



GLOSSARY OF TERMS

Air quality monitoring – Method used to measure ambient air quality.

Air toxics – Toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious, chronic health effects, such as reproductive effects or birth defects, or adverse environmental effects.

Alternative fuel – Also known as “non-conventional fuels,” is any material or substance that can be used as a fuel, other than fossil fuels, or conventional fuels of petroleum (oil), coal, propane, and natural gas. The term “alternative fuels” usually refers to a source of which energy is renewable (See “renewable fuel”).

Area source – A general term for a source that is an aggregate of all emission sources within a defined spatial boundary. Though emissions from individual sources in an area are relatively small, collectively their emissions can be of concern - particularly where large numbers of sources are located in heavily populated areas.

Auxiliary engine – A small engine often used when a ship is hotelling.

Baseline Air Emissions Inventory – For a given air emission source category, a baseline inventory establishes a reference point with more detailed emission data than previously existed. An established baseline allows comparison with future inventories of similar precision to describe changes to the characteristics of the source category and intensity of the emissions.

Brake-Specific Fuel Consumption – A way to measure the efficiency of an engine by dividing rate of fuel consumption by the rate of power production.

Bunker Fuel – See “Fuel Oil”

Cargo Handling Equipment (CHE) – Equipment used to move cargo to and from marine vessels, railcars and trucks. This includes equipment such as cranes, rubber tired gantry cranes, terminal trucks, container handlers, bulk loaders, and forklifts.

Cold Ironing – Also called “Alternative Maritime Power” and more generally referred to as “Shore Power.” This specifically refers to an electrical connection made between the vessel and the terminal to provide full or partial operational power during hoteling periods. The primary motivation for cold ironing has been as a method to reduce emissions from the exhausts of auxiliary engines that would normally operate during hoteling. “Cold iron” is a reference to when ships mainly used boilers to produce steam for propulsion, heat, and power. When the steam production was shut down, the iron in the boiler housing would go cold.

Commercial vessel – Any vessel involved in commercial trade or business.



IAPH Tool Box for Port Clean Air Programs

Criteria pollutants – A regulatory term that refers specifically to six outdoor air pollutants for which EPA is required to develop National Ambient Air Quality Standards (NAAQS), as codified in the federal Clean Air Act. These six are carbon monoxide (CO), lead, nitrogen dioxide (NO₂), particulate matter (PM_x), ozone, and sulfur oxides (SO_x).

Deadweight tonnage – Refers to the total amount of weight that a vessel is carrying, minus the actual weight of the vessel. Historically, tonnage was the tax on tons (casks) of wine that held approximately 252 gallons of wine and weighed approximately 2,240 pounds. This suggests that the unit of weight measurement, long tons (also 2,240 lb) and tonnage both share the same etymology. The confusion between weight based terms (deadweight and displacement) stems from this common source and the eventual decision to assess dues based on a ship's deadweight rather than counting the tons of wine.

Deterioration factor – For use in emission or performance calculation, this number accounts for the effect of gradual wear in the internal engine components in the course of normal operation.

Diesel – In standard use, this refers to a specific fractional distillate of fuel oil that is used as fuel in a compression-ignition (CI) engine. Practically, diesel can refer generally to any hydrocarbon-dense oil with relatively low volatility that can be used as a combustion fuel. In common maritime use, diesel can refer to several varieties of distillate fuels including “Marine Diesel Oil” (MDO, aka DMB or DMC) and “Marine Gas Oil” (MGO, aka DMA or DMX) as specified by ISO 8217. Diesel can also be referred to by its sulfur content, such as the case of LSD (low sulfur diesel with less than 500 ppm sulfur) or ULSD (ultra low sulfur diesel with less than 15 ppm sulfur).

Diesel electric – Refers to equipment that uses electric motive systems that rely on electricity from diesel generators.

Diesel Oxidation Catalyst (DOC) – A flow-through canister, fit to an engine exhaust pipe, containing a honeycomb-like structure or substrate. The substrate has a large surface area that is coated with an active catalyst layer. This layer contains a small, well dispersed amount of precious metals such as platinum or palladium. As exhaust gases pass over the catalyst, carbon monoxide, gaseous hydrocarbons and liquid hydrocarbon particles (unburned fuel and oil) are oxidized, thereby reducing harmful emissions.

Diesel Particulate Matter (DPM) – Refers to particulate components of combustion products that are directly emitted from diesel engines. These include soot (“elemental” or “black” carbon) and other aerosols that are complex aggregates of hydrocarbons, metals, silicates, and other chemicals. In recent years, DPM has been singled out as posing a carcinogenic risk to people who regularly work in proximity to diesel equipment over the course of many years.

Diesel Particulate Filter (DPF) – A filter installed on the exhaust pipe of diesel engine to physically separate particulate matter from the exhaust stream. Some filters are single use (disposable), while others are designed to burn off the accumulated particulate, either through the use of a catalyst (passive), or through an active technology, such as a fuel burner which heats the filter to soot combustion temperatures



IAPH Tool Box for Port Clean Air Programs

Economizer – A heat exchanger that transfers heat from the exhaust stream to a water circulation system to produce steam. Often used when a vessel is in transit, an economizer can allow the regular diesel powered boiler to be shut off.

Emission factor – A number specific to an engine or system that describes the amount of a pollutant that is generated per unit of activity, e.g. mg/mile or g/hr

Emulsified fuel – A homogenized blend of water into diesel fuel that changes the fuel combustion characteristics and resulting emissions. This strategy is mainly employed to reduce NOx emissions but may also reduce PM and improve fuel economy.

Environmental Protection Agency (EPA) – A US federal or state agency responsible for standard setting in the environmental field

EPA NONROAD model – NONROAD is a computer modeling program created and regularly updated by EPA that calculates past, present, and future emission inventories (i.e., tons of pollutant) for all offroad equipment categories except commercial marine, locomotives, and aircraft. For a specified geographic area, time period, and fuel type, the model estimates exhaust and evaporative hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), particulate matter (PM), sulfur dioxide (SO₂), and carbon dioxide (CO₂).

Exhaust gas recirculation (EGR) – A technique used in most gasoline and diesel powered engines to control emissions. Engine exhaust is mixed with engine intake air and recirculated through the combustion process. The result is a reduction in NOx emissions due to lower combustion temperatures and reduction of excess oxygen.

Fine particulate matter – See *Particulate Matter*

Four-stroke engines – The most common type of engine for cars and trucks. This engine uses the 'Otto cycle' and consists of four strokes: 1. in-take stroke, 2. compression stroke, 3. power (ignition) stroke, and 4. exhaust stroke.

Fuel correction factor (FCF) – A number used in emission inventory models to reflect the impact on emissions of commercially dispensed fuel compared to fuel used during the certification process. These factors are derived as the ratio of the impact of the dispensed fuel to the impact of the certification fuel.

Fuel Oil – A general term for viscous liquid fuels used for powering engines. In the maritime industry the following classifications are used.

- ***MGO (Marine gas oil)*** – A purely distillate fuel (see "diesel")
- ***MDO (Marine diesel oil)*** - A blend of gas oil and heavy fuel oil
- ***IFO (Intermediate fuel oil)*** A blend of gas oil and heavy fuel oil, with less gas oil than marine diesel oil



IAPH Tool Box for Port Clean Air Programs

- ***MFO (Medium fuel oil)*** - A blend of gas oil and heavy fuel oil, with less gas oil than intermediate fuel oil
- ***HFO (Heavy fuel oil)*** - Pure or nearly pure residual oil (bunker fuel)

Fugitive emissions – Emissions not created through a defined process or controlled by a dedicated system. These can be due to equipment leaks, evaporative processes, materials processing, and windblown disturbances

GHG equivalent – Similar to “carbon equivalent” this refers to a method by which air emissions are standardized for comparison based on their “global warming potential” (GWP) as greenhouse gases. Each greenhouse gas differs in its ability to absorb heat in the atmosphere so will be presented in units of carbon equivalents, which weighs each gas by its GWP relative to carbon dioxide. For example, methane traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule than carbon dioxide.

Greenhouse Gas (GHG) – Substances in the atmosphere that absorb radiated heat from the earth’s surface and also radiate heat back to the surface, causing a net retention of heat energy. Carbon dioxide, methane, and nitrous oxide are common examples.

Gross vehicle weight rating – The estimated total weight of a road vehicle that is loaded to capacity, including the weight of the vehicle, the passengers, fuel, cargo, and miscellaneous items. The rating allows the vehicle driver to know what routes are acceptable, depending on whether the roadways can accommodate a vehicle of the estimated weight.

Harbor craft – A term that generally refers to vessels that do not make regular ocean passage. These include fishing boats, tug boats, ferries, and other commercial workboats. For the purpose of this report, any craft that is not an ocean-going vessel, recreational vessel, or tank barge, has been categorized as a harbor craft.

Hoteling – The period during which a vessel is secured at berth

Hydrocarbon – A chemical term referring to compounds that consists of carbon and hydrogen in various structures. Most common liquid fuels are primarily comprised of some form of hydrocarbon.

Integrated tug/barge – Any tug and barge combination with a specially designed connection system joining the two together. The combination allows the vessel to have increased seakeeping capabilities when compared to a separated tug and barge.

Intermediate fuel oil (IFO) – See *Fuel Oil*

Intermodal Container Transfer Facility – A rail yard that is located close to a port facility and is where a cargo transition between two different transportation modes (e.g. trucks, trains, or ships) occurs.

Liquefied Natural Gas (LNG) – Natural gas that has been processed to remove impurities and heavy hydrocarbons and is then condensed into a liquid using extremely low temperature or high pressure.



IAPH Tool Box for Port Clean Air Programs

Liquefied Petroleum Gas (LPG) – A mixture of hydrocarbon gases that are commonly used to fuel heating appliances and vehicles. The two most common forms of liquefied petroleum gas are propane and butane.

Load Factor (LF) – A ratio of an engine's average actual power used to its maximum power rating.

Low Sulfur Diesel (LSD) – See "Diesel"

Main line locomotives – Also called "line-haul," these are the largest class of locomotives and are designed for the heaviest loads, longest distances, and steepest grades.

Main propulsion engine – The engines on a vessel that are dedicated to movement of a ship over long distances.

Marine Diesel Oil (MDO) – See "Fuel Oil"

Maximum continuous rating – A value assigned to a piece of equipment by its manufacturer that sets a guideline for which the equipment can be operated for an unlimited period of time without damage.

Non-Methane Organic Gas (NMOG) – Organic gases that exclude methane but account for all other organic pollutants that form a foundation for the formation of ozone.

Ocean-going vessel (OGV) – Vessels that operate in open oceanic waters.

Particulate Matter (PM) – A general term for any substance, except pure water, that exists as a liquid or solid in the atmosphere under normal conditions and is of microscopic or sub-microscopic size but larger than molecular dimensions. Airborne PM can result from direct emissions of particles (primary PM) or from condensation of certain gases that have themselves been directly emitted or chemically transformed in the atmosphere (secondary PM). PM is often classified by size:

- ***PM_{2.5}*** – Also known as "fine" particulate matter, PM_{2.5} refers to the fraction of PM in a sample that is 2.5 microns in diameter or less. This size of PM is commonly associated with combustion and secondary PM.
- ***PM₁₀*** – Also known as "coarse" particulate matter, PM₁₀ refers to the fraction of PM in a sample that is 10 microns in diameter or less.

Polycyclic Aromatic Hydrocarbon (PAH) – One of the first atmospheric species to be identified as carcinogenic. PAH's are formed during the incomplete combustion of organic matter, e.g. coal, oil, wood, and petroleum. PAH's consist of two or more fused benzene rings in various configurations that, by definition, contain only carbon and hydrogen.

Polycyclic organic material – Compounds containing polycyclic aromatic hydrocarbons and derivatives.



IAPH Tool Box for Port Clean Air Programs

Renewable Fuels – Fuels derived from sources that are regenerative or for all practical purposes can not be depleted.

Residual oil – “Residual Fuel Oil” or “Bunker Fuel” – See “Fuel Oil”.

Roll-on/Roll-off (RoRo) – A vessel featuring a built-in ramp for wheeled cargo to be ‘rolled-on’ and ‘rolled-off’ of the vessel.

Rubber Tired Gantry (RTG) Crane – A common piece of cargo handling equipment at marine terminals used to transfer containers from stacked storage to a vehicle.

Selective Catalytic Reduction (SCR) – A process where a gaseous or liquid reductant (most commonly ammonia or urea) is added to the flue or exhaust gas stream and absorbed onto a catalyst. The reductant reacts with NO_x in the exhaust gas to form H_2O (water vapor) and N_2 (nitrogen gas).

Sea water scrubbing – An exhaust treatment technique used on ships to reduce emissions by through physical and chemical interaction with sea water. When the exhaust comes in contact with the seawater, the SO_x reacts with calcium carbonate to form a solid calcium sulfate and CO_2 . Scrubbers also function by physically scavenging particles and gases from the air.

Shaft generators – Provides electric power to a moving vessel by generating current from the rotation of the vessel’s drive shaft.

Shore power – See “Cold Ironing”

Point source – A single, stationary point source of emissions that is immovable for all practical purposes.

Total organic gases – The sum of reactive and non-reactive organic gases in the air.

Two-stroke engines – A type of internal combustion engine that completes the same four processes as a four-stroke engine (intake, compression, power, and exhaust) in only two strokes of the piston rather than four. This is accomplished by using the space below the piston for air intake and compression, thus allowing the chamber above the piston to be used for just the power and exhaust strokes. This results in a power stroke with every revolution of the crank, instead of every second revolution as in a four-stroke engine. For this reason, two-stroke engines provide high specific power, so they are valued for use in portable, lightweight applications. Two stroke diesel engines are common in large marine vessels.

Ultra Low Sulfur Diesel (ULSD) – See “diesel.”

Volatile Organic Compound (VOC) – A very board term used to describe the entire set of vapor-phase atmospheric organic chemicals except CO and CO_2 .