SAFETY DATA SHEET (SDS)

SDS in accordance with UN GHS Purple Book **CAP – SDS – 01 - Ethylene (Rev.04)**

This SDS is effective as of 29 Feb 2024 and supersedes previous document published | Validity date: 28 Feb 2029

SECTION-1. IDENTIFICATION

Product/Material	:	**Ethylene**
Recommended Use	:	Raw material for chemicals and petrochemical applications, Production of polyethylene, ethylene copolymers, chemical synthesis etc.
Manufacturer	:	**PT CHANDRA ASRI PACIFIC Tbk (CAP)**
Head Office	:	Wisma Barito Pacific, Tower A, 7th floor, Jl. Letjend S. Parman, Kav.62-63. Jakarta 11410, Indonesia.
Plant	:	Jl Raya Anyer Km.123, Ciwandan, Cilegon 42447, Indonesia. Ph: 62-254-601501
Emergency contact (24 hrs)	:	Ph: 62-254-601501 Ext 1232

SECTION-2. HAZARD IDENTIFICATION

GHS Classification	:	Flammable gas: Category 1A | Gas under pressure: Compressed gas | Specific target organ toxicity, single exposure; Respiratory tract irritation: Category 3 | Specific target organ toxicity, single exposure; Narcotic effects: Category 3
Hazard statements	:	H220: Extremely flammable gas | H280: Contains gas under pressure; may explode if heated | H335: May cause respiratory irritation | H336: May cause drowsiness or dizziness.
Pictogram (Hazard Symbols)	:	
Signal Word	:	DANGER
NFPA Hazard Rating	:	Health = 1 Flammability = 4 Reactivity = 2
Precautionary Statements	:	P210: Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources – No smoking | P261: Avoid breathing dust/fume/gas/mist/vapor/spray | P271: Use only outdoors or in a well-ventilated area | P304+P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing | P312: Call a POISON CENTER/doctor if you feel unwell | P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely | P381: In case of leakage, eliminate all ignition sources | P403+P233: Store in a well-ventilated place. Keep container tightly closed | P405: Store locked up | P410+P403: Protect from sunlight. Store in a well-ventilated place | P501: Dispose of contents/container in accordance with local/regional/national/international regulation (to be specified).

SECTION-3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Identity	:	Ethylene	CAS No.	: 74-85-1
			EC No.	: 200-815-3
Common Name	:	Ethylene (C_2H_4)		

Concentration	:	≥ 99,95 % vol	Impurities	: ≤ 0,05% vol

SECTION-4. FIRST-AID MEASURES

General	:	DANGER! Extremely cold, flammable liquid and gas under pressure. Can perform explosive mixtures with air. Can cause severe frostbite. May cause dizziness and drowsiness. Keep away from heat, sparks and flame. Do not puncture or incinerate the container. Self-contained breathing apparatus and protective clothing may required by rescue workers. Evaporates readily and forms cold fogs heavier than air and explosive mixture with air. Contact with liquefied gas may cause frostbite. In case of health troubles or doubts, seek medical advice immediately and show this Safety Data Sheet where possible. Ensure activity of vitally important functions until the arrival of the doctor (artificial respiration, inhalation of oxygen, heart massage). If the patient is unconscious, or in case of danger of black out (aspychia), transport patient in a stabilized position. In case of first-degree burns (painful redness), and second-degree burns (painful blisters), cool the affected area with cold running water for a long time. In case of third-degree burns (redness, cracking pale skin, usually without pain), do not cool affected skin, dress the area with sterile dry gauze only.
Skin	:	More affected individuals to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.
Inhalation	:	For skin contact, wash immediately with soap and water. DO NOT USE HOT WATER. Seek medical attention if symptoms develop or persist. Thaw frostbite slowly with lukewarm water. DO NOT RUB the affected area. Do not pull off adherent clothing or objects. Seek medical attention at once
Eyes	:	If can be done safely remove contact lenses. Immediately flush your eyes with cold water for at least 15 minutes while holding your eyelids open. DO NOT USE HOT WATER. Seek medical attention if symptoms develop or persist.
Ingestion	:	Not applicable (gas)
Note to Physician	:	Treat unconsciousness, frostbite, nausea, hypotension, seizures and cardiac arrhythmia in a conventional manner. Administer oxygen by mask if there is respiratory distress. Treatment of overexposure should be directed at controlling the symptoms and clinical condition of a patient. After adequate first aid, no further treatment is necessary unless symptoms reappear.

SECTION-5. FIRE-FIGHTING MEASURES

Flammable Properties	:	Extremely flammable. Gas/air mixtures are explosive. In case of leakage high risk of fire. The gas is heavier than air and may travel along the ground ignition is possible. Vapors may form an explosive mixture with air. Keep containers away from sources of heat or fire. Highly explosive in the presence of sparks, fire, heat and oxidizing agents.

Extinguishing Media

Suitable Extinguishing Media	:	Dry chemicals, foam, carbon dioxide, and water fog. Do not use water jets. Foam cover may help suppress the evolution of flammable gas. Use massive quantities of water to cool fire-exposed containers and to protect personnel. Do not attempt to extinguish a leaking gas fire unless the leak source can be isolated and shut off. Let

the uncontrolled fire burn off.

Unsuitable Extinguishing Media : Do not use water jet.

Specific Hazards in Case of Fire

Hazardous Combustion Products : Upon combustion, this product emits carbon monoxide, carbon dioxide, and/or low molecular weight hydrocarbons.

Special Protective Equipment and Precaution for Fire Fighter

Special Protective Equipment : Full-face self-contained breathing apparatus, thermal protective clothing.

Precautions for Fire-Fighter : Keep unnecessary personnel away. Pipeline and container explosion hazards are extremely high when this product had exposed to heat or flame. May explode when heated or involved in a fire. Use massive quantities of water to cool fire-exposed pipelines or containers. Immediately withdraw in case of fire and tank venting or heat discoloration of a tank. Vapors may travel to some distant source of ignition and flash back. Be aware of the possibility of re-ignition. When the pressure in a container needs to be controlled, consider setting up emergency isolation and evacuation for at least 800m. If the tank is involved in a fire, ISOLATE for 1,600m in all directions. Let uncontrolled fires burn off. Firefighters should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling any smoke and combustion materials. Remove and clean or destroy any contaminated clothing. Cools containers with flooding quantities of water until well after the fire is out. Control runoff waters to prevent entry into ditches, sewers, drains, underground or confined spaces and waterways.

SECTION-6. ACCIDENTAL RELEASE MEASURES

Personal Precautions : Wear self-contained breathing apparatus when entering the area unless the atmosphere is proven safe.

Environmental Precautions : Avoid entry of product into drains, sewers, or waterways

Methods and Materials for Containment and Cleaning up : Evacuate area. Ensure adequate air ventilation. Do not touch spilt material. No smoking or open flames are permitted in storage, use, or handling areas. Eliminate ignition sources. Dissipate static electricity during transfer or processing by proper earthing (grounding) and bonding of containers and equipment.

SECTION-7. HANDLING AND STORAGE

Precautions for Safe Handling : Wear self-contained breathing apparatus when entering the area unless the atmosphere is proven safe. Keep locked up or secured. This material can be stored as a flammable gas or liquid depending on the temperature and pressure. Handle is fully enclosed, grounded, adequately designed and approved transfer and storage systems. Use with adequate ventilation. Avoid inhalation. Keep away from uncontrolled heat and incompatible materials. Ground all material handling and transfer equipment to dissipate the build-up of static electricity. Wear suitable protective equipment including thermally protective gloves. No smoking or open flames are permitted in storage, use, or handling areas. If used in refrigeration, check if the drains are not plugged and if the valves are working and not plugged by ice formed from the vaporizing liquid.

Conditions for Safe Storage, including Incompatibilities : Storage area should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorized personnel. Store in grounded, adequately designed and approved pressure containers and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. Store according to applicable codes or regulations for liquefied pressurized gases as applicable to: cylinders, vessels, piping, building, rooms, cabinets, allowable

quantities and minimum storage distance. Have appropriate extinguishing capability in storage areas (e.g. sprinkler system, portable fire extinguishers) and flammable gas detectors. Storage pressure vessels should be above ground and dike. Keep cylinders secure while in storage or in transportation.

See Section 8: Exposure Controls/Personal Protection for appropriate Personal Protective Equipments. See Section 10 for information on Incompatibilities

SECTION-8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Information on the System Design : Engineering methods include mechanical ventilation (dilution and local exhaust) process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems, and other process modifications. Ensure all exhaust ventilation systems are discharged outdoors, away from air intakes and ignition sources. Supply sufficient replacement air to make up for air removed by exhaust systems. Administrative (procedure) controls and the use of personal protective equipment may also be required. Personal protective equipment should not be considered a long-term solution to exposure control. Persons in ill health where such illness would be aggravated by exposure to the product should not be allowed to work with or handle this product.

Exposure Limits

Component Name (CAS No)	Reference	TWA		STEL	
		ppm	mg/m^3	ppm	mg/m^3
Ethylene (74-85-1)	ACGIH	200	230	-	-

Ventilation : Control airborne concentrations below the exposure guidelines

Respiratory Protection : If engineering controls and ventilation are insufficient to prevent the build-up of aerosols or vapor and/or oxygen concentrations are low, appropriate air-supplied breathing apparatus should be used.

Hand Protection : Use impervious gloves designed to prevent the freezing of body tissues if contact with liquefied gas is possible. Wear chemical-resistant safety footwear with good traction to prevent slipping.

Eyes Protection : Wear safety glasses. Use of chemical goggles under a full-face shield is recommended if contact with liquefied vapor is possible.

Skin Protection : Work clothing that sufficiently prevents skin contact and prevents freezing of body tissues if contact with liquefied gas is possible should be worn, such as coveralls and/or long sleeves and pants. Fire-resistant (i.e., Nomex) or natural fibber clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and would not recommend where flammable vapor releases may occur.

SECTION-9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance	Gas at ambient conditions, liquid under pressure	Oxidizing Properties	May react with strong oxidizing agents.
Color	Colorless	Explosive Properties	Explosion class IIB
Odor	Gassy/Aromatic	Evaporation Rate	Not Applicable
Odor Threshold	270 – 600 ppm	Solubility (water)	Negligible (131 mg/l at $25^{O}C$)
pH	Not Applicable	Relative Density at $104^{O}C$	0.5678 (water=1)
Boiling Point/Boiling Range	$-103.77^{O}C$	Partition Coefficient (Octanol/Water Log Pow)	1.13
Melting Point Flash Point	$-169.15^{O}C$ $-136^{O}C$	Viscosity	1.06 cSt at $-170^{O}C$
Auto-ignition	450 ~ $490^{O}C$	Evaporation	Immediate at $20^{O}C$
Flammable Classification	3F	Relative Vapor Density	0.975 (air=1)

Lower Flammable (explosion) Limit	2.7%	Additional Physical and Chemical properties	No additional information available
Upper Flammable (explosion) Limit	36%		

SECTION-10. STABILITY AND REACTIVITY

Chemical Stability	:	This product is moderately reactive and may polymerize, decompose, or become self-reactive under certain conditions of shock, high temperatures, high pressures, or contamination.
Possibility of Hazardous reaction & Hazardous Polymerization	:	Hazardous polymerization can occur at elevated temperatures and pressure in the presence of a catalyst
Conditions to Avoid	:	Keep away from heat, spark, or open flame.
Substances to Avoid	:	Product can react with water to form hydrates. Avoid strong acids, strong oxidizing agents, chlorine, halogens, organic peroxides, ozone and nitrogen dioxide. Many materials become brittle after contact with liquefied gases and hoses periodically to ensure integrity and compatibility.
Hazardous Decomposition Products	:	Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.
Special Remarks	:	Vapors may form an explosive mixture with air. May polymerize explosively when heated or involved in a fire. May react vigorously with oxidizing agents. Liquefied gas may explode in contact with hot water ($45^{O}C$ – $75^{O}C$).

SECTION-11. TOXICOLOGICAL INFORMATION

Acute Toxicity	:	This product is not considered toxic. Ethylene gas is not irritating to the skin and eyes. The liquefied form will cause freezing burns (frostbite) to the eyes and skin. At very high exposures, ethylene gas produces an aesthetic effect. Excessive exposure may cause headaches, muscular weakness, dizziness, nausea, loss of condition, coma, and possibly death in extreme conditions. High concentrations may trigger heartbeat irregularities. Excessive amounts of oxygen in the air in an enclosed space will decrease the amount of oxygen and may cause asphyxiation.
4h inhalation-rat LC50	:	>57,000ppm
Repeated Dose Toxicity	:	Ethylene is relatively inactive biologically and essentially non-toxic; therefore, the major hazard is excluding an adequate oxygen supply to the lungs. Inhalation of ethylene by Sprague Dawley rats, in concentrations of 0, 300, 1000, 3000 and 10,000 ppm, 6 hours/day, 5 days/week for 14 weeks, was not found to cause any toxic effects.
Chronic Toxicity Carcinogenicity	:	ACGIH – A4 – Not Classifiable as a Human Carcinogen | OSHA - / IARC - Group 3 – Not classifiable as to its carcinogenicity to humans | NTP - /
Special Remarks on Other Toxic Effect on Humans	:	Ethylene is a simple asphyxiate. Oxygen levels should be maintained at greater than 19.5 per cent at normal atmospheric pressure. High concentrations of ethylene to exclude an adequate oxygen supply to the lung cause dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness.

SECTION-12. ECOLOGICAL INFORMATION

Ecotoxicity – Acute Toxicity	:	**Fish:** LC50: 126.012 mg/l 96 h | **Daphnia magna:** LC/EC50 62.482 mg/l 48 h | **Green algae:** EC50 30.327 mg/l 96 h
Mobility	:	Gas at ambient conditions
Persistence and Degradability		
Air	:	Ethylene (gas) is degraded by ozone, nitrate radicals, or photochemically produced hydroxyl radicals. The lifetime of ethylene in the atmosphere ranges from 0.4 to 4

		days and strongly depends on the amount of sunlight. BioHCwin v1.01 predicts that the half-life of ethylene will be 2.905 days based on the presence of an alkenyl hydrogen functional group.
Soil	:	Gas may permeate through.
Water	:	Ethylene may oxidize to ethylene oxide in soil and water. Volatilization is the major environmental process in soil and water. Product is highly volatile and will partition rapidly to air on release to land or water. Product is largely insoluble in water, evaporating rapidly from surface soils and water.
Bioaccumulation Potential	:	Bioconcentration potential is low. Long Pow is 1.13 (ethylene)
Biodegradation Potential	:	Biodegradation, hydrolysis, bioconcentration, and adsorption are not major processes for ethylene. Pure culture studies suggest that ethylene could be susceptible to microbial degradation.
Environmental Adverse Effects	:	Not toxic. This product is not considered harmful to aquatic life and has limited absorption into soil and sediment. Ethylene is a natural plant hormone produced by plants in varying amounts at all stages of growth. Terrestrial plants such as fruit, flowers and nursery stock show diverse effects from ethylene exposure. For example, grasses and grassy vegetables such as lettuce are resistant to ethylene. However, several species of flowers (orchids, carnations, etc), and vegetables such as tomatoes, potatoes, peppers, beans and pears are sensitive to ethylene exposure. Under certain conditions, emissions may contribute to the photochemical formation of ground-level ozone and possible smog formation.

SECTION-13. DISPOSAL CONSIDERATIONS

Waste Disposal

The use, mixing or processing of this product may alter this product. Since emptied containers retain product and material residue, follow safe handling/label warnings even after the container is emptied. DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION.

See Section7: Handling and Storage and Section 8: Exposure controls/Personal Protection for additional handling information that may be applicable for safe handling and the protection of employees.

Waste generator is advised to carefully consider hazardous properties and control measures needed for other materials that may be found in the waste

SECTION-14. TRANSPORT INFORMATION

UN Number	1038	
UN Proper Shipping name	Ethylene, Refrigerated Liquid	
Transport Hazard Class	Road (ADR)/Rail (RID)/Water (ADNR)	2 (2.1 flammable gas)
	IMDG class (Marine Transport)	2 (2.1 flammable gas)
	ICAO/IATA class (Air Transport)	2 (2.1 flammable gas)
Packing Group	None	
Marine Pollutant	No	

SECTION-15. REGULATORY INFORMATION

Regulatory Information	:	PERMENLH RI No. 3 Year 2008: Tata Cara Pemberian Simbol dan Label Bahan Berbahaya dan Beracun. PERMENPERIN RI No. 87/M-IND/PER/9/2009: Sistem Harmonisasi Global Klasifikasi dan Label pada Bahan kimia. KEPMENAKER 187/Men/1999 Pengendalian Bahan Kimia Berbahaya

SECTION-16. OTHER INFORMATION

Training Advice	:	Personnel handling the product need to be demonstrable with its hazardous

		properties, with health and environmental protection principles related to the product and first aid principles
Recommended Uses	:	THE PRODUCT IS RESTRICTED TO PROFESSIONAL USAGE. Ensure all national/local regulations are observed. Ensure operators understand the flammability hazard. The hazard of asphyxiation is often overlooked and must be stressed during operator training. This Safety Data Sheet has been established in accordance with the applicable European. Directives and applies to all countries that have translated the Directives into their national laws. Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in preparing this document, no liability for injury or damage resulting from its use can be accepted. Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose.

Abbreviations that may have been used in this document:

ACGIH	:	American Conference of Governmental Industrial Hygienist
ADNR	:	European Agreement concerning the Int'l Carriage of Dangerous Goods by inland Waterways
ADR	:	European Agreement concerning the Int'l Carriage of Dangerous Goods by Road
CAS	:	Chemical Abstract Service
EPA	:	Environmental Protection Agency
EU	:	European Union
IATA	:	International Air Transport Association
ICAO	:	International Civil Aviation Organization
IMDG	:	International Maritime Dangerous Goods
IMO	:	International Maritime Organization
LC50	:	Lethal Concentration, concentration of chemical which kills 50% of a sample population
LD50	:	Lethal Dose, dose of a chemical which kills 50% of a sample population
NFPA	:	National Fire Protection Association
NTP	:	National Toxicology Program
PSHA	:	Occupational Safety and Health Administration
RID	:	International Rule for Transportation of Dangerous Substance by Railway
TLV	:	Threshold Limit Value
TWA	:	Time Weighted Averages

This Safety Data Sheet (SDS) contains the following historical revisions:

Rev No	Issued Date	Revision Change	Description
00	09 Jan 2015	Original Document	
01	25 Jan 2019	SECTION-02	NFPA was modified
02	15 Sep 2021	HEADER	Company logo was modified
		SECTION-01	Contact person was modified
03	30 Jun 2023	SECTION-01	Update emergency contact information
		SECTION-02	Modify the hazard and precautionary statements
		SECTION-03	Add EC No.
04	29 Feb 2024	SECTION-01	Change on company's name

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