



Green Plains

GHS SAFETY DATA SHEET

FUSEL OIL

SDS DATE: 04/17/2019

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME (GHS Product Identifier): Fusel Oil
(Other means of Identification): Fusel Oil, Fusel

PRODUCT INTENDED USE AND RESTRICTION: By-product of alcoholic fermentation

MANUFACTURER: Green Plains, Inc.
DIVISION:

Green Plains Atkinson LLC. 87590 Hill Crest Rd. Atkinson, NE 68713 P.O. Box 391, Atkinson, NE 68713 Phone: 402-925-5570 Fax: 402-925-2988 <input checked="" type="checkbox"/>	Green Plains Central City LLC. 214 20 th St., Central City, NE 68826 Phone: 308-946-9700 Fax: 308-946-2623 <input checked="" type="checkbox"/>	Green Plains Fairmont LLC. 1125 N Bixby Road, Fairmont, MN 56031 Phone: 507-238-3600 Fax: 507-238-3624 <input checked="" type="checkbox"/>	Green Plains Hereford LLC 4300 County Road 8 Hereford, TX 79045 Phone: 806-258-7800 Fax: 806-258-7801 <input checked="" type="checkbox"/>	Green Plains Madison LLC 395 Bissell St Madison, IL 63060 Phone: 618-451-4420 Fax: 618-452-8946 <input checked="" type="checkbox"/>
Green Plains Mt Vernon LLC 8999 W Franklin Rd Mt Vernon, IN 47620 Phone: 812-985-4023 Fax: 812-985-9983 <input checked="" type="checkbox"/>	Green Plains Obion LLC. 2098 McDonald Rd., Rives, TN 38253/P.O. Box 95, Obion, TN 38240 Phone: 731-536-1286 Fax: 731-536-1434 <input checked="" type="checkbox"/>	Green Plains Ord LLC. 48267 Val-E Road, Ord, NE 68862 Phone: 308-496-4823 Fax: 308-496-4890 <input checked="" type="checkbox"/>	Green Plains Otter Tail LLC. 24096 170th Ave., Fergus Falls, MN 56537 Phone: 218-998-4301 Fax: 218-998-4302 <input checked="" type="checkbox"/>	Green Plains Shenandoah LLC. 4124 Airport Rd., Shenandoah, IA 51601 Phone: 712-246-2932 Fax: 712-246-3988 <input checked="" type="checkbox"/>
Green Plains Superior LLC. 1495 320th Ave, Superior, IA 51363 Phone: 712-858-4666 Fax: 712-858-4684 <input checked="" type="checkbox"/>	Green Plains Wood River LLC. 7874 South 140th Road, Wood River, NE 68883 Phone: 308-385-1200 Fax: 308-385-9990 <input checked="" type="checkbox"/>	Green Plains York LLC 1414 County Rd O York, NE 68467 Phone: 402-362-2285 Fax: 402-362-7041 <input checked="" type="checkbox"/>		
Green Plains Grain Company LLC. Archer 2132 Archer Road Archer, NE 68816 Phone: 308-795-2211 <input type="checkbox"/>	Green Plains Grain Company LLC. Cimarron 19016 Road I Kismet, KS 67859 Phone: 620-624-6296 Fax: 620-624-4411 <input type="checkbox"/>	Green Plains Grain Company LLC. Essex 411 North Street, Essex, IA 51638 Phone: 712-379-3155 Fax: 712-379-3175 <input type="checkbox"/>	Green Plains Grain Company LLC. Hopkins 200 N. Railroad Hopkins, MO 64461 Phone: 660-778-3331 Fax: 660-778-3676 <input type="checkbox"/>	

CHEMTREC PHONE (24HR Emergency Telephone): 1-800-424-9300 (Within U.S.A)
INTERNATIONAL CHEMTREC CALL: 1-703-527-3887
OTHER CALLS: 1-402-884-8700 (M-F, 8 AM-5 PM, Central time (U.S.A & Canada); within U.S.A)
FAX PHONE: 1-402-884-8776 (M-F, 8 AM-5 PM, Central time (U.S.A & Canada); within U.S.A)

SECTION 1 NOTES: None Available

SECTION 2: HAZARDS IDENTIFICATION

GHS LABELING AND CLASSIFICATION: This product meets the definition of the following hazard classes as defined by the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

GHS CLASSIFICATION ACCORDING TO ANNEX II:



HEALTH	ENVIRONMENTAL	PHYSICAL
Acute toxicity (Oral)-Category 4 Acute toxicity (Dermal)-Category 5 Skin irritant-Category 2 Eye irritant-2A	Not classified	Flammable Liquid-Category 2
SIGNAL WORD:		DANGER



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SYMBOL:		 
HAZARD STATEMENT:		H225: Highly flammable liquid and vapor H302+H315: Harmful if swallowed; Cause skin irritation H319: Cause serious eye irritation
PRECAUTIONARY STATEMENTS:	PREVENTIVE:	P210: Keep away from heat/sparks/open flames/hot surfaces. No smoking P233: Keep container tightly closed P235: Keep cool P240: Ground/bond container and receiving equipment P241: Use explosion-proof electrical/ventilating/lighting/.../equipment P242: Use only non-sparking tools P243: Take precautionary measures against static discharge P264: Wash...thoroughly after handling P270: Do not eat, drink or smoke when using this product P280: Wear protective gloves/protective clothing/eye protection/face protection
	RESPONSE:	P301+P312: IF SWALLOWED: Call a POISON CENTER/doctor.../if you feel unwell P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing P332+P313: If skin irritation occurs: Get medical advice/attention P337+P313: If eye irritation persists: Get medical advice/attention P370+P378: In case of fire: Use alcohol-resistant foam to extinguish
	STORAGE:	P403: Store in a well-ventilated place
	DISPOSAL:	P501: Dispose of contents/container to...in accordance with local, state, and federal regulations

Any Regional Considerations: N/A

SECTION 2 NOTES: None Available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

	Isoamyl alcohol CAS#: 123-51-3	Isobutanol CAS#:78-83-1	Ethanol CAS#: 64-17-5
CHEMICAL NAME	Isoamyl alcohol	Isobutanol	Ethyl alcohol
COMMON NAME	Isoamyl alcohol	Isobutanol	Ethanol
CHEMICAL FAMILY	Alcohols	Alcohols	Alcohols
CHEMICAL FORMULA	C ₅ H ₁₂ O	C ₄ H ₁₀ O	C ₂ H ₆ O
SYNONYMS	3-Methyl-1-butanol Isopentyl alcohol Isobutylcarbinol	2-Methyl-1-propanol Isopropyl carbinol Isobutyl alcohol	Alcohol, absolute ethanol

INGREDIENT: Isoamyl alcohol
Ethanol
Isobutanol

NAME	CAS#	EC#	ICSC#	% WT	% VOL
Isoamyl alcohol	123-51-3	204-633-5	0798	N/A	About 60-65%
Ethanol	64-17-5	200-578-6	0044	N/A	Varies
isobutanol	78-83-1	201-148-0	0113	N/A	varies

CARCINOGENICITY

OSHA: NO
OTHER: N/A

ACGIH: NO DATA

NTP: NO DATA

IARC: NO DATA

IMPURITIES/STABILIZING ADDITIVES IDENTIFICATION:

IMPURITIES/STABILIZING ADDITIVES CLASSIFICATION (if applicable):

SECTION 3 NOTES: The average concentration of isopentanol in fusel oil is 60-65%. ICSC 0798: isoamyl alcohol, 3-methyl-1-butanol, isopentyl alcohol, isobutylcarbinol

SECTION 4: FIRST AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.



EMERGENCY OVERVIEW: Flammable liquid and vapor. May irritate nose, throat and upper respiratory tract over long exposure. May cause de-fatting and irritation of skin. Ingestion may cause dizziness, headache, or nausea. Use water in large amounts, powder, alcohol-resistant foam, carbon dioxide to extinguish fire.

ROUTES OF ENTRY/FIRST AID:

EYES CONTACT: Immediately flush eyes with water for a minimum 15 minutes. Obtain medical attention

SKIN CONTACT: Remove contaminated clothes. Flush affected skin area with water for a minimum 15 minutes. Wash affected area with soap and water

INHALATION: If inhaled, remove to fresh air

INGESTION: DO NOT induce vomiting unless directed to do so by medical personnel. Seek medical attention

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: According to ACGIH/86 the toxicity of isoamyl alcohol for anesthetic death is 12 times higher than ethyl alcohol. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and clinical conditions of the patient.

NOTES TO PHYSICIANS OR FIRST AID PROVIDERS: If ingested, gastric lavage, followed by saline catharsis

SECTION 4 NOTES: None Available

SECTION 5: FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, water spray, or alcohol resistant foam; For large fires, use water spray, fog or alcohol resistant foam; For massive fire use unmanned hose holder or monitor nozzle

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIRE FIGHTERS: Fire-fighters should wear full protective clothing including self-contained breathing apparatus. Water may not be effective. Use carbon dioxide, dry chemical or alcohol-resistant foam, applied according to manufacturer's recommended techniques. Do not direct a stream of water into hot, burning pools because the product may spread and increase the fire intensity. Cool exposed containers with water spray

UNUSUAL FIRE AND EXPLOSION HAZARDS:

(Define specific hazards arising from the chemical e.g., nature of any hazardous combustion products)

Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving iso-amyl alcohol.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition may release acrid smoke and irritating fumes.

FLAMMABLE LIMITS IN AIR (% by volume):

UPPER LIMIT: 9%

LOWER LIMIT: 1.2% at 212.0°F

FLASH POINT:

F: 55.0°F

C: 13.0°C

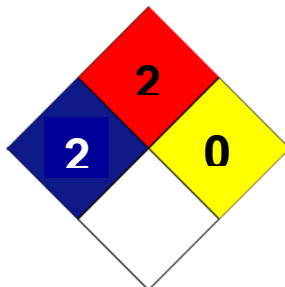
METHOD USED: Open Cup

AUTOIGNITION TEMPERATURE:

F: 791.0°F

C: 422.0°C

NFPA HAZARD CLASSIFICATION:



HEALTH=2
FLAMMABILITY=2
REACTIVITY=0
OTHER=N/A

HMIS HAZARD CLASSIFICATION (0-4 scale):

Fusel Oil	
HEALTH	2
FLAMMABILITY	2
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H
Splash goggles, gloves, chemical apron, vapor respirator	

SECTION 5 NOTES: None Available



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SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES: No open flames, no sparks and no smoking. Use ventilation and explosion-proof electrical equipment. Wear appropriate personal protective equipment. Do not eat, drink or smoke during work

ENVIRONMENTAL PRECAUTIONS: Keep material out of sewers, storm drains, surface waters, and soil; toxic to aquatic life at low concentrations

METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP: Remove all ignition sources. Ventilate area of spill or leak. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Iso-amyl alcohol should not be allowed to enter a confined space, such as sewer, because of the possibility of an explosion.

SECTION 6 NOTES: None Available

SECTION 7: HANDLING AND STORAGE

PRECAUTION FOR SAFE HANDLING: Avoid breathing vapors. Keep upwind. Do not handle broken packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water

CONDITIONS FOR SAFE STORAGE (any incompatibilities): Remove source of ignition. Keep containers closed. Store in prescribed, controllable places

SECTION 7 NOTES: None Available

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES: Reported lethal dose of isoamyl alcohol is 500 ppm (oral). Immediate dangerous to life or health concentration of isobutanol is 1600 ppm.

INGREDIENTS	ACGIH	NIOSH	OSHA-FINAL PELs
Iso-amyl alcohol	N/A	100 ppm 10-hr TWA; 125 ppm 15-minute short-term exposure limit	100 ppm 8-hr TWA
Ethanol	1000 ppm TWA	1000 ppm TWA; 1900 mg/m ³ TWA 3300 ppm IDLH	1000 ppm TWA; 1900 mg/m ³ TWA
Isobutanol	N/A	50 ppm 10-hr TWA	100 ppm 8-hr TWA

ENGINEERING CONTROLS:

VENTILATION: Local exhaust hoods; Special: 100 LFM face velocity; Mechanical: floor mounted fans

PERSONAL PROTECTIVE EQUIPMENT (PPE):

EYE PROTECTION: Splash proof goggles or face shield

SKIN PROTECTION: Rubber or chemical resistant gloves

RESPIRATORY PROTECTION: NIOSH approved respirator, SAR of SCBA

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: If permissible exposure limit is exceeded, NIOSH approved respirator. Eye wash stations and safety showers

SECTION 8 NOTES: Iso-amyl alcohol: Immediately dangerous to life or health-500 ppm

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless Liquid

PHYSICAL STATE: Liquid



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COLOR: colorless

ODOR: Disagreeable odor, pungent

pH AS SUPPLIED: N/A

pH (Other): N/A

FREEZING POINT: N/A

F:

C:

BOILING POINT:

F: 270.5°F

C: 132.5°C

MELTING POINT:

F: -179.0°F

C: -117.0°C

FLASH POINT:

F: 55.0°F

C: 13.0°C

EVAPORATION RATE (BASIS=1):

FLAMMABILITY (by %volume):

UPPER FLAMMABILITY LIMIT: 9.0%

LOWER FLAMMABILITY LIMIT: 1.2%

VAPOR PRESSURE (mmHg):

Ethanol: 59.3 mm Hg at 25.0°C

Isobutyl alcohol: 10.4 mm Hg at 25.0°C

Isoamyl alcohol: 2.37 mm Hg at 25.0°C

VAPOR DENSITY (AIR = 1) : >1

Ethanol: 1.59

Isobutyl alcohol: 2.56

Isoamyl alcohol: 3.04

SOLUBILITY IN WATER: Slightly soluble

PARTITION COEFFICIENT n-octanol/water: 1.16

AUTO-IGNITION TEMPERATURE:

Ethanol: 685.0°F/363.0°C

Isobutyl alcohol: 780.0°F/415.0°C

Isoamyl alcohol: 662.0°F/350.0°C

DECOMPOSITION TEMPERATURE: N/A (When heated to decomposition it emits acrid smoke and fumes.)

F:

C:

SPECIFIC GRAVITY (H2O = 1): 0.8

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F: 59°F/39.2°F

C: 15.0°C/4.0°C

PERCENT SOLIDS BY WEIGHT: N/A

PERCENT VOLATILE: N/A

BY WT/BY VOL @

F:

C:

VOLATILE ORGANIC COMPOUNDS (VOC):

WITH WATER: N/A

WITHOUT WATER: N/A

LBS/GAL

LBS/GAL

MOLECULAR WEIGHT: 88.15 g/mol



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VISCOSITY: 3.738 cP

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F: 77.0°F

C: 25.0°C

SECTION 9 NOTES: None Available

SECTION 10: STABILITY AND REACTIVITY

REACTIVITY: React with strong oxidizers; corrosive; ignitable; react with aluminum

STABILITY: Heat contributes to instability

CONDITIONS TO AVOID (STABILITY): Incompatible materials, heat, source of ignition

POSSIBILITY OF HAZARDOUS REACTIONS: Contact with strong oxidizers may cause fires and explosions; corrosive and will attack some forms of plastics, rubber and coatings; ignites on contact with chromium trioxide; react with aluminum. (See Ethanol, 200 proof SDS for ethanol's hazardous reactions)

INCOMPATIBILITY MATERIAL: Hydrogen trisulfide, oxidizers, reducing agents

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition may release acrid smoke and irritating fumes

SECTION 10 NOTES: None Available

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION: The toxicity data of this product has not been determined by testing or research, but to our best knowledge, this product is non-toxic.

ROUTES OF EXPOSURE: Inhalation; dermal contact; food ingestion

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS:

CONTACT WITH EYES: Irritating to eyes

CONTACT WITH SKIN: Irritating to skin; the exposure of human skin to 3-methyl-1-butanol for 5 min induced erythema in 100% of the 12 human subjects over the subsequent 60 min

INHALATION: May irritate nose, throat, and upper respiratory tract over long exposure

INGESTION: May cause dizziness, headache, or nausea; ingestion of 50-100 ml of isoamyl alcohol in humans resulted in weakness, pain, burning sensation in the chest and stomach, nausea, headache.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE:

ACUTE HEALTH HAZARDS: May irritate nose, throat and upper respiratory tract. Higher exposures will cause burns; ingestion may cause dizziness, headache or nausea.

CHRONIC HEALTH HAZARDS: May irritate nose, throat and upper respiratory tract over long exposure, may cause de-fatting and irritation of skin. Low levels will cause irritation. Higher exposure levels will cause burns. Some individuals may experience headache, nausea, dizziness, and vomiting after extended exposure time.

NUMERICAL MEASURES OF TOXICITY:

LD50/LC50:

	Fusel Oil CAS#: 75-85-4	Isoamyl Alcohol CAS#: 123-51-3	Ethanol CAS#: 64-17-5	Isobutyl Alcohol CAS#: 78-83-1
LD50/LC50:	Oral, rabbit: LD50=2028 mg/kg Oral, rat: LD50=1000 mg/kg	Oral, rabbit: LD50=2028 mg/kg Oral, rat: LD50=1300 mg/kg Oral, rabbit: LD50=3.4 g/kg Skin, rabbit: LD50=3970 mg/kg Oral, human: lethal dose: 50-500 mg/kg	Inhalation, mouse: LC50 = 39 gm/m ³ /4H; Inhalation, rat: LC50 = 20000 ppm/10H; Oral, mouse: LD50 = 3450 mg/kg; Oral, rabbit: LD50 = 6300 mg/kg; Oral, rat: LD50 = 7060	Oral, rat: LD50=2.46 g/kg Oral, rat: LD50=3100 mg/kg Oral, rabbit: LC50=3.75 g/kg Oral, mouse: LD50=3500 mg/kg Inhalation, rat: LC50=8000ppm/4-hr Inhalation, rabbit:



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			mg/kg; Oral, rat: LD50 = 9000 mg/kg;<BR.	LD50=26250 mg/cu m Skin, rabbit:LD50=3392 mg/kg Inhalation, rat: LD50=19200 mg/cu m Skin, rabbit: LD50=3400 mg/kg
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Isobutyl alcohol CAS#78-83-1

IRRITATION DATA: Slight erythema without the formation of wheals was observed...following the application of isobutyl alcohol to the skin of man. Irritation of the eyes and throat, formation of vacuoles in the superficial layers of the cornea, and loss of appetite and weight were reported among workers subjected to an undetermined, but apparently high, concentration of isobutyl alcohol and butyl acetate. Acute toxicity is about 3 times that of ethyl alcohol. It is more irritating than ethyl but less so than amyl. Under same conditions of exposure as for n-butyl alcohol, no evidence of eye irritation was noted with repeated 8 HR exposures to levels on the order of 100 ppm

CARCINOGENICITY: Not listed by ACGIH, IARC, NTP, or CA Prop 65

EPIDEMIOLOGY: No information available

TERATOGENICITY: No information available

REPRODUCTIVE EFFECTS: No information available

MUTAGENICITY: No information available

NEUROTOXICITY: No information available

MUTAGENICITY: No information available

OTHER: No information available

Isoamyl alcohol CAS# 123-51-3

IRRITATION DATA: Very high vapor concentrations irritate eyes and upper respiratory tract. A skin irritant.
Draize test, rabbit, eye: 20 mg/24H Moderate
Draize test, rabbit, skin: 20 mg/24H Moderate

CARCINOGENICITY: Not listed by ACGIH, IARC, NTP, or CA Prop 65

EPIDEMIOLOGY: No information available

TERATOGENICITY: No information available

REPRODUCTIVE EFFECTS: No information available

MUTAGENICITY: No information available

NEUROTOXICITY: No information available

MUTAGENICITY: No information available

OTHER: Near borderline between toxicity classes 3 and 4. 4=very toxic: probable oral lethal dose (human) 50-500 mg/kg, between 1 teaspoon and 1 oz for 70 kg person (150 lb). 3=moderately toxic: probable oral lethal dose (human) 0.5-5.0 g/kg, between 1 oz and 1 pint.

Ethanol, CAS# 64-17-5

IRRITATION DATA:
Draize test, rabbit, eye: 500 mg Severe;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 20 mg/24H Moderate

CARCINOGENICITY: CAS# 64-17-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

EPIDEMIOLOGY: Ethanol has been shown to produce fetotoxicity in the embryo or fetus of laboratory animals. Prenatal exposure to ethanol is associated with a distinct pattern of congenital malformations that have collectively been termed the "fetal alcohol syndrome".



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TERATOGENICITY: Oral, Human - woman: TDLo = 41 gm/kg (female 41 week(s) after conception) Effects on Newborn - Apgar score (human only) and Effects on Newborn - other neonatal measures or effects and Effects on Newborn - drug dependence.

REPRODUCTIVE EFFECTS: Intrauterine, Human - woman: TDLo = 200 mg/kg (female 5 day(s) pre-mating) Fertility - female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated).

NEUROTOXICITY: No information available.

MUTAGENICITY: DNA Inhibition: Human, Lymphocyte = 220 mmol/L.; Cytogenetic Analysis: Human, Lymphocyte = 1160 gm/L.; Cytogenetic Analysis: Human, Fibroblast = 12000 ppm.; Cytogenetic Analysis: Human, Leukocyte = 1 pph/72H (Continuous).

CHROMATID EXCHANGE: Human, Lymphocyte = 500 ppm/72H (Continuous).

SECTION 11 NOTES: No information is available for fusel oil (as a mixture) regarding carcinogenicity, epidemiology, teratogenicity, reproductive effects, mutagenicity, neurotoxicity, and mutagenicity.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICITY (AQUATIC AND TERRESTRIAL, WHERE AVAILABLE):

Isopentanol: The average concentration of isopentanol in fusel oil is 60-65%. The concentration of isopentanol in the volatile fraction of fresh poultry manure was 0.398 ppm. The concentration of isopentanol was 4.01 ppm and not detectable in manure samples that had been incubated for 9 and 28 days, respectively, at 27-28 deg C under nearly anaerobic conditions. In a study in which 29 samples of printer's inks from different European manufacturers were analyzed, isopentanol was found in only one sample at a concentration of 0.3%.

Ethanol: Ecotoxicity: Fish: Rainbow trout: LC50 = 12900-15300 mg/L; 96 Hr; Flow-through @ 24-24.3°C Fish: Rainbow trout: LC50 = 11200 mg/L; 24 Hr; Fingerling (Unspecified) Bacteria: Phytobacterium phosphoreum: EC50 = 34900 mg/L; 5-30 min; Microtox test. When spilled on land it is apt to volatilize, biodegrade, and leach into the ground water, but no data on the rates of these processes could be found. Its fate in ground water is unknown. When released into water it will volatilize and probably biodegrade. It would not be expected to adsorb to sediment or bioconcentrate in fish.

PERSISTENCE AND DEGRADABILITY: Isopentanol is readily biodegraded in aerobic screening tests using sewage or activated sludge inocula. The half-life of isopentanol is 2.4 days. Five day BOD values ranged from 49% to 77% of theoretical. The half-life of isopentanol in the atmosphere will be 2.0 days. The first-order biodegradation rate constant of isobutanol using an activated sludge inoculum was reported as $1.15 \times 10^{-2} \text{ hour}^{-1}$. This corresponds to a half-life of about 2.5 days.

BIOACCUMULATIVE POTENTIAL: The BCF for isopentanol estimated from isopentanol's octanol/water partition coefficient, log 1.42, using a recommended regression equation is 7. Such a low BCF would indicate that isopentanol would not bioconcentrate in aquatic organisms. The potential for bioconcentration in aquatic organisms of isobutanol is low.

MOBILITY IN SOIL: Expected to be very mobile in soil

OTHER ADVERSE EFFECTS: N/A

SECTION 12 NOTES: None Available

SECTION 13: DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Spray into the furnace. Incineration will become easier by mixing with a more flammable solvent; absorb it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill. Consult with environmental regulatory agencies for guidance on acceptable disposal practices.

RCRA HAZARD CLASS: Not listed

DESCRIPTION OF WASTE RESIDUES AND INFORMATION ON THEIR SAFE HANDLING AND METHODS OF DISPOSAL, INCLUDING ANY CONTAMINATED PACKAGING: When heated to decomposition it emits acrid smoke and fumes.

SECTION 13 NOTES: None Available



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SECTION 14: TRANSPORT INFORMATION

U.N. GHS TRANSPORT REQUIREMENT

UN NUMBER: UN 1201
PROPER SHIPPING NAME: Fusel Oil
TRANSPORT HAZARD CLASS: 3
PACKING GROUP: II
LABEL STATEMENT: Flammable liquid
MARINE POLLUTANT: No

SPECIAL PRECAUTIONS FOR USER: N/A

SECTION 14 NOTES: None Available

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

TOXIC SUBSTANCE CONTROL ACT (TSCA): This product is listed on the TSCA Inventory

OCCUPATIONAL, SAFETY AND HEALTH ADMINISTRATION (OSHA): Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT (CERCLA): None of the chemicals in this material have an RQ

CLEAN WATER ACT (CWA): Isobutyl alcohol is listed as Hazardous Substances under the CWA. None of the ingredients of fusel oil is listed as Priority Pollutants under the CWA. None of the ingredients of fusel oil is listed as Toxic Pollutants under the CWA.

CLEAN AIR ACT (CAA): None

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III INFORMATION:

SARA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: None

SARA SECTION 311/312 (40 CFR 370) HAZARD CATEGORIES: Acute, Chronic, and Flammable

SARA 313 REPORTABLE INGREDIENTS: None

STATE REGULATIONS: Rhode Island RTK hazardous substances-n-amyl alcohol; Pennsylvania RTK-n-amyl alcohol; Massachusetts RTK-n-amyl alcohol; Massachusetts spill list-n-amyl alcohol; New Jersey-n-amyl alcohol

INTERNATIONAL REGULATIONS: WHMIS (Canada): CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

DSDL (EEC):
R10-Flammable
R20-Harmful by inhalation
R36/38-Irritating to eyes and skin
S16-Keep away from sources of ignition-No smoking
S24/25-Avoid contact with skin and eyes
S36/37/39-Wear suitable protective clothing, gloves and eye/face protection
S46-If swallowed, seek medical advice immediately and show this container or label
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances

SECTION 15 NOTES: None Available

SECTION 16: OTHER INFORMATION

DISCLAIMER: The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Green Plains Inc. be liable for any claims, losses or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Green Plains Inc. has been advised of the possibility of such damages.

REFERENCES:

GHS Annex II
GHS SDS Instruction



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ACRONYMS/ABBREVIATIONS:

ACGIH-American Conference of Governmental Industrial Hygienists
CAA-Clean Air Act
CAS-Chemical Abstracts Service
CERCLA-Comprehensive Response Compensation and Liability Act
CHEMTREC-It serves as a round-the-clock resource for obtaining immediate response information for incidents involving hazardous material and dangerous goods.
CWA-Clean Water Act
EC-European Commission
GHS-Globally Harmonized System of Classification and Labeling of Chemicals
IARC-International Agency for the Research on Cancer
ICSC-International Chemical Safety Cards
LC50-The concentration of a chemical in air or of a chemical in water which causes the death of 50% of a group of test animals.
LD50-The amount of a chemical, given all at once, which causes the death of 50% of a group of test animals.
NIOSH-The National Institute for Occupational Safety and Health
NTP-National Toxicology Program
OSHA-Occupational Safety and Health Administration
RCRA-Resource Conservation and Recovery Act
RQ-Reportable Quantity
SARA-Superfund Amendments and Reauthorization Act
STOST-SE-Specific Target Organ Toxicity Single Exposure
TPQ-Threshold Planning Quantity
TSCA-Toxic Substance Control Act
U.N.-United Nation
UNCED-United Nations Conference on Environment and Development
VOL-Volume
WT-Weight