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Hazardous Effects of Petrochemical Industries: A Review



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Abstract

Petrochemicals refer to all those compounds that can be derived from the petroleum refinery products. Petrochemical industries impart vital role in the national economy. Environmental issues have now become important considerations due to the potential harmful impacts produced by chemical releases. Unsafe emissions may be due to improper production process, poor maintenance practices and internal operational process problems. Petrochemicals cause acute and chronic health diseases such as ulcer, allergy, cancer, and liver and kidney problems to the living beings. This review article discusses various problems associated with petrochemical industries and their products.

Keywords: Petrochemicals; Economy; Environmental issues; Cancer

Introduction

The petrochemicals sector is a major segment of manufacturing industry as it has several connections with other sectors of an economy. Petroleum distillates (petrochemicals) are any of a large group of chemicals derived from petroleum and natural gas either by direct manufacture or indirect manufacture as by-products which are used commercially. Oil and natural gas are supposed to be the main sources for most petrochemicals because they are economical and readily accessible [1]. Manufacturing of petrochemical products requires about 5% of the oil and gas each year. Petrochemicals share nearly 40 per cent of world chemicals market [2]. Petrochemicals play a major role in today's society as they are essential for food, clothing, shelter and leisure. The petrochemicals are used in many industries like polymers, synthetic fibers, synthetic rubber, plastics, soaps and detergents, solvents, drugs, fertilizers, pesticides, explosives, paints, and flooring and insulating materials. Petrochemicals are found in distinct products as aspirin, polyester clothes, luggage, boats, automobiles, air craft and recording discs and tapes. Lubricating oil, kerosene, diesel fuel, gasoline, LPG and jet fuel are not included in petrochemicals as these are not chemical compounds but are mixtures of hydrocarbons [3,4].

Applications of Petrochemicals

The petrochemical industry is responsible for manufacturing many of the things we use every day. Petrochemicals are useful in food industries, pharmaceutical industries, agricultural industries and

technology industries. These chemicals can be used in making fertilizers, polymers, solvents, dyes, pesticides, detergents, cosmetics, etc. These are exploited as fuel and lubricants for automotive and industrial purposes. Petrochemical products such as petrol, diesel, and other lubricants are in great demand in the market due to tremendous increase in number of vehicles [5]. Petrochemicals may be used as food grade lubricants in pharmaceutical; food processing plants is beverage industries. Petroleum jelly utilized as ointment base, lubricant and protective covering obtained from petroleum. Another important use of petrochemicals is as preservatives and food-additives which increase the tenure of freshness of canned food. Cosmetics that contain oils, perfumes are petroleum derivatives. The flexible rubber shoes which remain intact in all weathers are produced by using petrochemicals. Dyes having various colors are also

one of the most important usages of petrochemical products. Petrochemical ethylene is used in photographic film, food packaging, construction components, garbage bags etc. [6].

Categories of Petrochemical Products

On the basis of their chemical structure petroleum products are mainly categorized into three groups i.e. aromatics, olefins, and synthetic gas. Aromatics are mainly used for the production of plastics and synthetic fibers, synthetic detergents, etc. Olefins are considered as the major source for the preparation of industrial chemicals and its important components are Toluene, Xylenes, and Benzene. Synthetic gases are usually meant for the production of methanol and ammonia and are comprised of hydrogen and carbon monoxide.

Hazards Associated with Petrochemical Industries

Although the petrochemicals give us innumerable useful products but they can also be injurious to the health of living beings and the earth's ecosystem. Most of these chemicals when released can exhibit unfavorable effects on our environment such as air, water and soil pollution. The aromatic compounds present in petrochemicals are important environmental pollutants which may be introduced into the environment through natural oil seeps, industry waste products and emissions, oil storage wastes, accidental spills from oil tankers, coal tar processing wastes, petrochemical industrial effluents and emissions etc. Petrochemical industry is an important source for the principal greenhouse gases responsible for global warming. Other environmental impacts include ozone layer depletion, acid rain, air pollution etc. In the petrochemical industry, potentially harmful substances release are noxious, foul odor, or combustible [7, 8].

In areas nearby petrochemical industries, elevated sound levels induce noise pollution associated with feelings of headache, annoyance, uneasiness, stress, impatience, displeasure, hypersensitivity, extreme anxiety, anger, endangerment and violence. Contamination of soils may take place from residuals of refining processes including some hazardous wastes, catalysts or coke dust, tank bottoms, and sludge from the treatment processes. The petrochemical industry may also come up with loss of biodiversity and destruction of ecosystems [9]. Effluents coming out of petrochemical industries contain a large amount of polycyclic and aromatic hydrocarbons, phenols, metal derivatives, surface-active substances, sulphides, naphthylenic acids and other chemicals [10]. Due to the inefficient purification systems, toxic products present in effluents accumulate in the water bodies resulting in water pollution which is fatal to both aquatic and human life [11].

Exposure to petrochemicals may take place in different ways; they may be absorbed through the skin or might be ingested. They can also affect human life by accumulating in tissues/organs and cause brain, nerve and liver damage,

birth defects, cancer, asthma and hormonal disorders. Skin irritation, ulcers and allergic dermatitis are chronic effects of exposure [12-15].

Conclusion

Petrochemical industries play a crucial role in various manufacturing sectors. However, potential environmental hazards associated with these industries have raised increased concern for societies. This industry releases large quantities of toxic and deleterious substances as effluents into the atmosphere and generates solid waste that is difficult both to treat and to dispose of. The emissions of harmful substances from the petrochemical industries has reduced significantly in last few years because of using environmental and technological developments along with an increased awareness about the safety aspects of plant operation. It is essential to develop control and preventive measures which are to be taken at the planning stages in these industries.

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