

# Safety regulations in the petroleum industry

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It is common knowledge that petroleum and petroleum gas (LPG) are good sources of energy. Imagine that petroleum did not exist. This simply means that all the technology that has been developed around petroleum will not be there. To say the least, development in the energy sector has been greatly enabled by petroleum. As fears of future deficit of petrol continue to be entertained by the superpowers, there has been an effort to shift the focus from petroleum to other sources of energy such as solar, hydro electricity, safe nuclear power, bio oil among other alternative sources of energy.

Despite the fact that petroleum is a very useful source of energy, it is also a very dangerous, volatile and flammable liquid or gas that can rein havoc if mishandled. Based on its volatile and inflammable nature, there is every need to uphold a high degree of safety measures so as to prevent explosion and fire disasters. The petroleum industry has a number of safety regulations often set by the government that need to be observed. Any organization that handles petroleum oil and gas can only be certified and allowed to operate after satisfying the safety regulations that are specified by the government.

The difference of these safety regulations throughout all countries is minimal because after all the petroleum oil and gas is the same. The safety regulations govern every activity in the petroleum industry ranging from drilling, refining, transportation (either through road, ship, air, rail or pipeline), packaging (especially for gas) to safety at the premises in which some of the activities take place. This paper seeks to explain a number of health and safety precautions and regulations that need to be adhered to by every actor in the petroleum industry (Williamson, 1979).

Taking US as our working example, we witness tight safety regulations governing the petroleum industry. These regulations are created and enforced by the Occupational Safety and Health Administration (OSHA). OSHA is an agency in the US labor department which was created by congress under the legislation of the Occupational Health and Safety Act (OSH Act) to set safety standards that will guarantee that workers do not suffer from any kind of work related deaths, injuries or even illnesses.

The OSHA agency is aided, in the release of occupational health and safety standards, by the National Institute for Occupational Safety and Health (NIOSH) whose main function is to conduct research into the areas that pose safety and health threats to the worker in the petroleum industry. Unlike OSHA, NIOSH does not lie under the US department of labor. Some of these safety standards are explained in the following paragraphs (Joseph, 2006).

The regulations governing occupational health and safety are industry specific those that apply to the petroleum industry are based on the fact that petroleum is flammable, inhalation of petroleum vapor is dangerous and harmful to health and for those who drill, exposure to natural gas can trigger cancer and the natural gas is poisonous. The first regulation is based on the Permissible Exposure Limits (PEL). This is specifically important because exposure to petroleum vapor is harmful.

However, it should be noted that the effects of the exposure depend on the concentration of the vapor and the amount of time one is in exposure.

Inhalation of petroleum vapors can cause nervous effects such as dizziness, headache and even nausea. It can also cause respiratory irritation. Chronic

exposure affects the blood, kidney and the nervous system. Very high exposure can lead to coma and death. Gasoline contains benzene which is a human carcinogen and thus the petroleum products that come to contact with the skin may be absorbed and eventually may cause skin cancer and myeloid leukemia.

Based on these health risks, OSHA released a PEL regulations that specifies the amount of petroleum vapor that petroleum industry workers (especially those working in petroleum refineries) are supposed to be exposed to.

Benzene-containing gasoline requires an 8 hour 1ppm with a maximum of 5ppm short term exposure. The other hydrocarbons also have their specific exposure limits. The limits are not supposed to be exceeded to avoid health hazards (National Safety Council, 1990). OSHA Personal Protection Equipment (PPE) regulations in the petroleum industry require a number of protective equipment.

Some of this protective equipment includes the use of goggles, face shields and safety glasses to protect the eye and the face from metal or wood flying objects, dangerous light or even chemicals. The Fall Protection regulation requires that those working in excavation sites such as petroleum drillers and those laying petroleum tankers and pipelines need to be protected against fall by use of guard rails, personal fall systems and safety nets that will protect the workers in an event that they fall.

Foot & hand and arm protection is also encouraged through the use of metatarsal guards, special shoes with anti puncture soles and toe shields and gloves ranging from heavy metal to soft cotton gloves respectively. The

head, respiratory and other parts of the body are also protected. Each part of the body requires specific protective equipment against a specific hazardous stimulus. Respirators are also part of the OSHA regulations (Olishifski, 1999).

According to OSHA 1910: 134, the employers in the petroleum industry are supposed to provide respirators to the workers to protect them inhaling excessive petroleum vapor which is harmful to their health. This regulation calls for special kind of air purifying or air supplying respirators depending on the exposure situation. In this way, the worker is protected from vapor in excess of the OSHA PEL. Those working in enclosed premises processing, mining or handling petroleum should either be supplied with respirators or ventilation of the premises should be maintained at the OSHA regulations.

All this is in a bid to maintain the concentration of petroleum vapor in air within the OSHA PEL brackets (Roughton, 2002) When handling the flammable or combustible liquids, OSHA proposes a number of guidelines that must be adhered to prevent fire and explosions. To avoid fire, there is need to prevent accumulation of petroleum in the air in such vapor-air mixture concentration that exceeds one quarter of the least flammable limit. This is achieved by encouraging ample ventilation to avoid this vapor accumulation.

Explosions on the other hand are likely to occur due to pressure building in tanks holding the flammable or combustible liquid. For this reason, tanks are to be built of heat resistant steel, corrosion resistant steel or if built of any material should be built based on sound engineering designs as per the principles governing the material used. The tanks should also be vented to

prevent any possible development of a vacuum or pressure which can lead to explosions (Penton/IPC, 1984)

The handling of LPG requires that it be odorized so as to enable detect its presence in air to a concentration that exceeds one fifth of the lower flammable limit. The odor should be distinct and easy to detect. However, odorizing is not necessary if it proves harmful if the LPG shall be used for further processing. Odorizing is necessary to prevent fires incase of a leakage from cylinders and pressure tanks used to hold the gas (because LPG is highly volatile and flammable) because one is able to detect it early and thus take remedial measures.

Regarding the cylinders that hold the LPG, one is not allowed to carry out any welding on the shell, head or any section of the pressure container. This is to prevent possibility of explosion of the container due to welding. Further, any fittings shutoff valves and any accessories fitted to the LPG pressure container should meet the 250 p. s. i. g pressure specifications. The shutoff valve should not be made of cast iron because of its less resistance to fire and heat. Incase of heat or fire, the valve is likely to expand or open leading to a leakage and hence fire or explosion.

All these specifications are for safety purposes to avoid possible leakage from the pressure containers holding LPG. Areas with high temperatures require lower vapor pressure LPG in a high pressure container so as to prevent the opening up of safety valves as a result of the high temperatures. The OSHA regulations governing the petroleum industry are very diverse and go down to greater finer details. Despite all that the bottom line is the fact

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that these regulations were set to protect the workers and even the consumers of products originating from the petroleum industry.

If these safety and health regulations are followed to the letter, it will lead to a high degree of safety in the petroleum industry. As said earlier, petroleum is a very important component in the energy sector development but poses a great danger to health and property if not handled with care (Olishifski, 1999). Any organization under the petroleum industry needs to adhere to these rules to avert any possible disaster that can result if the regulations were not adhered to. However stiff the regulations may be, for safety purposes, they need to be followed.

The OSHA's regulations have often been criticized by the petroleum industry players for lacking practicability. The department of labor under which the OSHA agency exists should set out modalities of working closely with the industry's stakeholders to encourage a health and safety culture among the key players in the industry. If the regulations seem to be expensive and the specifications too much specific, then OSHA has no alternative than to liaise with engineers and some other professionals so as to supply the equipment and services which are compliant with the safety and health specifications to the ministry players.