Ministry of Higher Education and Scientific Research Al-Mustaqbal University College

Department of Chemical Engineering and petroleum Industrials

Pollution

2nd Stage

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Treatment of Waste Water from Petroleum Industries

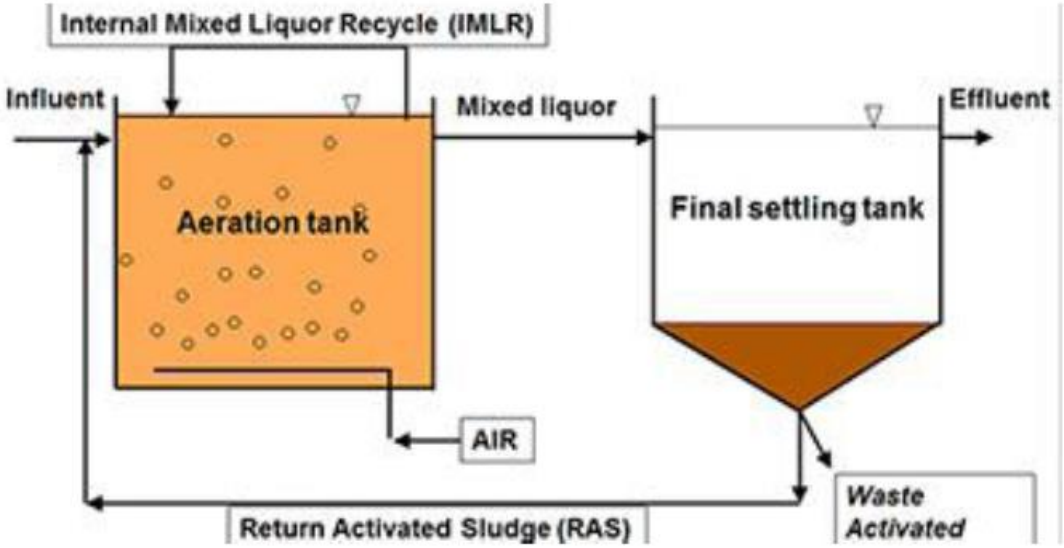
Secondary treatment

Coagulation- flocculation, and **further biological treatment** is used to reduce toxicity of petroleum wastewater. Petroleum effluent contains large number of refractory components. **Polyaluminum chloride** is more effective rather than ferric chloride in coagulation process for treatment of petroleum wastewater. **Coagulation-flocculation** is a process in which chemical product is added to accelerate the sedimentation in clarification tank. The coagulants are organic or inorganic components such as aluminum hydroxide chloride and aluminum sulfate or high molecular weight cationic polymer. The aim of addition of coagulant is to remove 90% of the suspended solids from the wastewater.

Biological treatment: is the most widely used method for removal of organic compounds in the oil

industry wastewater. Using microorganisms, mostly bacteria, in the biochemical decomposition of wastewaters to stable end products. Activated sludge reactors or **biofilm**-based reactor to remove the **organic pollutants**. Methods can be divided into **aerobic** and **anaerobic** methods, based on availability of dissolved oxygen. **Anaerobic systems**, has an excellent organic removal efficiency and an economical cost. Organic matter is converted into CO_2 and CH_4, and sludge but the products of chemical and biochemical reactions produce displeasing colors and odors in water.

The activated sludge process is the biological process by which dissolved matters and colloidal are converted into activated sludge which is removed from the liquid carrier (water). At a plant the activated sludge is settled out along with the suspended solids present in the wastewater.



Bio film-based reactor Fundamentals

Most definitions include the attachment of microorganisms to a solid surface. Biofilm formation is a process that consists of a sequence of steps. It begins with the adsorption of macromolecules(e.g., proteins, polysaccharides, and smaller molecules (e.g., fatty acids, lipids, and pollutants such as polyaromatic hydrocarbons onto surfaces. These adsorbed molecules form conditioning films which may have multiple effects, such as altering the physicochemical characteristics of the surface, acting as a

concentrated nutrient source for microorganisms enhancing the release of toxic metal ions. Once the surface is prepared, cells begin to attach. The adherence of bacteria to a surface is followed by the production of slimy adhesive substances, extracellular polymeric substances (EPS).

Trickling Filter. The trickling filter (TF) has been in use for more than 50 years. It is a three-phase biofilm reactor, including an **influent recirculation pump station**, the **TF**, and a **clarification unit**.

A key element that should be taken into consideration in the design of TFs is the selection of filter media. The most commonly used material in this system was for a long time stones and gravel. However, these materials were restricting the air circulation in the filter and consequently the available oxygen quantity for the growth of microbial biofilm. other materials have been used to overcome these limitations including plastic

rings, zeolite, ceramsite, sponge, etc. Wastewater treatment using TFs requires a further liquid-solid separation for the elimination of suspended solids as the TF treatment results in the total suspended solid production.