Safety Data Sheet (US)

1. Identification

Product Identifier:	Isooctane
Other Means of Identification:	Isoctane; Iso-octane; 2,2,4-Trimethylpentane; Pentane, 2,2,4-Trimethyl; 2,4,4-Trimethylpentane; Isobutyltrimethylmethane; TMP
Product use:	Gasoline blending component
Restrictions on use:	Do not use for non-industrial purpose
Manufacturer:	Keyera Alberta Envirofuels Facility
Address:	9511-17th Street, Edmonton, Alberta T6P 1Y3
SDS Information:	1-780-449-7910
Emergency Contact (24 hours):	1-613-996-6666 (CANUTEC, Canada) 1-800-424-9300 (CHEMTREC, U.S.)

2. Hazards Identification

GHS Hazards

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

Signal Word: Danger

Precautionary Statements:

Prevention

- Keep away from heat/sparks/open flames/hot surfaces – No smoking.
- Keep container tightly closed.
- Ground/Bond container and receiving equipment.
- Use explosion-proof ventilation equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.

- 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.

- Avoid release to the environment.

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 swallowed: immediately call a doctor/ physician. Do not induce vomiting.

- Collect spillage.

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: Isooctane

Common Name/Synonyms: Isoctane; Iso-octane; 2,2,4-Trimethylpentane; Pentane, 2,2,4-Trimethyl; 2,4,4-Trimethylpentane; Isobutyltrimethylmethane; TMP

Ingredient Name	wt %	CAS No.
Isooctane	85 – 100	540-84-1
Isododecane	0 – 10	13475-82-6
Paraffins & Isoparaffins	0 – 5	N/A
Benzene	0 – 0.005 (0 – 50 ppm)	71-43-2

The quantity of benzene in isooctane is below the threshold of 0.1 % for classification of this product as carcinogen.

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. If eye irritation persists: get medical advice/attention.
Ingestion:	If swallowed: immediately call a poison center/doctor/ physician. Do not induce vomiting.

Most Important Effects and Symptoms, Acute or Delayed:		
Exposure Route	**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 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: isooctane 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 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.

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
Isooctane (2,2,4-trimethylpentane) CAS 540-84-1	ACGIH TLV	None	300 ppm (1401 mg/m^3)
	OSHA PEL	None	None
	NIOSH REL	None	None
Benzene (CAS 71-43-2)	ACGIH TLV	2.5 ppm (8 mg/m^3)	0.5 ppm (1.6 mg/m^3)
	OSHA PEL	5 ppm (15 mg/m^3) *	1 ppm (3 mg/m^3) *
	NIOSH REL	0.1 ppm	1.0 ppm

* Table Z-2 for exclusions in 29 CFR 1910.1028(d)

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: C8H18 $(CH_3)_3CCH_2CH(CH_3)_2$	**Molecular Weight:** 114.23 g/mole	**Chemical Family:** Hydrocarbon, aliphatic
Appearance: Clear, colorless, mobile liquid	**Odor:** Mild gasoline odor	**Odor Threshold:** Not established
pH: N/AP	**Freezing Point:** -107°C (-161°F)	**Boiling Point:** 96-97°C (204.8-206.61°F)
Flashpoint and Method: -12°C (10.4°F) Closed Cup 4.5°C (40.1°F) Open Cup	**Flammability:** Yes	**Evaporation Rate:** <1 (ether = 1) >1 (Butyl Acetate = 1)
Upper-Lower Explosive Limit: 6.0% - 1.1%	**Vapor Pressure:** 13-20 kPa @20°C	**Vapor Density:** 3.9 (air = 1)
Specific Gravity: ~0.701 @20°C/4°C	**Percent Soluble (@25°C):** 0.0002% in water	Soluble in organic solvents e.g. acetone, chloroform, xylene, alcohol and ether
Partition Coefficient n-octanol/water: Not available	**Auto-Ignition Temperature:** ~415°C (779°F)	**Decomposition Temp.:** Not available
Dynamic Viscosity: 0.51 mPas @ 22°C (less than 32 saybolt universal seconds)	**Kinematic Viscosity:** ~0.8 cSt (or mm^2/sec) @ 20°C(68°F)	**Isobaric Heat Capacity:** 2.408 J/g K (360K, 20 bar), 2.399 J/g K (360K, 100 bar)
Henry's Law Constant: 3.04 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:	May cause slight irritation of the nose, throat and lungs.	Cough, running nose, difficulty in breathing.
	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 and in extreme cases, respiratory arrest, convulsions or loss of consciousness.
Skin:	May produce mild irritation.	Redness, rash.
Eye:	May cause mild 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 isyellow 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.
	May cause gastrointestinal irritation.	Symptoms of gastrointestinal irritation include diarrhea, nausea and vomiting.

Chronic Exposure:

Inhalation:
Animal studies indicated that isooctane can induce kidney tumor in male rats; the effects are not considered to be relevant to human since it is a male-rate-specific nephropathy involving the alpha-2μ-globulin protein.

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

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: Yes (benzene component).	**Irritancy:** Irritant to eyes, nose, throat, gastrointestinal tract & skin.	**Target Organs:** Central Nervous System (CNS), Kidneys.

Lethality Tests:

Chemical Name	CAS No.	LD50	LC50
Isooctane	540-84-1	Rat >2500 mg/kg	Rat, inhalation 47.4 mg/L/1 hr.
Benzene	71-43-2	Rabbit, dermal:>8200 mg/kg Rat, oral: 810 mg/kg	Rat, inhalation: 44.66 mg/L 4 hr.

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:

- Photolysis and hydrolysis of isooctane are not expected to be important in soil. Although isooctane may undergo slow biodegradation in soil, volatilization from dry and wet soil surfaces is expected to be more important in the fate process. Isooctane is not expected to leach into groundwater.

Aquatic Fate:

- Hydrolysis of isooctane in water is not expected to be important because the compound does not contain any hydrolysable group.
- Photolysis of the compound in water is also expected to be unimportant because isooctane is transparent to wavelengths available in sunlight.
- Although slow biodegradation may occur in aquatic medium, volatilization from water is expected to be the dominant process. Isooctane is expected to have a half-life of less than 1 day in water.
- This material may bio-accumulate to some extent.

Atmospheric Fate:

- The reaction of isooctane with atmospheric oxygen may not be important in the atmosphere. The gas-phase reactions of alkanes with ozone and nitrate radicals are of negligible importance as atmospheric loss processes. The half-life of isooctane due to the reaction with atmospheric OH radicals is 4.4 days.

Eco Toxicity Tests (isooctane: CAS 540-84-1)

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

DOT (U.S.) CLASSIFICATION

PROPER SHIPPING NAME: Octanes

CLASS: 3 (Flammable Liquid) **UN NUMBER:** UN1262

PACKING GROUP: II **LABEL/PLACARD:**

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

- UN 1262, Octanes,3, II (-12°C /10.4°F)
- Marine Pollutant (2,2,4-Trimethylpentane/ Isooctane); Pollution Category: X
- Hazards: P
- Ship Type 2
- Tank Type: 2G

15. Regulatory Information

UNITED STATES

Isooctane is on the

- HAP Hazardous Air Pollutant list
- TSCA Toxic Substances Control Act list
- CERCLA Comprehensive Environmental Response, Compensation, and Liability Act (Superfund List): 1000 lb/454 kg final RQ
- CSWHS Clean Water Act Hazardous Substance list (Statutory Code 3)
- EPA HPV EPA sponsored High Production Volume chemical list

16. Other Information

NFPA Hazard Rating:
Health 1, Flammability 4, Instability 0

Prepared for: Keyera Health and Safety
Issue Date/ Revision No: September 26, 2017/ Revision #11

Revisions:	Dates:	Main Changes
• Original:	February 15, 2001	
• 1st revision:	November 20, 2002	regulatory information
• 2nd revision:	February 26, 2003	emergency contact phone number
• 3rd revision:	January 31, 2006	contact info; vapor pressure
• 4th revision:	February 22, 2007	IMO's adoption of IBC code
• 5th revision:	January 4, 2010	emergency contact phone number
• 6th revision:	July 1, 2012	company name change
• 7th revision	February 8, 2013	added corporate logo and info
• 8th revision	September 30, 2014	corrected NFPA rating; GHS format
• 9th revision	July 15, 2015	added benzene component; added glossary
• 10th revision	August 31, 2015	changed emergency contact number
• 11th revision	September 26, 2017	updated Section 9

Glossary

ACGIH – American Conference of Governmental Industrial Hygiene
DOT – US Department of Transportation
IARC – International Agency for Research on Cancer
IDLH – Immediately Dangerous to Life and Health
NIOSH – National Institute for Occupational Safety & Health
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

Disclaimer of Expressed and Implied Warranties

The information presented in the Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. However, neither Keyera nor its affiliates assumes any liability whatsoever for the accuracy or completeness of the information contained herein. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use.

~ End of Safety Data Sheet ~