm grate will filter out most large food particles and other solid contaminants. These solids will be collected and sent to our composting facility in Carrollstown Estate, Trim, Co. Meath (Waste Permits WP2002/20 & WP2003/39).

The UCO will pass through the 5mm grate and into the UCO Reception Vessel. The Reception Vessel will be heated by water jacket to raise the temperature of the UCO to 50°C. This is to allow easier pumping of the UCO.

The UCO will then be pumped through a cartridge filter of <0.1mm aperture using wood dust as a filter aid to remove all remaining solid contaminants. The UCO exiting the filter will be transferred to one of two Water Separation Vessels.

2. Water Separation

The water separation vessels will be hopper bottomed, agitated and heated by water jacket to raise the temperature of the UCO to 80°C. Once the UCO reaches this temperature agitation will cease and the UCO will be allowed to settle for between 8 and 12 hours. During this time any water present will have settled to the bottom of the hoppered vessel.

The water will then be drained off to the water treatment stage.

The Purified UCO will be transferred by gravity feed to the UCO storage vessels.

3. Water Treatment and Disposal

The removed water will pass through an oil interception chamber. The water will be tested and disposed of to sewer under licence to the relevant Local Authority. Oil from the interception chamber will be drawn off as required to the UCO reception vessel.

4. UCO Storage

The purified UCO will be stored in insulated bunded tanks. These tanks will be monitored in regards to temperature and Free Fatty Acid Level. The tanks will be fitted with heating coils to aid removal of UCO.

5. BioDiesel Production

We propose using batch reaction vessels for converting UCO to BioDiesel (transesterification). These vessels will be stainless steel, hopper bottomed and heated by water jacket. We are currently investigating the most appropriate method for transesterification in conjunction with the QUESTOR centre in Queens University Belfast. Trial work on the two most common methods began in their laboratories on 16th of May 2005. This trial work will be carried out using UCO collected by Greyhound.

The production of BioDiesel in the proposed Greyhound facility will be carried out as follows:

- a) The Reaction Vessel will be 9/10 filled with UCO and heated to 50°C while being agitated. The UCO will flow by gravity feed to the reaction vessel.
- b) A sample of UCO will be drawn from this for analysis. The sample will be tested for free fatty acids, moisture, iodine value, saponification value and salt content.
- c) Methanol will be mixed with the catalyst sodium hydroxide (NaOH) or potassium hydroxide (KOH) in the methoxide mixer to form methoxide.
- d) The methoxide will be added to the Reaction Vessel where the temperature will be maintained at 45-50°C, and the mix will be agitated for 1.5 hours.
- e) The mixture will then be allowed to gravity separate for a minimum of 8 hours. Glycerine will gather at the bottom of the tank during this time.
- f) The Glycerine will be removed from the base of the tank where it will enter a Vacuum Vessel. The remaining liquid in the tank (BioDiesel) will be allowed flow into the BioDiesel Wash Vessel.

6. Methanol Recovery

The Glycerine in the vacuum vessel will be subjected to a vacuum of 25" Hg. At this vacuum all unused methanol will vapourise. The methanol vapours will be passed through a condenser to reform into liquid methanol. The recondensed methanol will then be pumped back into the methoxide tank to use in the next batch. The glycerol co-product will be pH neutralised before being transferred to the glycerol storage vessel.

7. BioDiesel Washing

The BioDiesel will be subjected to 'washing' in the BioDiesel Wash Vessel. This is to remove the catalyst NaOH / KOH and other impurities. This is normally carried out by either mixing the BioDiesel with a quantity of water, or by 'bubble washing' where bubbles of air are passed through a layer of water before passing through the BioDiesel. BioDiesel is then transferred to BioDiesel storage vessels where it will await shipment to suitable outlets.

Product Number: 06213
Product Name: Sodium hydroxide

Description / Pricing

Valid 08/2000 - 10/2000

Cert. of Analysis

RdH Laborchemikalien GmbH & Co. KG

MSDS

P.O.Box 10 02 62, D-30918 Seelze, Germany

Tel: +49-(0)5137-999 0 Fax +49-(0)5137-999 120

Print Preview

Bulk Quote

Ask A Scientist

M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1. - - - - - CHEMICAL IDENTIFICATION - - - - -

CATALOG #: 06213
NAME: SODIUM HYDROXIDE, WHITE, PELLETS, PURIFIED
MIN. 98%

SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - -

CAS #: 1310-73-2
MF: HNAO
EC NO: 215-185-5

SYNONYMS

CAUSTIC SODA * HYDROXYDE DE SODIUM (FRENCH) * LEWIS-RED DEVIL LYE *
NATRIUMHYDROXID (GERMAN) * NATRIUMHYDROXYDE (DUTCH) * SODA LYE *
SODIO (IDROSSIDO DI) (ITALIAN) * SODIUM HYDRATE * SODIUM HYDROXIDE
(ACGIH:OSHA) * SODIUM (HYDROXYDE DE) (FRENCH) * WHITE CAUSTIC *

SECTION 3. - - - - - HAZARDS IDENTIFICATION - - - - -

LABEL PRECAUTIONARY STATEMENTS

CORROSIVE
CAUSES BURNS.
EXOTHERMIC IN CONTACT WITH WATER.
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF
WATER AND SEEK MEDICAL ADVICE.
TAKE OFF IMMEDIATELY ALL CONTAMINATED CLOTHING.
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE
PROTECTION.
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE
IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

SECTION 4. - - - - - FIRST-AID MEASURES - - - - -

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN IMMEDIATELY.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF SKIN CONTACT, FLUSH WITH COPIOUS AMOUNTS OF WATER
FOR AT LEAST 15 MINUTES. REMOVE CONTAMINATED CLOTHING AND
SHOES. CALL A PHYSICIAN.
IN CASE OF CONTACT WITH EYES, FLUSH WITH COPIOUS AMOUNTS OF WATER
FOR AT LEAST 15 MINUTES. ASSURE ADEQUATE FLUSHING BY SEPARATING
THE EYELIDS WITH FINGERS. CALL A PHYSICIAN.

SECTION 5. - - - - - FIRE FIGHTING MEASURES - - - - -

EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE TO SURROUNDING FIRE CONDITIONS.
DO NOT USE WATER.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO
PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.
CONTACT WITH ALUMINUM, TIN AND ZINC LIBERATES HYDROGEN GAS. CONTACT
WITH NITROMETHANE AND OTHER SIMILAR NITRO COMPOUNDS CAUSES FORMATION
OF SHOCK-SENSITIVE SALTS.

SECTION 6. - - - - - ACCIDENTAL RELEASE MEASURES - - - - -

WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY
RUBBER GLOVES.
EVACUATE AREA.
SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

SECTION 7. - - - - - HANDLING AND STORAGE - - - - -

REFER TO SECTION 8.

SECTION 8. - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION - - - - -

SAFETY SHOWER AND EYE BATH.
USE ONLY IN A CHEMICAL FUME HOOD.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
DISCARD CONTAMINATED SHOES.
WASH THOROUGHLY AFTER HANDLING.
DO NOT BREATHE DUST.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

AVOID PROLONGED OR REPEATED EXPOSURE.
NIOSH/MSHA-APPROVED RESPIRATOR.
COMPATIBLE CHEMICAL-RESISTANT GLOVES.
CHEMICAL SAFETY GOGGLES.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.
DO NOT ALLOW CONTACT WITH WATER.

SECTION 9. - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - -

APPEARANCE AND ODOR
SOLID.

PHYSICAL PROPERTIES

MELTING POINT: 318 C
VAPOR PRESSURE: 3 MMHG
SPECIFIC GRAVITY: 2,13
VAPOR DENSITY: > 1 G/L

SECTION 10. - - - - - -STABILITY AND REACTIVITY - - - - -

STABILITY
STABLE.

CONDITIONS TO AVOID

ABSORBS CO2 FROM AIR.
HEAT OF SOLUTION IS VERY HIGH, AND WITH LIMITED AMOUNTS OF WATER,
VIOLENT BOILING MAY OCCUR.
NEVER ADD WATER TO THIS MATERIAL, ALWAYS ADD THIS MATERIAL TO WATER.

INCOMPATIBILITIES

DO NOT ALLOW WATER TO ENTER CONTAINER BECAUSE OF VIOLENT REACTION.
STRONG OXIDIZING AGENTS
STRONG ACIDS
ORGANIC MATERIALS

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS

SODIUM/SODIUM OXIDES

HAZARDOUS POLYMERIZATION

WILL NOT OCCUR.

SECTION 11. - - - - - TOXICOLOGICAL INFORMATION - - - - -

ACUTE EFFECTS

CAUSES BURNS.
MAY BE HARMFUL IF ABSORBED THROUGH THE SKIN.
MAY BE HARMFUL IF INHALED.
MATERIAL IS EXTREMELY DESTRUCTIVE TO THE TISSUE OF THE MUCOUS MEMBRANES
AND UPPER RESPIRATORY TRACT.
MAY BE HARMFUL IF SWALLOWED.
MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES
AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
INHALATION MAY RESULT IN SPASM, INFLAMMATION AND EDEMA OF THE
LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING,
WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND
VOMITING.

TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND
TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

RTECS #: WB4900000

SODIUM HYDROXIDE

IRRITATION DATA

EYE-MK 1 1/2/24H SEV	TXAPA9 6,701,1964
SKN-RBT 500 MG/24H SEV	28ZPAK -,7,1972
EYE-RBT 400 UG MLD	OYYAA2 26,627,1983
EYE-RBT 1 1/2 SEV	AJOPAA 29,1363,1946
EYE-RBT 50 UG/24H SEV	28ZPAK -,7,1972
EYE-RBT 1 MG/24H SEV	TXAPA9 6,701,1964
EYE-RBT 1 MG/30S RINSE SEV	TXCYAC 23,281,1982

TOXICITY DATA

IPR-MUS LD50:40 MG/KG COREAF 257,791,1963

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES
(RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR
COMPLETE INFORMATION.

SECTION 12. - - - - - ECOLOGICAL INFORMATION - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - DISPOSAL CONSIDERATIONS - - - - -

CONTACT A LICENSED PROFESSIONAL WASTE DISPOSAL SERVICE TO DISPOSE OF
THIS MATERIAL.

OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - TRANSPORT INFORMATION - - - - -

CONTACT SIGMA CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - REGULATORY INFORMATION - - - - -

EUROPEAN INFORMATION

EC INDEX NO: 011-002-01-3

CORROSIVE

R 35

CAUSES SEVERE BURNS.

S 26

IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

S 37/39

WEAR SUITABLE GLOVES AND EYE/FACE PROTECTION.

S 45

IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

REVIEWS, STANDARDS, AND REGULATIONS

OEL=MAK

ACGIH TLV-CL 2 MG/M3

DTLVS* TLV/BEI,1999

EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
FEREAC 54,7740,1989

MSHA STANDARD: AIR-CL 2 MG/M3

DTLVS* 3,233,1971

OSHA PEL (GEN INDU): 8H TWA 2 MG/M3

CFRGR 29,1910.1000,1994

OSHA PEL (CONSTRUC): 8H TWA 2 MG/M3

CFRGR 29,1926.55,1994

OSHA PEL (SHIPYARD): 8H TWA 2 MG/M3

CFRGR 29,1915.1000,1993

OSHA PEL (FED CONT): 8H TWA 2 MG/M3

CFRGR 41,50-204.50,1994

OEL-AUSTRALIA: TWA 2 MG/M3 JAN 1993

OEL-AUSTRIA: MAK 2 MG/M3, JAN1999

OEL-BELGIUM: STEL 2 MG/M3 JAN 1993

OEL-DENMARK: TWA 2 MG/M3, JAN1999

OEL-FINLAND: TWA 2 MG/M3 JAN 1993

OEL-GERMANY: TWA 2 MG/M3 JAN 1993

OEL-JAPAN: OEL-C 2 MG/M3, JAN1999

OEL-JAPAN: STEL 2 MG/M3 JAN 1993

OEL-THE NETHERLANDS: TWA 2 MG/M3 JAN 1993

OEL-THE PHILIPPINES: TWA 2 MG/M3 JAN 1993

OEL-POLAND: MAC (TWA) 0.5 MG/M3, MAC (STEL) 1 MG/M3, JAN1999

OEL-SWEDEN: TWA 2 MG/M3 JAN 1993

OEL-SWITZERLAND: TWA 2 MG/M3; STEL 4 MG/M3 JAN 1993

OEL-THAILAND: TWA 2 MG/M3 JAN 1993

OEL-TURKEY: TWA 2 MG/M3 JAN 1993

OEL-UNITED KINGDOM: TWA 2 MG/M3; STEL 2 MG/M3 JAN 1993

OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA CHECK ACGIH TLV

OEL IN NEW ZEALAND, SINGAPORE, VIETNAM CHECK ACGIH TLV

NIOSH REL TO SODIUM HYDROXIDE: AIR: CL 2 MG/M3/15M

NIOSH* DHHS #92-100,1992

NOHS 1974: HZD 69070; NIS 359; TNF 112525; NOS 192; TNE 1122583

NOES 1983: HZD X3782; NIS 167; TNF 21989; NOS 120; TNE 370582; TFE

137156

NOES 1983: HZD 69070; NIS 426; TNF 133757; NOS 246; TNE 2819743; TFE

995960

EPA GENETOX PROGRAM 1988, NEGATIVE: CELL TRANSFORM.--SA7/SHE

EPA TSCA SECTION 8(B) CHEMICAL INVENTORY

EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, DECEMBER 1999

NIOSH ANALYTICAL METHOD, 1994: ALKALINE DUSTS, 7401

SECTION 16 - - - - - OTHER INFORMATION - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

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Product Number: P6310

Product Name: Potassium hydroxide

Register for Cli

Product Info

Valid 05/2003 - 07/2003

Description / Pricing

Sigma-Aldrich Canada Ltd.

Cert. of Analysis

2149 Winston Park Drive

Cert. of Origin

Oakville, Ontario L6H 6J8

MSDS

Tel: (905) 829-9500

Options

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Ask A Scientist

MATERIAL SAFETY DATA SHEET

SECTION 1. - - - - - CHEMICAL IDENTIFICATION- - - - -

CATALOG #: P6310
NAME: POTASSIUM HYDROXIDE ACS REAGENT PELLETS

SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - -

CAS #: 1310-58-3
MF: HKO
EC NO: 215-181-3

SYNONYMS

CAUSTIC POTASH * HYDROXYDE DE POTASSIUM (FRENCH) * KALIUMHYDROXID (GERMAN) * KALIUMHYDROXYDE (DUTCH) * LYE * POTASSA * POTASSE CAUSTIQUE (FRENCH) * POTASSIO (IDROSSIDO) DI (ITALIAN) * POTASSIUM HYDRATE * POTASSIUM HYDROXIDE (ACGIH) * POTASSIUM (HYDROXYDE DE) (FRENCH) *

SECTION 3. - - - - - HAZARDS IDENTIFICATION - - - - -

LABEL PRECAUTIONARY STATEMENTS

CORROSIVE
HARMFUL IF SWALLOWED.
CAUSES SEVERE BURNS.
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
AIR SENSITIVE
VERY HYGROSCOPIC

SECTION 4. - - - - - FIRST-AID MEASURES- - - - -

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN IMMEDIATELY.
DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF SKIN CONTACT, FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. REMOVE CONTAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN.
IN CASE OF CONTACT WITH EYES, FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. ASSURE ADEQUATE FLUSHING BY SEPARATING THE EYELIDS WITH FINGERS. CALL A PHYSICIAN.

SECTION 5. - - - - - FIRE FIGHTING MEASURES - - - - -

EXTINGUISHING MEDIA
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
DO NOT USE WATER.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.
MAY REACT WITH METALS, RELEASING FLAMMABLE HYDROGEN GAS.

SECTION 6. - - - - - ACCIDENTAL RELEASE MEASURES- - - - -

WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
EVACUATE AREA.

SECTION 7. - - - - - HANDLING AND STORAGE- - - - -

REFER TO SECTION 8.
SECTION 8. - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION - - - - -
SAFETY SHOWER AND EYE BATH.
USE ONLY IN A CHEMICAL FUME HOOD.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
DISCARD CONTAMINATED SHOES.
WASH THOROUGHLY AFTER HANDLING.
DO NOT BREATHE DUST.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
NIOSH/MSHA-APPROVED RESPIRATOR.
COMPATIBLE CHEMICAL-RESISTANT GLOVES.
CHEMICAL SAFETY GOGGLES.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.
ABSORBS CO2 FROM AIR.

SECTION 9. - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - -
APPEARANCE AND ODOR
SOLID.
PHYSICAL PROPERTIES
BOILING POINT: 1,320 C
MELTING POINT: 320 C
VAPOR PRESSURE: 1 MMHG @ 719 C
SOLUBILITY:
WATER -Z1076
SPECIFIC GRAVITY: 2.044
PERCENT VOLATILE: 0 %
PH: 13.5
SWISS POISON CLASS: 2

SECTION 10. - - - - - -STABILITY AND REACTIVITY - - - - -
STABILITY
STABLE.
CONDITIONS TO AVOID
ABSORBS CO2 FROM AIR.
HEAT OF SOLUTION IS VERY HIGH, AND WITH LIMITED AMOUNTS OF WATER,
VIOLENT BOILING MAY OCCUR.
INCOMPATIBILITIES
DO NOT HEAT ABOVE MELTING POINT.
TIN
NITRO COMPOUNDS
ZINC
ORGANIC MATERIALS
MAGNESIUM
COPPER
WATER
ALUMINUM
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
HYDROGEN GAS
CARBON MONOXIDE
POTASSIUM OXIDES
HAZARDOUS POLYMERIZATION
WILL NOT OCCUR.

SECTION 11. - - - - - TOXICOLOGICAL INFORMATION - - - - -
ACUTE EFFECTS
INHALATION MAY RESULT IN SPASM, INFLAMMATION AND EDEMA OF THE
LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING,
WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND
VOMITING.
MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES
AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND
TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.
CAUSES SEVERE BURNS.
MAY BE HARMFUL IF ABSORBED THROUGH THE SKIN.
MAY BE HARMFUL IF INHALED.
MATERIAL IS EXTREMELY DESTRUCTIVE TO THE TISSUE OF THE MUCOUS MEMBRANES
AND UPPER RESPIRATORY TRACT.
TOXIC IF SWALLOWED.
LD

RTECS #: TT2100000
POTASSIUM HYDROXIDE
IRRITATION DATA
SKN-HMN 50 MG/24H SEV TXAPA9 31,481,1975
SKN-RBT 50 MG/24H SEV TXAPA9 31,481,1975
EYE-RBT 1 MG/24H RINSE MOD TXAPA9 32,239,1975
SKN-GPG 50 MG/24H SEV TXAPA9 31,481,1975
TOXICITY DATA
ORL-RAT LD50:273 MG/KG FAATDF 8,97,1987

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

SECTION 12. - - - - - ECOLOGICAL INFORMATION - - - - -
DATA NOT YET AVAILABLE.

SECTION 13. - - - - - DISPOSAL CONSIDERATIONS - - - - -
CONTACT A LICENSED PROFESSIONAL WASTE DISPOSAL SERVICE TO DISPOSE OF THIS MATERIAL.
DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - TRANSPORT INFORMATION - - - - -
CONTACT SIGMA CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - REGULATORY INFORMATION - - - - -

EUROPEAN INFORMATION

EC INDEX NO: 019-002-01-5
CORROSIVE

R 22
HARMFUL IF SWALLOWED.

R 35
CAUSES SEVERE BURNS.

S 26
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

S 36/37/39
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.

REVIEWS, STANDARDS, AND REGULATIONS

OEL=MAK
ACGIH TLV-CL 2 MG/M3 DTLVS* TLV/BEI,1999
EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
FEREAC 54,7740,1989
OEL-AUSTRALIA: TWA 2 MG/M3, JAN1993
OEL-AUSTRIA: MAK 2 MG/M3, JAN1999
OEL-BELGIUM: STEL 2 MG/M3, JAN1993
OEL-DENMARK: TWA 2 MG/M3, JAN1999
OEL-FINLAND: TWA 2 MG/M3, JAN1999
OEL-JAPAN: STEL 2 MG/M3, JAN1999
OEL-THE NETHERLANDS: MAC-TGG 2 MG/M3, JAN1999
OEL-NORWAY: TWA 2 MG/M3, JAN1999
OEL-POLAND: MAC(TWA) 0.5 MG/M3, MAC(STEL) 1 MG/M3, JAN1999
OEL-SWITZERLAND: MAK-W 2 MG/M3, JAN1999
OEL-UNITED KINGDOM: STEL 2 MG/M3, SEP2000
OEL IN ARGENTINA, BULGARIA, COLOMBIA, JORDAN, KOREA CHECK ACGIH TLV;
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM CHECK ACGIH TLV
NIOSH REL TO POTASSIUM HYDROXIDE-AIR:CL 2 MG/M3
NIOSH* DHHS #92-100,1992
NOHS 1974: HZD 60440; NIS 340; TNF 80620; NOS 181; TNE 1081553
NOES 1983: HZD 3783; NIS 11; TNF 543; NOS 16; TNE 6722; TFE 2651
NOES 1983: HZD 60440; NIS 346; TNF 74278; NOS 221; TNE 1959889; TFE 797390
EPA TSCA SECTION 8(B) CHEMICAL INVENTORY
EPA TSCA SECTION 8(E) RISK NOTIFICATION, 8EHQ-0892-9197
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JANUARY 2001
NIOSH ANALYTICAL METHOD, 1994: ALKALINE DUSTS, 7401

SECTION 16. - - - - - OTHER INFORMATION - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.
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3. HAZARDS IDENTIFICATION (Continued)

- * tract burns; Contact with metals liberates flammable gas; *
 - * Water runoff from fire fighting may be corrosive; Corrosive *
 - * gases/fumes are given off during burning or thermal *
 - * decomposition. *
- *****

POTENTIAL HEALTH EFFECTS:

ROUTE(S) OF ENTRY.....: Skin Contact; Eye Contact; Inhalation

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE INHALATION.....: Inhalation of gas or fumes at lower levels may cause irritation and burning of the throat, coughing and choking. At higher levels (above 50 ppm), exposure may cause inflammation and ulceration of the nose, throat or larynx, bronchitis, pneumonia, and headache. Severe cases may have necrosis (destruction of tissue) of the tracheal (windpipe) and bronchial epithelium (cellular layer in the branches of the windpipe), damage to pulmonary blood vessels and emphysema (a lung disease characterized by decreased lung capacity) resulting in laryngeal spasm or pulmonary edema with possible fatal consequences.

CHRONIC INHALATION.....: Repeated or prolonged overexposure may cause erosion and discoloration of exposed teeth, chronic bronchitis and gastritis (inflammation of the stomach).

ACUTE SKIN CONTACT.....: Contact may cause severe irritation, inflammation, ulceration, necrosis and chemical burns.

CHRONIC SKIN CONTACT.....: Repeated or prolonged contact may cause chronic irritation and dermatitis. Photosensitization may also occur.

ACUTE EYE CONTACT.....: Contact may cause severe irritation, conjunctivitis, corneal necrosis and burns.

CHRONIC EYE CONTACT.....: Conjunctivitis or effects similar to those for acute exposure may occur.

ACUTE INGESTION.....: Ingestion may cause burns of the mouth, throat, esophagus and stomach with pain, nausea, salivation, vomiting, diarrhea, chills, shock and intense thirst. Nephritis (inflammation of the kidneys), fever and perforation of the intestinal tract, and circulatory collapse may occur.

CARCINOGENICITY.....: This product is not listed by NTP, IARC or regulated as a carcinogen by OSHA.

MEDICAL CONDITIONS

AGGRAVATED BY EXPOSURE.....: Asthma, other respiratory disorders (bronchitis, emphysema, bronchial hyperactivity), skin allergies, eczema.

4. FIRST AID MEASURES:

FIRST AID FOR EYES.....: Immediately flush eyes with large amounts of water, occasionally lifting upper and lower lids, for at least 15 to 20 minutes.

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Approval date: 06/27/2003

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Continued on next page

4. FIRST AID MEASURES (Continued)

Severe eye injury can occur, particularly if rinsing is delayed. Get medical attention immediately.

FIRST AID FOR SKIN.....: Remove contaminated clothing and shoes immediately. Wash affected area with soap and large amounts of water for at least 15 to 20 minutes. In case of chemical burns, cover area with sterile, dry dressing. Get medical attention immediately.

FIRST AID FOR INHALATION: Remove to fresh air. Administer oxygen if breathing is difficult. If not breathing, give artificial respiration. Immediately contact a physician.

FIRST AID FOR INGESTION.: Do not induce vomiting. If conscious, give large amounts of water or milk. If vomiting persists, administer fluids repeatedly. Maintain airway and treat shock. If vomiting occurs, keep head below hips to prevent aspiration. Get medical attention immediately. (Dreisbach, Handbook of poisoning, 12th Ed.).

5. FIRE FIGHTING MEASURES:

FLASH POINT.....: Not Applicable.

AUTO-IGNITION TEMPERATURE.....: Not Applicable.

EXTINGUISHING MEDIA.....: Dry Chemical; Carbon Dioxide; Halon; Water; Foam

SPECIAL FIRE FIGHTING PROCEDURES: No fire hazard exists directly from Hydrochloric Acid. However, when Hydrochloric Acid comes in contact with common metals, it can generate hydrogen gas. In sufficient concentrations hydrogen can form explosive mixtures in air. Firefighters exposed to Hydrochloric Acid vapors should wear a self-contained breathing apparatus and full protective acid resistant clothing. Water spray should be used to cool fire exposed containers and to control vapors.

6. ACCIDENTAL RELEASE MEASURES:

SPILL OR LEAK PROCEDURES.....: Evacuate area and deny entry by unauthorized personnel. Do not breathe vapors and keep upwind. For large spills, contain and pump into tanks which have been constructed for Hydrochloric Acid service. Full acid resistant suits and self-contained breathing apparatus should be worn during emergency operations. Knock down vapors with water spray or water fog. Water used to knock down vapors may become corrosive and should be contained properly for later disposal. Neutralize spill with slaked lime, sodium bicarbonate or crushed limestone. Since neutralization with these bases will generate heat (exothermic), the reaction can be violent. The acid should be diluted and cooled before attempting to neutralize. DO NOT FLUSH TO SEWER BEFORE NEUTRALIZING AND CONSULTING FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS. For small spills, take up with sand or other absorbent material and react with dry alkali (soda ash or lime). Place into containers for later disposal.

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Continued on next page

6. ACCIDENTAL RELEASE MEASURES (Continued)

Adhere to federal, state, and local regulations on reporting releases.

7. HANDLING AND STORAGE:

STORAGE TEMPERATURE (MIN/MAX): Ambient/Ambient.
SHELF LIFE.....: Unlimited in tightly closed containers.
SPECIAL SENSITIVITY.....: None known.
HANDLING/STORAGE PRECAUTIONS: Keep container tightly closed when not in use.
Hydrochloric Acid should be handled and stored in equipment suitably designed for acid service. Store in a dry, cool place in original or similar waterproof containers.

8. PERSONAL PROTECTION:

EYE PROTECTION REQUIREMENTS.....: Splash-proof safety goggles and a full faceshield to prevent contact.
SKIN PROTECTION REQUIREMENTS.....: Rubber or neoprene gloves and boots, and acid resistant coats or overalls as appropriate for work conditions.
Employees should wash their hands and face before eating, drinking or using tobacco products.
VENTILATION REQUIREMENTS.....: Provide local exhaust or process enclosure ventilation to maintain levels below the recommended exposure limit.
RESPIRATOR REQUIREMENTS.....: Fullface NIOSH approved respirator for acid gases. Do not exceed the working limits of the respirator.
ADDITIONAL PROTECTIVE MEASURES.....: Eye wash and safety showers should be immediately available. Full acid suits and NIOSH approved self contained breathing apparatus should be readily available to handle major spills.

9. PHYSICAL AND CHEMICAL PROPERTIES:

PHYSICAL FORM.....: Liquid
COLOR.....: Colorless to slightly yellow
ODOR.....: Sharp, Pungent
ODOR THRESHOLD.....: 1 to 5 ppm
pH.....: Acidic in solution (< 1.5)
BOILING POINT.....: 178 F to 185 F (81 C to 84 C)
MELTING/FREEZING POINT....: Approx. -49 F (-45 C)
VISCOSITY.....: Not Established
SOLUBILITY IN WATER.....: Soluble
SPECIFIC GRAVITY.....: Approx. 1.16 @ 68 F (20 C)
BULK DENSITY.....: Approx. 9.7 lbs/gal
% VOLATILE BY VOLUME.....: 100 %

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9. PHYSICAL AND CHEMICAL PROPERTIES (Continued)

VAPOR PRESSURE: Approx. 25 mm Hg @ 68 F (20 C)

10. STABILITY AND REACTIVITY:

STABILITY.....: This is a stable material.
HAZARDOUS POLYMERIZATION...: Will not occur.
INCOMPATIBILITIES.....: Oxidizing substances, common metals, alkali or active metals.
INSTABILITY CONDITIONS.....: Flammable, poisonous gases may accumulate in tanks and hopper cars.
DECOMPOSITION TEMPERATURE...: Not established.
DECOMPOSITION PRODUCTS.....: Contact with common metals produces hydrogen which may form explosive mixtures with air. Thermal decomposition may release corrosive hydrogen chloride. Contact with strong oxidizers may produce chlorine gas.

11. TOXICOLOGICAL INFORMATION:

ACUTE TOXICITY

ORAL LD50.....: 900 mg/kg (Rabbit). (1)

INHALATION LC50.....: 3124 ppm/1 hr. (Rat). (1)

EYE EFFECTS.....: Animals exposed to vapor concentrations of 1350 ppm for one and a half hours showed clouding of the cornea. Animals exposed to concentrations of 300 ppm for 6 hours showed slight erosion of the corneal epithelium. (2)

MUTAGENICITY.....: Mouse lymphoma L5178Y cells, tk locus: positive with metabolic activation. Chinese hamster ovary (CHO) cells: positive with and without activation. Drosophila SLRT test: positive (p = less than 0.001) (3)

DEVELOPMENTAL TOXICITY: Hydrogen chloride was administered via inhalation to (pregnant and non-pregnant) female Wistar rats at a dose of 450 mg/m³ (0.45 mg/l) for an exposure of one hour. The frequency of treatment was 12 days prior to mating and on different days of gestation not specified. Maternal toxicity resulted with hemorrhagic edema of the lungs. One third of the animals died of severe dyspnea and cyanosis; the surviving animals showed functional disorders of the lungs, kidneys, and the liver (pregnant animals only). Embryotoxicity: Mainly the male offspring of mothers who inhaled HCL before mating or at day 9 of gestation suffered from functional disorders of the lungs, kidneys, and liver. Mortality of offspring of mothers who inhaled HCL during gestation was significantly higher compared to controls. Mortality of offspring whose mothers inhaled HCL before mating was not increased but weight development was reduced until the 4th week. (3)

REPRODUCTION.....: A report notes that no adverse effects were apparently seen when an unspecified number of pregnant mice ingested water containing HCL at a pH of 2.5 (providing about 14.3 mg/kg bw/day). A slight increase in fetal mortality occurred when about 0.2 mg/kg bw was injected into the womb of

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Continued on next page

11. TOXICOLOGICAL INFORMATION (Continued)

pregnant mice, but no malformations were induced in 17 fetuses. (3)

- 1 Registry for Toxic Effects of Chemical Substances (RTECS).
- 2 MDL Information Systems Inc. MSDS
- 3 IUCLID

12. ECOLOGICAL INFORMATION:

AQUATIC TOXICITY.....: Fish Toxicity: LC50 = 21900 ug/L (96 hrs., fathead minnow). (1)

- 1 MDL Information Systems Inc. MSDS.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD.....: Landfill or neutralize in accordance with federal, state and local environmental regulations.

14. TRANSPORTATION INFORMATION:

TECHNICAL SHIPPING NAME.....: Hydrochloric Acid
FREIGHT CLASS BULK.....: Muriatic (Hydrochloric Acid)
PRODUCT LABEL.....: 20 Degree Baume Muriatic Acid

DOT (DOMESTIC SURFACE)

PROPER SHIPPING NAME.....: Hydrochloric Acid
HAZARD CLASS OR DIVISION ..: 8
UN/NA NUMBER.....: UN1789
PACKING GROUP ..: II
DOT PRODUCT RQ lbs (kgs).....: 15,625 lbs (7087.5 kgs)
HAZARD LABEL(s).....: Corrosive
HAZARD PLACARD(s).....: Corrosive

IMO / IMDG CODE (OCEAN)

PROPER SHIPPING NAME.....: Hydrochloric Acid
HAZARD CLASS DIVISION NUMBER...: 8
UN NUMBER.....: UN1789
PACKAGING GROUP.....: II
HAZARD LABEL(s).....: Corrosive
HAZARD PLACARD(s).....: Corrosive

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Continued on next page

14. TRANSPORTATION INFORMATION (Continued)

IMO / IMDG CODE (continued)

ICAO / IATA (AIR)

PROPER SHIPPING NAME.....: Hydrochloric Acid
 HAZARD CLASS DIVISION NUMBER...: 8
 UN NUMBER.....: UN1789
 SUBSIDIARY RISK.....: None
 PACKING GROUP.....: II
 HAZARD LABEL(S).....: Corrosive
 RADIOACTIVE?.....: Non-Radioactive
 PASSENGER AIR - MAX. QTY.: 1 L
 PASSENGER PACKING INSTRUCTION..: 809
 CARGO AIR - MAX. QTY.: 30 L
 CARGO AIR PACKING INSTRUCTION..: 813

15. REGULATORY INFORMATION:

OSHA STATUS.....: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

TSCA STATUS.....: On TSCA Inventory

CERCLA REPORTABLE QUANTITY..: 5,000 lbs / 2270 kg for Hydrochloric Acid

SARA TITLE III:

SECTION 302 EXTREMELY
 HAZARDOUS SUBSTANCES...: None.

SECTION 311/312
 HAZARD CATEGORIES.....: Immediate Health Hazard

SECTION 313
 TOXIC CHEMICALS.....: Hydrochloric Acid, CAS# 7647-01-0, Approx. 32 %.

RCRA STATUS.....: When discarded in its purchased form, this product meets the criteria of corrosivity, and should be managed as a hazardous waste (EPA Hazardous Waste Number D002). (40 CFR 261.20-24)

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

COMPONENT NAME /CAS NUMBER	CONCENTRATION	STATE CODE
Hydrogen chloride (hydrochloric acid, muriatic acid) 7647-01-0	Approx. 32 %	PA1, PA4, MA, NJ1, NJ2, NJ3, CN1
Water 7732-18-5	Approx. 68 %	PA3, NJ4
Aniline 62-53-3	< 0.01 ppb*	CA1

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 Continued on next page

16. OTHER INFORMATION (Continued)

service.

REASON FOR ISSUE.....: Revised Transportation
PREPARED BY.....: Heather F. Doerr
APPROVED BY.....: S. Van Volkenburg
APPROVAL DATE.....: 06/27/2003
SUPERSEDES DATE.....: 03/19/2001
MSDS NUMBER.....: 01829

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Material Safety Data Sheet

Sulfuric acid 95-98%

Section 1 - Chemical Product and Company Identification

MSDS Name:

Sulfuric acid 95-98%

Catalog Numbers:

A298-212, A298N119, A300-212, AC300225, A300-500, A300-612GAL, AC300700, A300C-212, A300C-212002, A300C-212003, A300C-212LC, A300C212004, A300C212005, A300C212006, A300C212007, A300C212008, A300C212009, A300C212010, A300J-500, A300P-500, A300S-212, A300S-212LC, A300S-500, A300SI-212, A468, A468-1, A468-250, A468-500, A4682, A484-212, A510, A510-212, A510-500, A510SK-212, NC9008405, NC9825433, S71211, S71211MF, S71211SC, S71211SCMF, S71826, S79200, S79200MF, S79200SCMF, S80213, S80213-1, SA174-212, SA174-4, SA176-4, SA196-500

Synonyms:

Hydrogen sulfate; Oil of vitriol; Vitriol brown oil; Matting acid; Battery acid; Sulphuric acid; Electrolyte acid; Dihydrogen sulfate; Spirit of sulfur; Chamber acid.

Company Identification:

Fisher Scientific - Fairlawn
 One Reagent Lane
 Fairlawn, NJ 07410

Company Phone Number:

(201) 796-7100

Emergency Phone Number:

(201) 796-7100

CHEMTREC Phone Number:

800-424-9300

CHEMTREC (International):

703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name:	Percent	EINECS/ELINCS
7664-93-9	Sulfuric acid	90-98	231-639-5

Hazard Symbols: C



Risk Phrases: 35

Section 3 - Hazards Identification

Potential Health Effects

Material Safety Data Sheet

Sulfuric acid 95-98%

Eye:

Causes severe eye burns. May cause irreversible eye injury. May cause permanent corneal opacification. The severity of injury depends on the concentration of the solution and the duration of exposure.

Skin:

No information found.

Ingestion:

May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns.

Inhalation:

May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary 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. Causes corrosive action on the mucous membranes. Because its vapor pressure is negligible, it exists in the air only as a mist or spray.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated inhalation may cause nosebleeds, nasal congestion, erosion of the teeth, perforation of the nasal septum, chest pain and bronchitis. Prolonged or repeated eye contact may cause conjunctivitis. Effects may be delayed. Workers chronically exposed to sulfuric acid mists may show various lesions of the skin, tracheobronchitis, stomatitis, conjunctivitis, or gastritis. Occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans.

Section 4 - First Aid Measures

Eyes:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

Skin:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion:

If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation:

Poison material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Monitor arterial blood gases, chest x-ray, and pulmonary function tests if respiratory tract irritation or respiratory depression is evident. Treat dermal irritation or burns with standard topical therapy. Effects may be delayed. Do NOT use sodium bicarbonate in an attempt to neutralize the acid.

Antidote:

Do NOT use oils or ointments in eye.

Section 5 - Fire Fighting Measures

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Substance is noncombustible. Contact with water can cause violent liberation of heat and splattering of the material. Contact with metals may evolve flammable hydrogen gas. Runoff from fire control or dilution water may cause pollution. Strong dehydrating agent, which may cause ignition of finely divided materials on contact. Oxides of sulfur may be produced in fire.

Material Safety Data Sheet

Sulfuric acid 95-98%

Extinguishing Media:

Use extinguishing media most appropriate for the surrounding fire. Do NOT get water inside containers. If water is used, care should be taken, since it can generate heat and cause spattering if applied directly to sulfuric acid.

Autoignition Temperature:

Not available.

Explosion Limits:

Lower: Not available. Upper: Not available.

Flash Point:

Not applicable.

NFPA Rating:

(estimated) Health: 3; Flammability: 0; Reactivity: 2 (water reactive)

Section 6 - Accidental Release Measures

General Information:

Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Carefully scoop up and place into appropriate disposal container. Provide ventilation. Do not expose spill to water. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not allow contact with water. Discard contaminated shoes. Use only with adequate ventilation. Do not breathe spray or mist.

Storage:

No information found.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name:	ACGIH	NIOSH	OSHA
Sulfuric acid	1 mg/m ³ TWA; 3 mg/m ³ STEL	1 mg/m ³ TWA 15 mg/m ³ IDLH	1 mg/m ³ TWA

OSHA Vacated PELs

Sulfuric acid: 1 mg/m³ TWA

Personal Protective Equipment

Material Safety Data Sheet
Sulfuric acid 95-98%**Eyes:**

Wear chemical goggles and face shield.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties**Physical State:** Liquid**Color:** clear colorless - oily**Odor:** odorless**pH:** 0.3 (1N solution)**Vapor Pressure:** <0.001 mm Hg @ 20°C**Vapor Density:** 3.38 (air=1)**Evaporation Rate:** Slower than ether.**Viscosity:** 21 mPas @ 25 C**Boiling Point:** 290-338°C**Freezing/Melting Point:** 10°C (50.00°F)**Decomposition Temperature:** 340°C**Solubility in water:** Soluble with much heat**Specific Gravity/Density:** 1.84**Molecular Formula:** H2SO4**Molecular Weight:** 98.07**Section 10 - Stability and Reactivity****Chemical Stability:**

Sulfuric acid reacts vigorously, violently or explosively with many organic and inorganic chemicals and with water.

Conditions to Avoid:

Excess heat, exposure to moist air or water, Note: Use great caution in mixing with water due to heat evolution that causes explosive spattering. Always add the acid to water, never the reverse..

Incompatibilities with Other Materials

metals, reducing agents, bases, acrylonitrile, chlorates, finely powdered metals, nitrates, perchlorates, permanganates, epichlorohydrin, aniline, carbides, fulminates, picrates, organic materials.

Hazardous Decomposition Products

Oxides of sulfur.

Hazardous Polymerization

Has not been reported.

Material Safety Data Sheet
Sulfuric acid 95-98%**Section 11 - Toxicological Information****RTECS:**

CAS# 7664-93-9: WS5600000.

LD50/LC50:

CAS# 7664-93-9:

Draize test, rabbit, eye: 250 ug Severe
Inhalation, mouse: LC50 = 320 mg/m³/2H
Inhalation, rat: LC50 = 510 mg/m³/2H
Oral, rat: LD50 = 2140 mg/kg.**Carcinogenicity:**

CAS# 7664-93-9

ACGIH: A2 - Suspected Human Carcinogen (contained in strong inorganic acid mists)
OSHA: Select carcinogen
IARC: Group 1 carcinogen**Epidemiology:****Teratogenicity:**Sulfuric acid was not teratogenic in mice and rabbits, but was slightly embryotoxic in rabbits (a minor, rare skeletal variation). The animals were exposed to 5 and 20 mg/m³ for 7 hr/day throughout pregnancy. Slight maternal toxicity was present at the highest dose in both species.**Reproductive:**

No information found.

Mutagenicity

There are no mutagenicity studies specifically of sulfuric acid. However, there are established effects of reduced pH in mutagenicity testing, as would be caused by sulfuric acid. These effects are an artifact of low pH and are not necessarily due to biological effects of sulfuric acid itself.

Neurotoxicity

No information found.

Other:

Standard Draize test Administration into the eye: 250 ug/24H (Severe). Rinsed with water test: Administration into the eye (rabbit) = 5 mg/30sec (Severe).

Section 12 - Ecological Information**Ecotoxicity:**Fish: Bluegill/Sunfish: 49 mg/L; 48Hr; TLm (tap water @ 20C)
Fish: Bluegill/Sunfish: 24.5 ppm; 48Hr; TLm (fresh water)**Section 13 - Disposal Considerations**

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

Material Safety Data Sheet

Sulfuric acid 95-98%

RCRA P Series Wastes

None of the components are on this list.

RCRA U Series Wastes

None of the components are on this list.

Section 14 - Transport Information
US DOT**Canadian TDG****Proper Shipping Name:** SULFURIC ACID**Hazard Class:** 8**UN Number:** UN1830**Packing Group:** II

SULFURIC ACID

8

UN1830

II

Section 15 - Regulatory Information
US Federal**TSCA**

CAS# 7664-93-9 is listed on the TSCA Inventory.

Health and Safety Reporting List

None of the components are on this list.

Chemical Test Rules

None of the components are on this list.

TSCA Section 12b

None of the components are on this list.

TSCA Significant New Use Rule (SNUR)

None of the components are on this list.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7664-93-9: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 7664-93-9: 1000 lb TPQ; 1000 lb EPCRA RQ

SARA Hazard Categories

CAS# 7664-93-9: acute, chronic, reactive.

CERCLA/SARA Section 313

This material contains Sulfuric acid (CAS# 7664-93-9, 90 98%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act - Hazardous Air Pollutants (HAPs)

None of the components are on this list.

Clean Air Act - Class 1 Ozone Depletors

None of the components are on this list.

Clean Air Act - Class 2 Ozone Depletors

None of the components are on this list.

Material Safety Data Sheet
Sulfuric acid 95-98%**Clean Water Act - Hazardous Substances**

CAS# 7664-93-9 is listed as a Hazardous Substance under the CWA.

Clean Water Act - Priority Pollutants

None of the components are on this list.

Clean Water Act - Toxic Pollutants

None of the components are on this list.

OSHA - Highly Hazardous

None of the components are on this list.

US State**State Right to Know**

Sulfuric acid can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California Regulations

CAS# 7664-93-9: No information found.

European/International Regulations**European Labelling in Accordance with EC Directives:**

Hazard Symbols: C

Risk Phrases: R 35 Causes severe burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 30 Never add water to this product.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 7664-93-9: 2

United Kingdom Occupational Exposure Limits

CAS# 7664-93-9: OES-United Kingdom, TWA 1 mg/m³ TWA

Canadian DSL/NDSL

CAS# 7664-93-9 is listed on Canada's DSL List.

Canadian WHMIS Classifications

This product does not have a WHMIS classification.

Canadian Ingredient Disclosure List

CAS# 7664-93-9 is listed on Canada's Ingredient Disclosure List.

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Material Safety Data Sheet

Sulfuric acid 95-98%

Exposure Limits

CAS# 7664-93-9: OEL-ARAB Republic of Egypt:TWA 1 mg/m3
OEL-AUSTRALIA:TWA 1 mg/m3
OEL-BELGIUM:TWA 1 mg/m3;STEL 3 mg/m3
OEL-CZECHOSLOVAKIA:TWA 1 mg/m3;STEL 2 mg/m3
OEL-DENMARK:TWA 1 mg/m3
OEL-FINLAND:TWA 1 mg/m3;STEL 3 mg/m3;Skin
OEL-FRANCE:TWA 1 mg/m3;STEL 3 mg/m3
OEL-GERMANY:TWA 1 mg/m3
OEL-HUNGARY:STEL 1 mg/m3
OEL-JAPAN:TWA 1 mg/m3
OEL-THE NETHERLANDS:TWA 1 mg/m3
OEL-THE PHILIPPINES:TWA 1 mg/m3
OEL-POLAND:TWA 1 mg/m3
OEL-RUSSIA:STEL 1 mg/m3;Skin
OEL-SWEDEN:TWA 1 mg/m3;STEL 3 mg/m3
OEL-SWITZERLAND:TWA 1 mg/m3;STEL 2 mg/m3
OEL-THAILAND:TWA 1 mg/m3
OEL-TURKEY:TWA 1 mg/m3
OEL-UNITED KINGDOM:TWA 1 mg/m3
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Other Information

No information found.
MSDS Creation Date: April 22, 1999
Revision Date: January 20, 2003

This MSDS is intended for review and guidance in the receipt, storage, handling, use and disposal of product purchased from Fisher Scientific, and for no other purpose. Use this product only as directed and in accordance with applicable instructions and warnings provided with the product. Please consult your institution's policies regarding use of this product. If you have obtained this MSDS other than in connection with the supply of this product from Fisher Scientific, this MSDS should be consulted for general information only, and should not be relied upon for any purpose. As with the use of all hazardous materials, you should in all instances follow the guidance of the MSDS provided or available with the specific product purchased.

MATERIAL SAFETY DATA SHEET

Date Printed: 06/03/2004

Date Updated: 04/04/2004

Version 1.2

Section 1 - Product and Company Information

Product Name (R) - (+) -ALPHA-METHYL-1-NAPHTHALENE-METHANOL, 99%

Product Number 372315

Brand ALDRICH

Company Sigma-Aldrich

Street Address 3050 Spruce Street

City, State, Zip, Country SAINT LOUIS MO 63103 US

Technical Phone: 314 771 5765

Emergency Phone: 414 273 3850 Ext. 5996

Fax: 800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
(R) - (+) -ALPHA-METHYL-1-NAPHTHALENE-METHANOL, 99%	42177-25-3	No
Formula C ₁₂ H ₁₂ O		

Section 3 - Hazards Identification

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

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

DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed. Store in a cool dry place.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling. Wash contaminated clothing before reuse.

Section 9 - Physical/Chemical Properties

Appearance	Color: White Form: Fine crystals	
Property	Value	At Temperature or Pressure
Molecular Weight	172.23 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	45 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	

SG/Density	N/A
Bulk Density	N/A
Odor Threshold	N/A
Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	N/A
Surface Tension	N/A
Partition Coefficient	N/A
Decomposition Temp.	N/A
Flash Point	N/A
Explosion Limits	N/A
Flammability	N/A
Autoignition Temp	N/A
Refractive Index	N/A
Optical Rotation	Degree of Rotation: 10 g/l Solvent: MeOH +94 - +78 (+/-2)
Miscellaneous Data	N/A
Solubility	N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Eye Contact: May cause eye irritation.

Multiple Routes: May be harmful by inhalation, ingestion, or skin absorption.

SIGNS AND SYMPTOMS OF EXPOSURE

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Section 12 - Ecological Information

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: None

Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA

Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION

S: 22 24/25

Safety Statements: Do not breathe dust. Avoid contact with skin and eyes.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: No

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

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Greyhound Recycling & Recovery Limited

Abridged Financial Statements

for the year ended 31 March 2004

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C. R. C.
- 1 SEP 2004

Greyhound Recycling & Recovery Limited

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Abridged Profit and Loss Account	4
Balance Sheet	5
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Greyhound Recycling & Recovery Limited

**Directors' Report
for the year ended 31 March 2004**

The directors present their report and the financial statements for the year ended 31 March 2004.

Principal Activity and Review of the Business

The principal activity of the company is the recycling of waste materials and the manufacture of fuel pellets.

Results And Dividends

The profit for the year after providing for depreciation and taxation amounted to € 1,325,732. (2003 - € 1,937,976). The directors do not recommend payment of a final dividend.

Directors

The present membership of the board is as set out in the preceding information page. There were no changes in the period.

Directors and their Interests

The directors who served during the year and their interests in the company are as stated below:

	Ordinary shares	
	2004	2003
Michael Buckley	1	1
Brian Buckley	1	1

There were no changes in shareholdings between 31 March 2004 and the date of signing the financial statements.

Directors' Responsibilities

Company law requires the directors to prepare financial statements for each financial year which give a true and fair view of the state of the affairs of the company and of the profit or loss of the company for that year. In preparing these the directors are required to:

- select suitable accounting policies and apply them consistently;
- make judgements and estimates that are reasonable and prudent;
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the company will continue in business.

The directors are responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the company and enable them to ensure that the financial statements comply with the Companies Acts 1963 to 2003. They are also responsible for safeguarding the assets of the company and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.


Auditors

The auditors, Hogan & Associates, have indicated their willingness to continue in office in accordance with the provisions of Section 160(2) of the Companies Act, 1963.

Taxation Status

So far as the directors are aware, the company is a close company within the meaning of the Taxes Consolidation Act, 1997.

Signed on behalf of the Board on 19 August 2004 by


Director


Director

**Auditors' Report to the Directors of Greyhound Recycling & Recovery Limited
pursuant to Section 18(3) of the Companies (Amendment) Act 1986**

On ~~19-08-04~~ we reported as auditors of Greyhound Recycling & Recovery Limited to the directors of the company on the abridged financial statements for the year ended 31 March 2004 on pages 5 to 8 and our report was as follows:

'We have examined :

(i) the abridged financial statements for the year ended 31 March 2004 on pages 5 to 8 which the directors of Greyhound Recycling & Recovery Limited propose to annex to the Annual Return of the company ; and

(ii) the financial statements to be laid before the Annual General Meeting which form the basis for those abridged financial statements.

The scope of our work for the purpose of this report was limited to confirming that the directors are entitled to annex abridged financial statements to the Annual Return and that those financial statements have been properly prepared pursuant to Sections 11 to 12 of the Companies (Amendment) Act, 1986 from the financial statements to be laid before the Annual General Meeting.

In our opinion the directors are entitled under Section 18 of the Companies (Amendment) Act, 1986 to annex to the Annual Return of the company the abridged financial statements and those abridged financial statements have been properly prepared pursuant to Sections 11 to 12 of that Act. (exemptions available to small/medium companies).'

On ~~19-08-04~~ we reported as auditors of Greyhound Recycling & Recovery Limited to the shareholders on the company's financial statements for the year ended 31 March 2004 to be laid before its Annual General Meeting and our report was as follows:

' We have audited the financial statements on pages 3 to 7 which have been prepared under the historic cost convention as modified by the revaluation of certain fixed assets and the accounting policies set out on page 5.

This report is made solely to the company's members, as a body, in accordance with Section 193 of the Companies Act, 1990. Our audit work has been undertaken so that we might state to the company's members those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the company and the company's members as a body, for our audit work, for this report, or for the opinions we have formed.

Respective responsibilities of directors and auditors

As described on page 1 the company's directors are responsible for the preparation of financial statements. It is our responsibility to form an independent opinion, based on our audit, on those statements and to report our opinion to you.

**Auditors' Report to the Directors of Greyhound Recycling & Recovery Limited
pursuant to Section 18(3) of the Companies (Amendment) Act 1986**

Basis of opinion

We conducted our audit in accordance with Auditing Standards issued by the Auditing Practices Board. An audit includes examination, on a test basis, of evidence relevant to the amounts and disclosures in the financial statements. It also includes an assessment of the significant estimates and judgements made by the directors in the preparation of the financial statements, and whether the accounting policies are appropriate to the company's circumstances, consistently applied and adequately disclosed.

We planned and performed our audit so as to obtain all of the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or other irregularity or error.

In forming our opinion we also evaluated the overall adequacy of the presentation of information in the financial statements.

Opinion

In our opinion the financial statements give a true and fair view of the state of the company's affairs as at the 31 March 2004 and of its profit for the year then ended and have been properly prepared in accordance with the Companies Acts 1963 to 2003.

We have obtained all the information and explanations we consider necessary for the purposes of our audit. In our opinion proper books of account have been kept by the company. The financial statements are in agreement with the books of account.

In our opinion the information given in the directors' report on page 1 is consistent with the financial statements.

The net assets of the company as stated in the Balance Sheet on page 3 are more than half of the amount of its called-up share capital and, in our opinion on that basis there did not exist at 31 March 2004 a financial situation which under Section 40(1) of the Companies (Amendment) Act 1983 may require the convening of an extraordinary general meeting of the company.

Way & Associates
Chartered Accountants and
Registered Auditors
45 Blackbourne Square
Rathfarnham Gate
Rathfarnham
Dublin 14

Certified to be a true copy

Director 

Secretary 

Date 19 August 2004

Greyhound Recycling & Recovery Limited

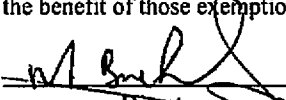
**Abridged Profit and Loss Account
for the year ended 31 March 2004**

	Notes	2004 €	2003 €
Gross profit		<u>3,250,501</u>	<u>3,143,123</u>
Administrative expenses		<u>(1,607,471)</u>	<u>(864,302)</u>
Operating profit	2	1,643,030	2,278,821
Interest payable and similar charges	3	<u>(126,779)</u>	<u>(82,823)</u>
Profit on ordinary activities before taxation		1,516,251	2,195,998
Tax on profit on ordinary activities		<u>(190,519)</u>	<u>(258,022)</u>
Profit on ordinary activities after taxation		1,325,732	1,937,976
Retained profit for the year		1,325,732	1,937,976
Retained profit brought forward		2,396,574	458,598
Retained profit carried forward		<u><u>3,722,306</u></u>	<u><u>2,396,574</u></u>

There are no recognised gains or losses other than the profit or loss for the above two financial years.

The financial statements were approved by the board on 19 August 2004 and signed on its behalf by

We have prepared the abridged financial statements and have relied on specified exemptions contained in Sections 11 and 12 of the Companies (Amendment) Act 1986 on the ground that the company is entitled to the benefit of those exemptions as a medium company.


Director


Director

Greyhound Recycling & Recovery Limited

**Balance Sheet
as at 31 March 2004**

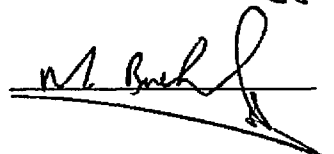
	Notes	2004		2003	
		€	€	€	€
Fixed Assets					
Tangible assets	4		4,657,474		4,191,717
Current Assets					
Debtors	5	4,488,120		2,758,377	
Cash at bank and in hand		1,328,862		1,422,124	
		5,816,982		4,180,501	
Creditors: amounts falling due within one year	6	(3,554,074)		(2,812,773)	
Net Current Assets			2,262,908		1,367,728
Total Assets Less Current Liabilities			6,920,382		5,559,445
Creditors: amounts falling due after more than one year	7		(2,527,550)		(2,492,345)
Net Assets			4,392,832		3,067,100
Capital and Reserves					
Called up share capital			3		3
Revaluation reserve			670,523		670,523
Profit and loss account			3,722,306		2,396,574
Equity Shareholders' Funds			4,392,832		3,067,100

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The financial statements were approved by the Board on 19 August 2004 and signed on its behalf by

Certified to be a true copy

Director 

Secretary 

Greyhound Recycling & Recovery Limited

**Notes to the Abridged Financial Statements
for the year ended 31 March 2004**

1. Accounting Policies

1.1. Accounting convention

The financial statements are prepared under the historical cost convention modified to include the revaluation of certain fixed assets.

1.2. Turnover

Turnover represents the total invoice value, excluding value added tax, of sales made during the year.

1.3. Tangible fixed assets and depreciation

Depreciation is provided at rates calculated to write off the cost less residual value of each asset over its expected useful life, as follows:

Buildings	-	2% Straight Line
Plant and machinery	-	20% Straight Line
Motor vehicles	-	20% Straight Line

1.4. Leasing and hire purchase commitments

Assets obtained under hire purchase contracts and finance leases are capitalised as tangible assets and depreciated over the shorter of the lease term and their useful lives. Obligations under such agreements are included in creditors net of the finance charge allocated to future periods. The finance element of the rental payment is charged to the profit and loss account so as to produce constant periodic rates of charge on the net obligations outstanding in each period.

1.5. Pensions

The pension costs charged in the financial statements represent the contribution payable by the company during the year.

2. Operating profit

	2004	2003
	€	€
Operating profit is stated after charging:		
Depreciation of tangible assets	249,841	160,690
Auditors' remuneration	8,000	5,000
	<u>257,841</u>	<u>165,690</u>

3. Interest payable and similar charges

	2004	2003
	€	€
On bank loans and overdrafts	98,066	56,009
Lease finance charges and hire purchase interest	28,713	26,814
	<u>126,779</u>	<u>82,823</u>

Greyhound Recycling & Recovery Limited

Notes to the Abridged Financial Statements
for the year ended 31 March 2004

4. Tangible assets

	Land and buildings freehold	Plant and machinery	Motor vehicles	Total
	€	€	€	€
Cost/revaluation				
At 31 March 2003	3,800,071	803,761	-	4,603,832
Additions	-	569,348	146,250	715,598
At 31 March 2004	<u>3,800,071</u>	<u>1,373,109</u>	<u>146,250</u>	<u>5,319,430</u>
Depreciation				
At 31 March 2003	65,545	346,570	-	412,115
Charge for the year	21,849	222,580	5,412	249,841
At 31 March 2004	<u>87,394</u>	<u>569,150</u>	<u>5,412</u>	<u>661,956</u>
Net book values				
At 31 March 2004	<u>3,712,677</u>	<u>803,959</u>	<u>140,838</u>	<u>4,657,474</u>
At 31 March 2003	<u>3,734,526</u>	<u>457,191</u>	<u>-</u>	<u>4,191,717</u>

The Directors revalued the freehold property as at 31 March 1999 based on the sale of a similar site in the area. No independent valuation was used.

5. Debtors

	2004 €	2003 €
Trade debtors	4,370,136	2,658,377
Site Deposit	100,000	100,000
Prepayments and accrued income	17,984	-
	<u>4,488,120</u>	<u>2,758,377</u>

Greyhound Recycling & Recovery Limited

Notes to the Abridged Financial Statements
for the year ended 31 March 2004

6. Creditors: amounts falling due within one year	2004 €	2003 €
Bank overdraft	81,267	-
Bank loan	247,800	247,800
Net obligations under finance leases and hire purchase contracts	231,800	160,909
Trade creditors	2,661,480	1,584,527
Corporation tax	101,019	242,850
Other taxes and social security costs	107,660	46,199
Directors' accounts	62,195	175,500
Accruals and deferred income	60,853	354,988
	<u>3,554,074</u>	<u>2,812,773</u>
<u>Analysis of Other Taxes</u>		
PAYE/PRSI	3,588	2,393
VAT	104,072	43,806
	<u>107,660</u>	<u>46,199</u>
7. Creditors: amounts falling due after more than one year	2004 €	2003 €
Bank loan	2,235,894	2,419,763
Net obligations under finance leases and hire purchase contracts	291,656	72,582
	<u>2,527,550</u>	<u>2,492,345</u>
As security for their loan AIB holds a fixed charge over the freehold lands and properties at Western Industrial Estate, Naas Road, Dublin 12, Clondalkin Industrial Estate, Dublin 22 and Galrane Industrial Estate, Limerick.		
8. Share capital	2004 €	2003 €
Authorised equity		
1,000,000 Ordinary shares of €1.27 each	<u>1,269,738</u>	<u>1,269,738</u>
Allotted, called up and fully paid equity		
2 Ordinary shares of € 1.27 each	<u>3</u>	<u>3</u>

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