



RSO Glossary of Terms

Acute Effect	A health effect on a human or animal with symptoms developing soon after exposure. Also, see “chronic.”
Alkylate	A high-octane gasoline blending stock produced in the alkylation unit.
Asbestos	A naturally occurring mineral fiber found in insulation, some gaskets, mastic and similar material. Inhalation of fibers can lead to mesothelioma (a specific type of lung cancer).
Asphyxiant	A vapor or gas, which can cause suffocation from lack of oxygen. An example of a chemical asphyxiant is carbon monoxide that combines with hemoglobin (blood pigment) to reduce the blood’s capacity to transport oxygen. A simple asphyxiant is methane gas that displaces oxygen in the atmosphere. Asphyxiation is one of the principal potential hazards of working in confined spaces.
Ammonia	Ammonia is a gas that is used in refineries as a neutralizing agent for corrosion control and in the recovery of cracking catalysts.
Banding	Metal strips placed around insulation, which are generally used to signify what type of insulation is around the piping.
Blending	One of the final operations in refining, in which two or more different components are mixed together to obtain the desired range or properties in the finished product.
Blind, Blank, Block, Block outdevice	All of these terms refer to Energy Isolating devices. These are chains, locks or physical barriers that prevent product movement or the turning of valves that would allow product to flow. There are different types and configurations.



RSO Glossary of Terms

Boiling Point	The temperature at which a liquid changes to a vapor state, at a given pressure; usually expressed in degrees Fahrenheit (°F) or Celsius (°C) at sea level pressure (760 mmHg, or one atmosphere). For mixtures, the initial boiling point or the boiling range may be given. Flammable materials with low boiling points generally present special fire hazards. Some approximate points: Propane=-44°F, Butane=31°F, Gasoline=100°F, Ethylene Glycolic=387°F.
Burner Oil Distillate (BOD)	A product of simple distillation from the crude unit. BOD has a boiling range between naphtha and heavier gas oils. It is further processed to produce jet and diesel fuels.
Carcinogen	A substance or agent capable of causing cancer in mammals.
Catalyst	Any substance that speeds up a reaction between two other substances but itself remains unchanged at the end of a reaction.
Catalyst Fines	Catalyst that is too small to be recovered in the separators and is carried over with the flue gas from the FCC Unit.
Caustic	A corrosive solution such as sodium hydroxide (NaOH).
Chronic Effect	An effect on a human or animal body, that develops slowly after exposure over a long period of time.
Claus Unit	Converts refinery hydrogen sulfide (H ₂ S) into molten sulfur.
CO	Carbon monoxide – A colorless, odorless, flammable, and very toxic gas produced by the incomplete combustion of carbon containing substances. It is found in the emissions of gasoline powered vehicles and is also a byproduct of many chemical processes.



RSO Glossary of Terms

CO ₂	Carbon dioxide – A heavy, colorless gas produced by the combustion and decomposition of organic substances and as a byproduct of many chemical processes. CO ₂ will not burn and is relatively non-toxic (although high concentrations, especially in confined spaces, can create hazardous oxygen-deficient environments).
Cogen	A term used for a Co-generation unit. This unit uses the energy from steam to drive turbines that create electrical energy. The energy produced can be for plant use or sale and for the provision of heat for buildings and industrial processes.
Coke	The solid residue left when petroleum is thermally cracked such as in heater tubes or at the DCU. It is somewhat similar to coal in appearance.
Combustible	Flammable. NFPA and OSHA generally define “combustible liquids” as having a flashpoint of 100 °F (37.8 °C). Also see “flammable.” Non-liquid substances such as wood and paper are classified as “ordinary combustibles” by NFPA.
Corrosive	As defined by DOT, a corrosive material is a liquid or solid that causes permanent tissue damage at the site of contact with skin or destructive effect on steel through chemical action. As defined by OSHA, corrosion does not refer to action on inanimate surfaces (e.g., steel).
Cracking	Breaking down higher molecular weight hydrocarbons to its smaller components by applying heat and pressure. Cracking in the presence of a catalyst is superior to simple cracking in that it improves the gasoline and diesel yield and quality.
Crude/Crude Oil	Petroleum in its natural state.
Diesel Fuel	A light gas oil product used as fuel in the diesel engine.
Diethanolamine	A liquid used to absorb hydrogen sulfide (H ₂ S) from petroleum streams.



RSO Glossary of Terms

(DEA)	Rich DEA has a high concentration of dissolved H ₂ S. Lean DEA contains little or no dissolved H ₂ S.
Distillation	Production of vapor by boiling the liquid mixture to be separated and condensing the vapors.
Emergency Actions	The set of actions taken by anyone in an emergency, (size up the situation, protect yourselves and others from the hazards, tell others about the situation and then suppress and control the situation only if trained to do so).
Emergency Response	Actions that trained personnel take to deal with an emergency. Emergencies can include spills, fires, rescues, medical situations and so on. Personnel are often called “responders” or ‘ERT” – Emergency Response Team.
Excavation	Refers to anywhere in the refinery where surfaces and soil are removed (usually to expose piping underneath the ground for repairs). Excavations of certain dimensions are considered confined spaces.
Exposure Limit	The concentration of a chemical or physical substance that a worker may be exposed to without adverse effects.
FCC	Fluid catalyst cracking. Catalyst and crude are allowed to flow together in a large vessel.
Firewatch and Safety watch	Sometimes called “refinery lifeguards”, these are trained personnel who have the skills to recognize refinery hazards of fire/combustions and/or the various hazards of work in confined spaces. These persons are key to activating emergency response in the event of an emergency or even acting as incipient fire fighters.
Flash gear	Special protective gear usually only used by high voltage electricians to protect against injury from arc flash (high pressure/high energy electrical flash fires)



RSO Glossary of Terms

Flashpoint	The minimum temperature at which a liquid or solid will give off enough flammable vapors to ignite. There are several flashpoint test methods, so flashpoints may vary for the same material depending on the method used.
Flammable	A “flammable liquid” is defined by NFPA and OSHA as a liquid with a flashpoint below 100 °F (37.8 °C). Solids that ignite readily and can cause fires under ordinary conditions of transportation through friction or retained heat from manufacturing or processing, and which burn so vigorously and persistently as to create a serious transportation hazard, are classified by DOT and OSHA as “flammable solids”. See “combustible”.
Fractionation	Separating a liquid mixture into fractions by distillation. Separations are sometimes called “cuts”.
FRC, Nomex	Sometimes used interchangeably, this refers to flame resistant clothing; the special aramid fiber that protects against injury from flash fires.
Fuel Gas	A fuel which consists mainly of methane, ethane, and propane; similar to natural gas. It is produced in refining operations and used to fire heaters, boilers, etc.
Gas Oil	Gas oils have higher boiling points than naphtha and are classified as light, intermediate, heavy, atmospheric, or vacuum. Gas oils are further processed to produce gasoline, and jet and diesel fuels.
HAZCOM	Hazard communication. See “hazard communication program”.
Hazard Communication Program	A written document specific to each employer that meets the requirements of OSHA’s Hazard Communication Standard and must include: a hazardous materials list, MSDS and labeling systems used, as well as an employee training program.
Hazard ID	The identification of hazards. This is done before the permit is issued and for development of the JSA.

RSO Glossary of Terms

Hazardous
Material /
Hazardous
Substance

In a broad sense, a hazardous material is any substance or mixture having properties capable of producing adverse effects on the health or safety of humans.

HMIS

Hazardous Material Identification System: A container labeling system developed by a National Paint and Coatings Association.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Hydrogen Sulfide is a toxic, flammable gas and has a distinct "rotten-egg" smell. Hydrogen Sulfide is a colorless liquid which rapidly turns into a gas at standard atmospheric temperatures and pressures. Inhalation of high concentrations of this gas can result in unconsciousness, coma, and death. Contact with rapidly expanding gases, or contact with the liquid, may cause frostbite. Both the liquid and gas pose a serious fire hazard when accidentally released. The gas is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flame or high temperature impinging on a localized area of the cylinder of Hydrogen Sulfide can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:
The most significant route of overexposure for Hydrogen Sulfide is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness. Exposure for more than 30 minutes at concentrations of greater than 600 ppm have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of Hydrogen Sulfide. A summary of exposure concentrations and observed effects are as follows:

CONCENTRATION	EXPOSURE SYMPTOM
0-30 ppm:	Odor is obvious and unpleasant.
50 ppm:	Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm:	Irritation of the respiratory system.
100-150 ppm:	Temporary loss of smell.
200-250 ppm:	Headache, vomiting, nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm:	Headache, excitement, staggering, stomach ache after brief exposure. Death occurs from 0.5-1 hour.
> 600 ppm:	Rapid onset of unconsciousness, coma, death.
> 1000 ppm:	Immediate respiratory arrest.

Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage.

SKIN and EYE CONTACT: The gas may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration (less than 10 ppm). Exposure over several hours may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is an intense tearing, blurring of vision, and pain when looking at light. Exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eyes can be permanently damaged.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.



HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms Overexposure to Hydrogen Sulfide may cause the following health effects:

ACUTE: Hydrogen Sulfide is irritating to the skin and eyes. Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness, and death. Contact with liquid or rapidly expanding gases may cause frostbite.

CHRONIC: Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage. Chronic overexposure may cause permanent eye damage.

TARGET ORGANS: Respiratory system, skin, eyes, central nervous system.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH (BLUE)		4	
FLAMMABILITY (RED)		4	
REACTIVITY (YELLOW)		0	
PROTECTIVE EQUIPMENT (D)			
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

[See Section 16 for Definition of Ratings](#)

Heavy Straight
Run (HSR)

A naphtha cut generally used as catalytic reformer feed to produce high-octane reformat for gasoline blending.



RSO Glossary of Terms

HEPA	High Efficiency Particulate Air filter. Cartridges are used with respirators in the refinery to protect against exposure to certain dusts, fumes or fibers (it is usually magenta in color and can be used in combination with an OVA).
HF	Hydrofluoric acid – a type of acid used in some refineries instead of sulfuric acid to produce alkylate product (higher octane product).
H ₂ S (Hydrogen sulfide)	A flammable, toxic, colorless gas with an offensive odor. It is a contaminant in many of the process streams.
Hydrocarbon	A general term for all organic compounds composed of carbon and hydrogen. Also, the general term for all petroleum product streams.
Hydrocracking	A refining process which adds hydrogen to the carbon rich molecules of heavier oil, in the presence of a catalyst, to produce high-octane gasoline.
Hydrotreat	A process by which hydrogen gas is added to the hydrocarbon stream. These units are generally found in conjunction with hydrocracking units.
Irritant	A substance which produces an irritating or inflammatory response when it contacts the eyes, skin, or respiratory system (including the nose). The contact may be a single exposure or multiple exposures. Examples of irritants include dilute acids, alkalis and alcohols. OSHA defines an irritant as a chemical which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.
JSA	Job Safety Analysis – this refers to an exercise in identifying the hazards of the job and the work area and making sure that there are controls to address each hazard. This is usually done on a form and should help “mirror” or complement the work permit for that job.



RSO Glossary of Terms

LEL or LFL	Lower Explosive Limit or Lower Flammable Limit of a vapor or gas is the lowest concentration (lowest percentage of the substance in the air) that will produce a flash of fire when an ignition source (heat, arc or flame) is present. This limit is constant up to 120°C (250°F). At temperatures higher than 120°C, explosibility increases. At concentrations lower than the LEL, the mixture does not burn. See “UEL”.
Light ends and heavy ends	Refer to the extreme “ends” of a spectrum of hydrocarbon products. Light ends refers generally to gaseous petroleum products like propane and heavy ends refer generally to heavy crudes.
Liquefied Petroleum Gas	Also called LPG, it is general term used for any normal petroleum gas that has been liquefied (generally for easier transport).
LOPC	Loss of Primary Containment is when products that are meant to be contained in piping and vessels are released. These releases are generally unplanned and uncontrolled events.
LOTO	Lock Out, Tag Out – the methods used to control hazardous energy sources of various types (thermal, pneumatic, stored energy, chemical energy, product movement, radiation, electrical and so on)
MSDS	Material Safety Data Sheet – a technical document containing information about the manufacturer, properties, hazards, safe handling, and exposure control of a hazardous substance.
N2 (Nitrogen)	A colorless, odorless and tasteless gas that will not burn and does not support combustion. The earth’s atmosphere (air) is about 78% nitrogen; at higher concentrations, nitrogen can displace oxygen and become an asphyxiant. See “Asphyxiant”.
NaOH	Sodium hydroxide or caustic soda (“caustic”).

RSO Glossary of Terms

Naphtha A general term referring to any normally liquid hydrocarbon product approximating the boiling range of gasoline. Naphtha is a cut or product that does not meet specifications for gasoline.

NFPA National Fire Protection Association – A voluntary membership organization to promote and improve fire protection and prevention and establish safeguards against loss of life and property by fire. The NFPA publishes the National Fire Codes which are 16 volumes of codes, standards, recommended practices and manuals developed (and periodically updated) by NFPA technical committees. NFPA 704 is the code for showing hazards of materials AS THEY MIGHT BE ENCOUNTERED UNDER FIRE OR RELATED EMERGENCY CONDITIONS, using the familiar diamond-shaped label with appropriate numbers or symbols. The brief explanation below illustrates the NFPA principle of using scales of 0 to 4 (low to high) to classify material hazards:

Fire Hazard (Red)

- 0 – Will not burn
- 1 – Will ignite if preheated
- 2 – Will ignite if moderately heated
- 3 – Will ignite at most ambient conditions
- 4 – Burns readily at ambient conditions


Reactivity (Yellow)

- 0 – Stable and not reactive with water
- 1 – Unstable if heated
- 2 – Violent chemical change
- 3 – Shock and heat may detonate
- 4 – May detonate

Health Hazard (Blue)

- 0 – No more than ordinary combustible hazards in a fire
- 1 – Slightly hazardous
- 2 – Hazardous
- 3 – Extreme danger
- 4 – Deadly

Specific Hazard

- OX – Oxidizer
- ACID – Acid
- ALK – Alkali
- COR – Corrosive
- W  No water



RSO Glossary of Terms

Odor Threshold	The minimum concentration of a substance at which a majority of test subjects can detect and identify the characteristic odor of a substance.
Offgas	A fuel which consists mainly of methane, ethane, propane and H ₂ S. It is produced in refining operations. Once the H ₂ S is removed it is used as fuel gas.
Olefins	Hydrocarbons containing at least two carbon atoms joined by double bonds. Olefins are feed for the alkylation unit.
Olfactory	Relating to the sense of smell. The olfactory organ is the nose.
OSHA	Occupational Safety and Health Administration – A division of the U.S. Department of Labor, a federal agency that has regulatory and enforcement authority for occupational health and safety laws for most U.S. industry.
OVA Cartridge	Organic Vapor cartridge contains charcoal in its filter in order to trap organic vapors (those fractions of the hydrocarbon that are volatile and can be found in the breathing zone of the worker).
PEL	Permissible Exposure Limit – An exposure limit established and enforced by OSHA as a legal standard. May be a time-weighted average (TWA) limit or a maximum concentration exposure limit. See “STEL” and “Ceiling Limit”.
Peripheral Unit	Those units that support hydrocarbon processing but do not process hydrocarbons themselves.
Permit	A legal document which is an agreement between the refinery and those performing work regarding what work will be performed, the hazards and the controls that will mitigate those hazards. Work permits have various classifications according to the work area and the scope of work. Examples include but are not limited to the following: Cold Work, Low energy work, Hot Work, Confined Space Work, High energy permit, High Voltage permit, Entry permit, Inert Entry permit and so on.



RSO Glossary of Terms

Physical Hazard	Can be used in reference to a chemical that has the following properties: combustible, explosive, an oxidizer, flammable, unstable (reactive), water-reactive, or stored under pressure.
PPE	Personal Protective Equipment- refers to the collection of gear used in the refinery to protect against all hazards. It includes but is not limited to hearing protection, body protection, head, face and eye protection, respiratory protection, hand protection and foot protection.
ppm	Parts per million – A unit for measuring the concentration of a gas, vapor or other contaminant in air – parts (by volume) of the gas or vapor in a million parts of air. Also used to indicate the concentration of a particular substance in a liquid or a solid.
ppb	Parts per billion – A unit for measuring the concentration of a gas, vapor or other contaminant in air – parts (by volume) of the gas or vapor in a billion parts of air. Usually used to express measurements of extremely low concentrations of unusually toxic gases or vapors. Also used to indicate the concentration of a particular substance in a liquid or a solid.
PSI	Pounds per square inch – For MSDS purposes, a unit for measuring the pressure which a material exerts on the walls of a confining vessel or enclosure.
Purging	A process by which refinery equipment is “cleaned” of flammable vapors by introducing large quantities of Nitrogen gas into them, thereby making a flammable or explosive atmosphere less likely by removing oxygen.
Reaction	Chemical transformation or change; the interaction of two or more substances to form one or more substances.



RSO Glossary of Terms

Reactivity	The tendency of a substance to undergo a chemical reaction with the release of energy. Undesirable effects, such as release of pressure and temperature changes, and formation of noxious, toxic or corrosive by-products may occur because of the reactivity of a substance to heating, burning or being in direct contact with other materials.
Reactor	This usually refers to large vessels where hydrocarbons come into contact with a catalyst. The different catalysts usually accelerate chemical reactions and processes that assure the production of higher octane gasoline.
Reduced Crude	Very heavy product produced by the crude unit's atmospheric tower.
Reformate	High-octane gasoline products produced by the catalytic reforming units.
Residium	The heavy feed that goes into the coker for further processing in the coke drums.
Respirator	Collection of full and half face masks. Some supply fresh air while others purify the surrounding air. Respirators of all types have limitations for their use and require separate training and medical clearance for their use.
SCBA	Self contained breathing apparatus. These are usually located around the units for emergency breathing air. They are sometimes used as supplied air for certain jobs.
Slop	Skimmed oil and material which is sent back to the Crude and Delayed Coking Units. Slop is a mix of "leftovers" from other refinery streams that get put back into the refining process in order to extract useful products and so that nothing is wasted.
Sour Water	Refinery wastewater containing H ₂ S and Ammonia (NH ₃).



RSO Glossary of Terms

Sour or Sweet Crude	Two classifications for crude. Sour crude has a sulfur content above 0.5 percent. Sweet crude contains relatively small amounts of sulfur.
Stantion	Stantions are supports (usually concrete) where some utilities are located.
STEL	Short Term Exposure Limit (ACGIH and OSHA) – A 15-minute time-weighted average. The maximum exposure above the 8-hour average that workers may be exposed for short periods (not more than 15 minutes). There should be at least 60 minutes between each STEL exposure, up to a maximum of four STEL exposures a day.
Toxicity	Refers to the adverse effects resulting from exposure to a substance, with entrance into the body via the mouth, skin or respiratory tract.
Turnaround	Turnaround is the general term for an extended maintenance period in which the refinery equipment is cleaned out, inspected repaired and then put back together (shifts are usually around the clock). Some are planned and some are unplanned. Turnarounds also go by other names such as: Shutdowns, Outage, Downperiod, I&T's and TAR's.
TWA	Time-Weighted Average exposure – The airborne concentration of a material to which a person is exposed, averaged over the total exposure time – generally the total workday (8 to 12 hours). 8-hour TWA is based on an 8-hour workday.
Tyvek	A brand of protective clothing, mainly utilized to protect against dusts and fibers.
UEL or UFL	Upper Explosive Limit or Upper Flammable Limit of a vapor or gas – The highest concentration (highest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc or flame) is present. At higher concentrations, the mixture is too "rich" to burn. See "LEL".



RSO Glossary of Terms

Vessel Any equipment that contains large amounts of hydrocarbon product. Some vessels are under higher pressures than others while some are at atmospheric pressure.