Safety Data Sheet (CANADA)

1. Identification

Product Identifier: Isooctene

Other Means of Identification: Isoctene (Isooctene-1 and isooctene-2); Iso-octene; 2,4,4-Trimethylpent-1-ene; 2,4,4-Trimethylpent-2-ene Isoocten; Di-n-Buten; Diisobutylenes (α-diisobutylene and β-diisobutylene)

Product use: An intermediate for the manufacture of isooctane at KAEF Commercially, it may be used as a chemical intermediate for antioxidants, surfactants, lube additives, plasticizers and rubber chemicals

Restrictions on use: Do not use for non-industrial purpose

Manufacturer: Keyera Alberta Envirofuels Facility (KAEF)

Address: 9511-17th Street, Edmonton, Alberta, Canada T6P 1Y3

Main Phone Number : 1-403-205-8300/ 1(888) 699-4853 (Mon. - ri. 8 AM - 5 PM)

Transportation Emergencies Only : **N TE** (CAN)Ph:1-888-CAN-UTEC(226-8832)/ Cell*666 (24 hr)
CH C (U.S.) Ph: 1-800-424-9300 (24 hr)

2. Hazards Identification

GHS Hazards

Pictogram	Classification	Hazard Statements
	Flammable Liquids – Category 2	Highly flammable liquid and vapor
	Skin Corrosion/Irritation – Category 2 Eye Damage/Irritation – Category 2A Specific Target Organ Toxicity, Single Exposure – Category 3	Causes skin irritation Causes serious eye irritation May cause drowsiness or dizziness
	Aspiration Hazard – Category 1	May be fatal if swallowed and enters airways
	Hazardous to the Aquatic Environment – Short Term (Acute) Hazard – Category 2	Toxic to aquatic life
	Hazardous to the Aquatic Environment – Long Term (Chronic) Hazard – Category 2	Toxic to aquatic life with long lasting effects

Signal Word: Danger

Precautionary Statements:

Prevention
- Keep away from heat, hot surfaces, sparks, open flames and other ignition sources – No smoking.
- Keep container tightly closed.
- Ground and bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting equipment.
- Use non-sparking tools.
- Take action to prevent static discharges.

- Avoid release to the environment.

- Avoid breathing vapors.
- Wash skin thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- Wear protective gloves/ protective clothing/ eye protection/ face protection.
  Gloves: neoprene, nitrile.
  Clothing: fire-retardant Nomex, Proban.
  Eye: Safety glasses with side shields or goggles.

Response
- In case of fire: use dry chemical, CO_2, or fire-fighting foam to extinguish.

- If inhaled: Remove person to fresh air and keep comfortable for breathing.
- Call a doctor/physician if you feel unwell.

- If on skin (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower.
- Take off contaminated clothing and wash it before reuse.
- If skin irritation occurs: get medical advice/attention.

- If in eyes: Rinse cautiously with water for several minutes. Remove contact lens, if present and easy to do. Continue rinsing.
- If eye irritation persists: Get medical advice/attention.
- Collect spillage.
- If swallowed: immediately call a doctor/ physician. Do not induce vomiting.

Storage
- Store in a well-ventilated place. Keep container tightly closed. Keep cool.
- Store locked up.

Disposal
- Dispose of contents/container in accordance with applicable local, provincial/state, and federal regulations.

3. Composition/Information on Ingredients

Chemical Name: Isooctene

Common Name/Synonyms: Isooctene (Isooctene-1 and isooctene-2); Iso-octene; Isoocten 2,4,4-Trimethylpent-1-ene; 2,4,4-Trimethylpent-2-ene; Di-n-Buten; Diisobutylenes (α-diisobutylene and β-diisobutylene)

Ingredient Name	wt %	CAS No.
Isooctene:	50-60	11071-47-9
Isooctene-1	40-45	107-39-1
Isooctene-2	10-15	107-40-4
Isooctane	30-35	540-84-1
C12+ Olefins/Paraffins	0 – 10	N/A
Benzene	0 – 0.004 (0 – 40 ppm)	71-43-2

4. First Aid Measures

Immediate Medical Attention and Special Treatment:
Treat symptomatically and supportively. Refer also to Table below.

First Aid:	
Inhalation:	Remove person to fresh air and keep comfortable for breathing. Call a doctor/physician if you feel unwell.
Skin:	If on skin (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: get medical advice/attention.
Eyes:	Rinse cautiously with water for several minutes. Remove contact lens, if present and easy to do. Continue rinsing. If eye irritation persists: get medical advice/attention.
Ingestion:	If swallowed: immediately call a doctor/ physician. Do not induce vomiting. **Note to Physician:** Ingestion of this product or subsequent vomiting can result in aspiration, which can cause pneumonitis.

Most Important Effects and Symptoms, Acute or Delayed:		
Exposure Route	**Health Effects**	**Symptoms of Exposure**
Skin:	Causes skin irritation.	Redness, rash.
Eye:	Causes serious eye irritation.	Redness and pain.
Inhalation:	Effects on the Central Nervous system (CNS) may range from mild to severe effects such as respiratory depression.	From rapid breathing, fatigue, headache, light-headedness to more severe symptoms of dizziness/drowsiness, and in extreme cases, respiratory arrest, convulsions or loss of consciousness.
Ingestion:	May be aspirated into lungs if swallowed, may result in pulmonary edema & chemical pneumonitis.	Signs and symptoms of aspiration may include coughing, difficulty breathing, “gurgling” lung sounds when breathing, coughing up phlegm (sputum) that isyellow or green in color or bad smelling, change in voice (hoarseness), skin turning bluish due to lack of oxygen.

5. Fire Fighting Measures

Flammability: Yes. The liquid and vapor are highly flammable.	**Hazardous Combustion Products:** Carbon monoxide (CO), carbon dioxide (CO_2), and acrid smoke.
Explosion: Sensitive to impact: No	**Sensitive to static discharge:** Yes

Extinguishing Media:
Small Fire: dry chemical, CO_2, or fire-fighting foam.
Large Fire: fire-fighting foam.

Fire-fighting foams which can be used are as follows:
Fluoroprotein (FP)- Aspirated, Film-Forming Fluoroprotein (FFFP)- Non aspirated or aspirated, Alcohol-Resistant FFFP- Non aspirated or aspirated, AFFF - Non-aspirated or aspirated, AR-AFFF - Non-aspirated or aspirated.

Unsuitable Extinguishing Media:

- Water: isooctene is not soluble in water. Using water may spread fire.

Special Protective Equipment for Firefighters:

- Wear full protective clothing and NIOSH-approved SCBA with full face-piece.

Precautions for Firefighters:

- If tank, rail car or tank truck is involved in a fire, isolate for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions.
- Move container from fire area if you can do it without risk.
- Apply cooling water to sides of containers that are exposed to flames until well after fire is out.
- Stay away from ends of tanks.
- Stay away from tanks engulfed in fire. Closed containers exposed to heat may explode. (OSHA Class 1B Flammable Liquid)
- Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
- Cool fire-exposed containers with flooding quantities of water applied from as far a distance as possible.
- See Guide 128, Emergency Response Guidebook (Tranp. Can/US Dept. of Transp).

Unusual Fire and Explosion Hazards:

- The highly flammable vapors are heavier than air and may accumulate in low areas and /or spread along ground to distant ignition sources and flash back.
- Thermal decomposition produces acrid fumes.
- Vapor-air mixtures are explosive above the flash point.

6. Accidental Release Measures

Protective Equipment:

Gloves:	Recommended: neoprene and nitrile. Not recommended for heavy use: rubber, PVC, latex.
Respirator:	NIOSH Approved and equipped with organic-vapor filter;
Eye:	Safety glasses with side shields, safety goggles or face shields.
Clothing:	Flame-retardant and chemical resistent e.g. Nomex, Proban.

Large spills: wear full protective clothing and NIOSH-approved SCBA with full face-piece.

Precautions:

- This highly flammable liquid must be kept from sparks, open flame, hot surfaces, and all sources of ignition and heat.
- The highly flammable vapors are heavier than air and may accumulate in low areas and /or spread along ground to distant ignition sources and flash back.

Emergency Procedures:

- Shut off leak/release source, if it can be done safely.
- Remove all sources of ignition.
- Isolate hazard area.
- Evacuate area of all unnecessary personnel.
- Keep unnecessary and unprotected personnel from entering.
- Emergency personnel must wear appropriate personal protective equipment.

  Small spill: will evaporate.

  Large spill: consider downwind evacuation of at least 300 meters (1000 ft.)
  If tank, rail car or tank truck is involved in a fire, ISOLATE and consider initial evacuation in all directions for 800 meters (½ mile).
- Ventilate area of leak or spill.

Containment and Clean-up:

- Use non-sparking tools and equipment.
- Use booms/pillows to prevent runoff into storm sewers and ditches that lead to waterways.
- Have foam or dry powder extinguisher on hand.
- Contain and recover liquid if it can be done safely: Collect spillage or absorb with an inert material (e.g., vermiculite, dry sand, earth), and place in metal container which can be grounded.
- Do not use combustible materials, such as sawdust, as absorbent.
- On large ground spills use fire fighting foam to contain vapors. Recommended application rate is 0.1 USGPM/sq. ft. (4.1 L/Min/sq.ft.). This is the application rate for hydrocarbons as per NFPA 11
- If a leak or spill has not ignited, water spray may be used to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.
- Refer to Guide 128 of the Emergency Response Guidebook (Transport Canada/US Dept. of Transportation).

7. Handling and Storage

Handling Precautions :

- Use only in a well ventilated area.
- Keep away from heat/sparks/open flames/hot surfaces – No smoking.
- Avoid contact with eyes, skin, and clothing.
- Avoid ingestion and inhalation
- Wear protective gloves/clothing and eye/face protection:

Gloves:	Recommended: neoprene and nitrile.
	Not recommended for heavy use: rubber, PVC, latex.
Respirator:	NIOSH Approved and equipped with organic-vapor filter;
Eye:	Safety glasses with side shields, safety goggles or face shields.
Clothing:	Flame-retardant e.g. Nomex, Proban.

- Use only non-sparking tools and explosion-proof ventilation equipment.
- Take precautionary measures against static discharge.
- Ground/bond containers and equipment when transferring material.
- Keep container tightly closed.

Storage Precautions:

Locations

- Store in a cool, dry, well-ventilated location, away from any area of fire-hazard.
- Outside or detached storage is preferred.
- Storage and use areas should be No Smoking areas.
- Ventilation system must be explosion-proof.
- Store locked-up.

Containers

- Containers should be grounded.
- Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters.
- Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.
- Do not attempt to clean empty containers since residue is difficult to remove.
- Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

.

Other precautions

- Separate from incompatibles like oxidizers e.g. bromates, chlorates, chromates, hypochlorites, perchlorates, peroxides, nitrates, nitrites.

8. Exposure Controls / Personal Protection

EXPOSURE LIMITS

	Authority	15 MINS STEL	8-HOURS OEL
Isooctene (2,4,4-trimethylpentene) CAS 11071-47-9	Alberta, B.C. Ontario	Not available	Not Available
	There is no STEL or OEL established for isooctene in Canada		
Isooctane (2,2,4-trimethylpentane)	Alberta, B.C.	-	300 ppm (1400mg/m3)
	Ontario	375 ppm (1750 mg/m3)	300 ppm (1400mg/m3)
Benzene (CAS 71-43-2)	Alberta	2.5 ppm (1.6 mg/m3) – skin	0.5 ppm (8 mg/m3) – skin
	Ontario, BC	2.5 ppm – skin	0.5 ppm – skin

ENGINEERING CONTROLS

- Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation, process or personal enclosure, control or process conditions, and process modification.
- Ventilate area where product is used, stored and/or handled to maintain airborne concentrations below the LEL and OEL, especially in confined spaces.
- Ventilation equipment must be explosion proof.
- Exhaust directly to the outside, taking necessary precautions for environmental protection.
- Supply sufficient replacement air to make up for air removed by exhaust systems.

PERSONAL PROTECTIVE EQUIPMENT

Gloves:	Recommended: neoprene and nitrile. Not recommended for heavy use: rubber, PVC, latex.
Clothing:	Flame-retardant e.g. Nomex, Proban.
Respirator:	NIOSH-approved air-purifying respirator equipped with organic-vapor cartridges. NIOSH-approved SCBA with full face-piece if concentration is unknown.
Eye:	Safety glasses with side shields, safety goggles or face shields.

9. Physical and Chemical Properties

Chemical Formula: C8H16 $CH_2=CH(CH_3)CH_2CH(CH_3)_3$ OR $CH_3C(CH_3)=CHC(CH_3)_3$	**Molecular Weight:** 112.22 g/mole	**Chemical Family:** Hydrocarbon, aliphatic
Appearance: Clear, colorless, mobile liquid	**Odor:** Mild gasoline odor	**Odor Threshold:** Not established
pH: N/AP	**Freezing Pt./Melting Pt.:** -106°C (-159°F)	**Boiling Point:** 101°C (214°F)
Flashpoint and Method: -3°C (26.6°F) Closed Cup 10°C (50.0°F) Open Cup	**Flammability:** Yes	**Evaporation Rate:** <1 (ether = 1) >1 (Butyl Acetate = 1)
Upper-Lower Explosive Limit: 4.8% - 0.8%	**Vapor Pressure:** 45 mmHg @ 25°C	**Vapor Density:** 3.9 (air = 1)
Specific Gravity: ~0.7150 @20°C/4°C	**Percent Soluble (@25°C):** <0.1% in water	Soluble in organic solvents e.g. acetone, chloroform, xylene, alcohol and ether
Partition Coefficient n-octanol/water: Not available	**Auto-Ignition Temperature:** ~384°C (723°F)	**Decomposition Temp.:** Not available
Dynamic Viscosity: Not available	**Kinematic Viscosity:** Not available	**Isobaric Heat Capacity:** Not available
Henry's Law Constant: 0.746 atm m^3/mol @ 25°C	**Percent Volatile:** 100 by volume	

10. Stability and Reactivity

Reactivity:
Avoid incompatible materials: may react violently with oxidizers.

Chemical Stability:
Stable under normal temperatures and pressures.

Possibility of Hazardous Reactions:
Polymerization has not been reported to occur under normal temperature and pressure conditions.

Conditions to Avoid:
Extreme temperatures and incompatible materials.

Incompatible Materials:

- Acids: may react violently with nitric acid, an oxidizer.
- Oxidizers: may react violently with oxidizers such as bromates, chlorates, chromates, hypochlorites, perchlorates, peroxides, nitrates, nitrites.

Hazardous Decomposition Products:
No decomposition if stored and applied as directed.

11. Toxicological Information

Exposure Route	Acute Health Effects	Symptoms of Exposure
Inhalation:	Effects on the Central Nervous system (CNS) may range from mild to severe effects such as respiratory depression.	From rapid breathing, fatigue, headache, light-headedness to more severe symptoms of dizziness/drowsiness and in extreme cases, respiratory arrest, convulsions or loss of consciousness.
Skin:	Causes skin irritation.	Redness, rash.
Eye:	Causes serious eye irritation.	Redness and pain.
Ingestion:	May be aspirated into lungs if swallowed, may result in pulmonary edema & chemical pneumonitis.	Signs and symptoms of aspiration may include coughing, difficulty breathing, "gurgling" lung sounds when breathing, coughing up phlegm (sputum) that is yellow or green in color or bad smelling, change in voice (hoarseness), skin turning bluish due to lack of oxygen.
	May have effects on the CNS.	See "inhalation" above for symptoms of CNS effects.

Chronic Exposure:

Inhalation:
Not available.

Skin:
Not known to be a skin-sensitizer. Repeated and prolonged contact may cause dermatitis due to the defatting action.

Medical Conditions Aggravated by Exposure:
Dermatitis impaired pulmonary function, diseases of the eyes, liver, kidneys or lungs.

Sensitization: No	**Reproductive Toxicology:** No	**Teratogenicity:** No	**Mutagenicity:** No
Carcinogenicity: No.	**Irritancy:** Irritant to eyes & skin.	**Target Organs:** Central Nervous System (CNS)	

Lethality Tests:

Chemical	CAS No.	LD50	LC50
Isooctene	11071-47-9	Rat, oral >12500 mg/kg	Rat, inhalation, 20 hrs >4900 ppm
Isooctane	540-84-1	Rat, oral >5000 mg/kg Rabbit, dermal >2000 mg/kg	Rat, inhalation 47.4 mg/L 1 hr. Rat, inhalation >14.38 mg/L 4 hr.
Benzene	71-43-2	Rabbit, dermal:>8200 mg/kg Rat, oral: 810 mg/kg	Rat, inhalation: 44.66 mg/L 4hr.

12. Ecological Information

Persistence & Degradability: Slow biodegradation in soil and water.	**Bioaccumulative Potential:** May bioaccumulate to some extent.
Mobility: No data available.	**Other Adverse Effects:** No data available.

Terrestrial Fate:

- Expected to have moderate mobility in soil based upon an estimated Soil organic carbob – water Partition Coefficient Koc of 276.
- Volatilization from moist soil surfaces is expected to be an important fate process based upon an estimated Henry's Law constant of 0.746 atm-cu m/mole.

Aquatic Fate:

- Hydrolysis of isooctane in water is not expected to be important because the compound does not contain any hydrolysable group.
- Volatilization from water surfaces is expected to be an important fate process based upon this compound's estimated Henry's Law constant.
- Estimated volatilization half-lives for a model river and model lake are 3.1 and 101 hours, respectively.
- However, volatilization from water surfaces is expected to be attenuated by adsorption to suspended solids and sediment in the water column. An estimated BCF of 240 suggests the potential for bioconcentration in aquatic organisms is high.

Atmospheric Fate:

- If released to air, a vapor pressure of 35.9 mm Hg at 25 deg C indicates that isooctene will exist solely in the vapor-phase in the ambient atmosphere.
- The half-life of isooctene due to the reaction with atmospheric hydroxyl OH radicals is 4.4 hrs.

Eco Toxicity Tests (isooctane: CAS 11071-47-9)

Species	Test Method	LC50/ EC50/
Oncorthynchus mykiss (rainbow trout)	Semi-static test; 96 hours	LC50 = 0.11 mg/L
Daphnia magna (water flea)	Static test; 48 hours Chronic Toxicity: 21 days	EC50 = 0.4 mg/L NOEC = 0.17 mg/L
Algae	72 hours	EL50 = 2.943 mg/L

Eco Toxicity Tests (benzene: CAS 71-43-2)

Species	Test Method	LC50/ EC50/
Oncorhynchus mykiss (rainbow trout)	Flow through 96 hours	5.3 mg/L
Pimephales promelas (fathead minnow)	Flow through 96 hours Static 96 hours	10.7-14.7 mg/L 22330-41160 ug/L
Lepomis macrochirus (bluegill)	Static 96 hours Static 96 hours	22.49 mg/L 70000-142000 ug/L
Poecilla reticulata (guppy)	Static 96 hours	28.6 mg/L
Daphnia magna (water flea)	Static test; 48 hours	EC50 = 8.76-15.6 mg/L
Algae Pseudokirchneriella subcapitata	72 hours	EL50 = 29 mg/L

13. Disposal Considerations

Waste Disposal:

- Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial, and federal regulations.
- Waste isooctane can be incinerated, fuels blending, or recycled
- Do not dispose of waste with normal garbage, or to sewer systems.

14. Transport Information

TDG (CANADA) CLASSIFICATION

PROPER SHIPPING NAME: Diisobutylene, Isomeric compounds

CLASS: 3 (Flammable Liquid)

UN NUMBER: UN2050

PACKING GROUP: II

LABEL/PLACARD:

TDG SPECIAL PROVISION: None

IMO (International Marine Organization) and IBC Code (International Bulk Chemical)

- UN 2050, Diisobutylene, Class 3, Packiing Group II
- Marine Pollutant (2,2,4-Trimethylpentene/ Isooctene); Pollution Category: X
- Hazards: P
- Ship Type 2
- Tank Type: 2G

15. Regulatory Information

CANADA

		DSL	NPRI	E2*
Isooctene	CAS 11071-47-9	yes	no	no

* E2 = Environmental Emergencies (Canada)

16. Other Information

NFPA Hazard Rating:
Health 2, Flammability 3, Instability 0

Prepared for:	Keyera Health and Safety
Issue Date/ Revision No:	August 17, 2021/ Revision#1

Revisions:	Dates:	Main Changes:
• Original:	March 1, 2017	
• 1st Revision	August 17, 2021	Phone numbers

Glossary
ACGIH – American Conference of Governmental Industrial Hygiene
DOT – US Department of Transportation
DSL – Domestic Substance List (Canada)
E2 – Environmental Emergencies (Canada)
GHS – Globally Harmonized System
IARC – International Agency for Research on Cancer
IDLH – Immediately Dangerous to Life and Health
NIOSH – National Institute for Occupational Safety & Health
NPRI – National Pollutant Release Inventory (Canada)
NTP – National Toxicology Program
OSHA – Occupational Safety & Health Administration of the US Depart of Labour
PEL – Permissible Exposure Limit
SARA – Superfund Amendments and Reauthorization Act of 1986
STEL – Short Term Exposure Limit
TRI – US Toxic Release Inventory
TSCA – Toxic Substance Control Act
TWA – Time Weighed Average

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~ End of Safety Data Sheet ~