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**CEG846 ASSIGNMENT**

1*. In a tabular form describe the major characteristics and treatment of the industrial wastewater from the following industries:*

*i. Petroleum refineries*

*ii. Tannery*

*iii. Fertilizer*

*iv. Pharmaceutical*

i. Petroleum Refineries

|  |  |
| --- | --- |
| Major Characteristics | Treatment |
| Wastewater from oil refineries contains large amounts of oil and fat in the form of suspended particles, light and heavy hydrocarbons, phenol, and other dissolved organic substances.  The wastewater from the petroleum industry consists of a wide variety of pollutants like petroleum hydrocarbons, mercaptans, oil and grease, phenol, ammonia, sulfide, and other organic compounds. | Membrane technology, photocatalytic degradation, advanced oxidation process, electrochemical catalysis, Electrocoagulation. |

ii. Tannery

|  |  |
| --- | --- |
| Major Characteristics | Treatment |
| Effluents tanneries contain compounds of trivalent chromium (Cr) and sulfides, Inorganic salts and polymeric organic coagulants are also present and used for primary coagulation, as coagulant aids, and for sludge dewatering; lime Ca(OH)2 and soda ash(Na2CO3) are necessary for pH correction are also present | Aerobic microorganisms use organic carbon in the effluent and convert it to biomass and carbon dioxide.  Coagulation/Flocculation.  Conventional Activated Sludge Process (ASP) System |

iii. Fertilizer

|  |  |
| --- | --- |
| Major Characteristics | Treatment |
| Wastewater from chemical fertilizer industry mainly contains organics, alcohols, ammonia, nitrates, phosphorous, heavy metals such as cadmium, and suspended solids.  The characterization of wastewater from different streams revealed huge variation in COD from 50 to 140,000 ppm and ammoniacal nitrogen from 6 to 1,700 ppm. Some effluent streams contained alcohol up to 5%. | Steam stripping.  Air stripping in towers.  Lagooning after pH adjustment.  Biological nitrification and denitrification |

iv. Pharmaceutical Industry

|  |  |
| --- | --- |
| Major Characteristics | Treatment |
| Wastewater from chemical fertilizer industry mainly contains organics, alcohols, ammonia, nitrates, phosphorous, heavy metals such as cadmium, and suspended solids.  The characterization of wastewater from different streams revealed huge variation in COD from 50 to 140,000 ppm and ammoniacal nitrogen from 6 to 1,700 ppm. Some effluent streams contained alcohol up to 5%. | Activated sludge biological process  Moving bed biofilm reactor process (MBBR)  Anaerobic digestion process  Advanced Oxidation Process |

*2. Air pollutants can be classified into various groups, discuss briefly the following*

classifications:

Criteria Pollutants

Toxic pollutants

Radioactive pollutants

Indoor Pollutants

**Criteria Pollutants**

Criteria air pollutants are six common air pollutants that are regulated by the United States Environmental Protection Agency (EPA) under the Clean Air Act. and most countries in the

world:

Here is a brief overview of each of the six criteria air pollutants:

* Carbon monoxide: CO is a colorless, odorless gas that is produced when fossil fuels are burned incompletely. CO can reduce the amount of oxygen that the blood can carry, which can lead to a number of health problems, including headache, dizziness, and nausea.
* Lead: Lead is a heavy metal that is toxic to humans. Lead exposure can damage the brain and nervous system, especially in children. Lead can also cause kidney damage, high blood pressure, and reproductive problems.
* Nitrogen dioxide: NO2 is a reddish-brown gas that is produced when fossil fuels are burned. NO2 can irritate the lungs and worsen asthma symptoms. NO2 can also contribute to the formation of ground-level ozone.
* Ground-level ozone: Ozone is a colorless gas that is formed in the atmosphere when sunlight reacts with nitrogen oxides and volatile organic compounds (VOCs). Ozone can irritate the lungs and worsen asthma symptoms. Ozone can also reduce lung function and damage lung tissue.
* Particulate matter: PM is a mixture of solid particles and liquid droplets found in the air. PM can come from a variety of sources, including vehicles, power plants, industrial facilities, wood burning, and wildfires. PM can irritate the lungs and worsen asthma symptoms. PM can also cause heart disease, stroke, and cancer.
* Sulfur dioxide: SO2 is a colorless gas that is produced when fossil fuels that contain sulfur are burned. SO2 can irritate the lungs and worsen asthma symptoms. SO2 can also contribute to the formation of acid rain.

The EPA has set National Ambient Air Quality Standards (NAAQS) for each of these pollutants. The NAAQS are set at levels that protect public health with an adequate margin of safety.

Criteria air pollutants are found all over the United States and can come from a variety of sources, including Vehicles, Power plants, Industrial facilities, Wood burning, and Wildfires Exposure to criteria air pollutants can have a number of adverse health effects, including Respiratory problems, Heart disease, Cancer, Stroke, Birth defects.

**Toxic Pollutants**

Hazardous air pollutants (HAPS), also called toxic air pollutants or air toxics, are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects. The US-EPA is required to control 188 hazardous air pollutants. Examples of toxic air pollutants include benzene, which is found in gasoline; perchloroethylene, which is emitted from some dry-cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries.

**Radioactive Pollutants**

Radioactivity is an air pollutant that is both geogenic and anthropogenic. Geogenic radioactivity results from the presence of radionuclides, which originate either from radioactive minerals in the earth's crust or from the interaction of cosmic radiation with atmospheric gases. Anthropogenic radioactive emissions originate from nuclear reactors, the atomic energy industry (mining and processing of reactor fuel), nuclear weapon explosions, and plants that reprocess spent reactor fuel. Since coal contains small quantities of uranium and thorium, these radioactive elements can be emitted into the atmosphere from coal-fired power plants and other sources.

**Indoor Pollutants**

When a building is not properly ventilated, pollutants can accumulate and reach concentrations greater than those typically found outside. This problem has received media attention as “Sick Building Syndrome”. Environmental tobacco smoke (ETS) is one of the main contributors to indoor pollution, as are CO, NO, and SO2, which can be emitted from furnaces and stoves. Cleaning or remodeling a house is an activity that can contribute to elevated concentrations of harmful chemicals such as VOCs emitted from household cleaners, paint, and varnishes. Also, when bacteria die, they release endotoxins into the air, which can cause adverse health effects. So ventilation is important when cooking, cleaning, and disinfecting in a building.

*4. Describe briefly the intention or the purpose of the Air Quality Regulation by NESREA*

The purpose of these Regulations is to provide for –

a. For improved control of the nation’s air quality to such an extent that would enhance the protection of flora and fauna, human health, and other resources affected by air quality deteriorations.

b. To provide for all users the right to;

i. Clean air

ii. Utilize and benefit from all-natural resources managed according to the principles of sustainable development

iii. Be informed of the nature and extent of the potential hazard of any activity, undertaking or project and to be served timely notice of any significant rise in the level of pollution and the accidental or deliberate release into the atmosphere of harmful or hazardous substances: and

c. The clean-up and rehabilitation of the affected area