



Prepared By:

Mohammed ALMannaa

427101143

Supervised by

Dr. Ashraf Refaat

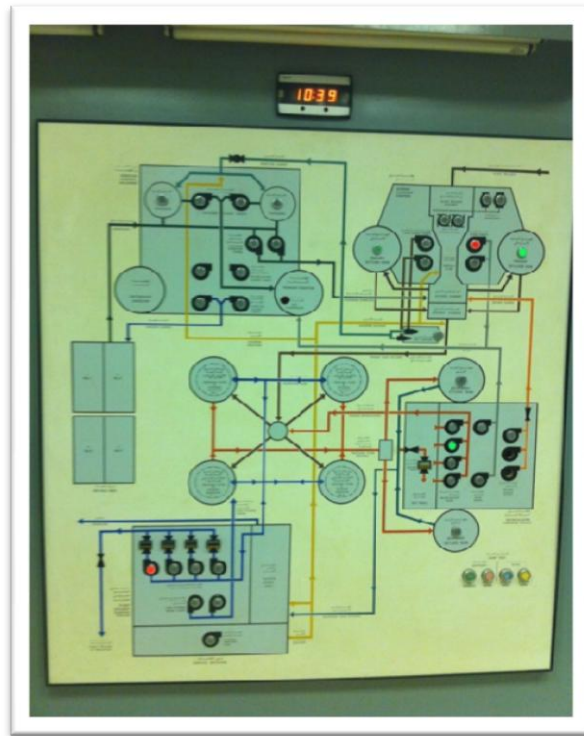
Introduction:

Sewage is the wastewater released by residences, businesses and industries in a community. It is 99.94 percent water, with only 0.06 percent of the wastewater dissolved and suspended solid material. The cloudiness of sewage is caused by suspended particles which in untreated sewage ranges from 100 to 350 mg/l. A measure of the strength of the wastewater is biochemical oxygen demand, or BOD₅. The BOD₅ measures the amount of oxygen microorganisms require in five days to break down sewage. Untreated sewage has a BOD₅ ranging from 100 mg/l to 300 mg/l. Pathogens or disease-causing organisms are present in sewage. Coliform bacteria are used as an indicator of disease-causing organisms. Sewage also contains nutrients (such as ammonia and phosphorus), minerals, and metals. Ammonia can range from 12 to 50 mg/l and phosphorus can range from 6 to 20 mg/l in untreated sewage.

Sewage treatment is a multi-stage process to renovate wastewater before it reenters a body of water, is applied to the land or is reused. The goal is to reduce or remove organic matter, solids, nutrients, disease-causing organisms and other pollutants from wastewater. Each receiving body of water has limits to the amount of pollutants it can receive without degradation. Therefore, each sewage treatment plant must hold a permit listing the allowable levels of BOD₅, suspended solids, coliform bacteria and other pollutants. The discharge permits are called NPDES permits which stands for the National Pollutant Discharge Elimination System.



Inflow for Wastewater plant



Preliminary Treatment

Preliminary treatment to screen out, grind up, or separate debris is the first step in wastewater treatment. Sticks, rags, large food particles, sand, gravel, toys, etc., are removed at this stage to protect the pumping and other equipment in the treatment plant. Treatment equipment such as bar screens, comminutors (a large version of a garbage disposal), and grit chambers are used as the wastewater first enters a treatment plant. The collected debris is usually disposed of in a landfill.



Screen

Primary Treatment

Primary treatment is the second step in treatment and separates suspended solids and greases from wastewater. Waste-water is held in a quiet tank for several hours allowing the particles to settle to the bottom and the greases to float to the top. The solids drawn off the bottom and skimmed off the top receive further treatment as sludge. The clarified wastewater flows on to the next stage of wastewater treatment. Clarifiers and septic tanks are usually used to provide primary treatment.



Secondary Treatment

Secondary treatment is a biological treatment process to remove dissolved organic matter from wastewater. Sewage microorganisms are cultivated and added to the wastewater. The microorganisms absorb organic matter from sewage as their food supply. Three approaches are used to accomplish secondary treatment; fixed film, suspended film and lagoon systems.

Fixed Film Systems

Fixed film systems grow microorganisms on substrates such as rocks, sand or plastic. The wastewater is spread over the substrate, allowing the wastewater to flow past the film of microorganisms fixed to the substrate. As organic matter and nutrients are absorbed from the wastewater, the film of microorganisms grows and thickens. Trickling filters, rotating biological contactors, and sand filters are examples of fixed film systems.

Suspended Film Systems

Suspended film systems stir and suspend microorganisms in wastewater. As the microorganisms absorb organic matter and nutrients from the wastewater they grow in size and number. After the microorganisms have been suspended in the wastewater for several hours, they are settled out as a sludge. Some of the sludge is pumped back into the incoming wastewater to provide "seed" microorganisms. The remainder is wasted and sent on to a sludge treatment process. Activated sludge, extended aeration, oxidation ditch, and sequential batch reactor systems are all examples of suspended film systems.

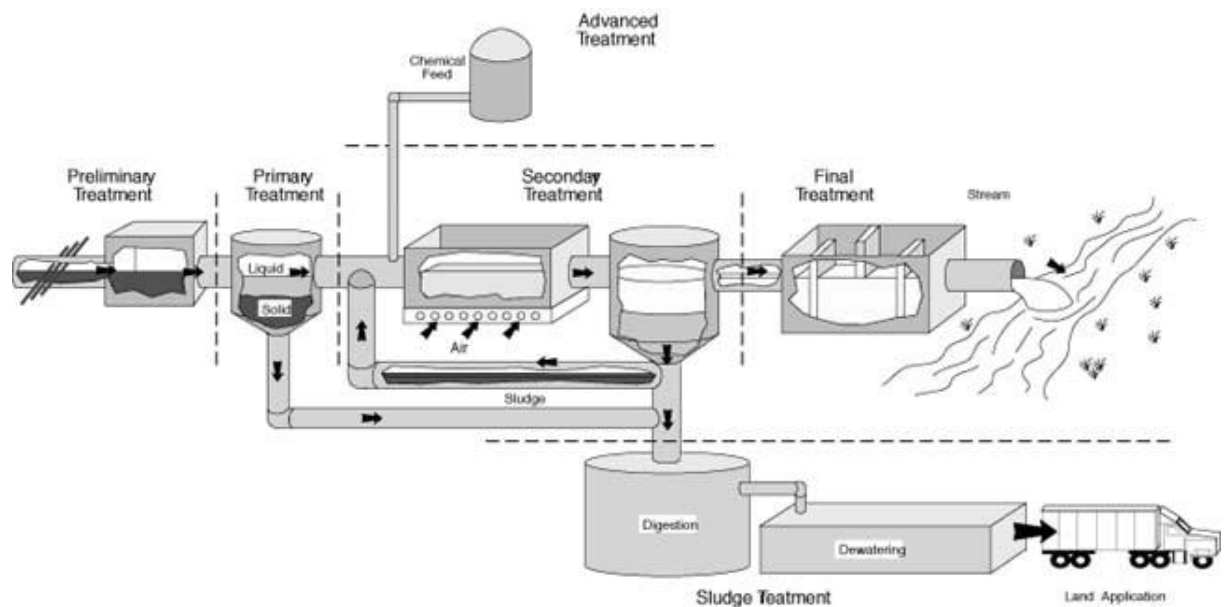
Lagoon Systems

Lagoon systems are shallow basins which hold the waste-water for several months to allow for the natural degradation of sewage. These systems take advantage of natural aeration and microorganisms in the wastewater to renovate sewage.

Final Treatment

Final treatment focuses on removal of disease-causing organisms from wastewater. Treated wastewater can be disinfected by adding chlorine or by using ultraviolet light. High levels of chlorine may be harmful to aquatic life in receiving streams. Treatment systems often add a chlorine-neutralizing chemical to the treated wastewater before stream discharge.

Chlorination



Advanced Treatment

Advanced treatment is necessary in some treatment systems to remove nutrients from wastewater. Chemicals are sometimes added during the treatment process to help settle out or strip out phosphorus or nitrogen. Some examples of nutrient removal systems include coagulant addition for phosphorus removal and air stripping for ammonia removal.

Sludges

Sludges are generated through the sewage treatment process. Primary sludges, material that settles out during primary treatment, often have a strong odor and require treatment prior to disposal. Secondary sludges are the extra microorganisms from the biological treatment processes. The goals of sludge treatment are to stabilize the sludge and reduce odors, remove some of the water and reduce volume, decompose some of the organic matter and reduce volume, kill disease causing organisms and disinfect the sludge.

Untreated sludges are about 97 percent water. Settling the sludge and decanting off the separated liquid removes some of the water and reduces the sludge volume. Settling can result in a sludge with about 96 to 92 percent water. More water can be removed from sludge by using sand drying beds, vacuum filters, filter presses, and centrifuges resulting in sludges with between 80 to 50 percent water. This dried sludge is called a sludge cake. Aerobic and anaerobic digestion are used to decompose organic matter to reduce volume. Digestion also stabilizes the sludge to reduce odors. Caustic chemicals can be added to sludge or it may be heat treated to kill disease-causing organisms. Following treatment, liquid and cake sludges are usually spread on fields, returning organic matter and nutrients to the soil.

Wastewater treatment processes require careful management to ensure the protection of the water body that receives the discharge. Trained and certified treatment plant operators measure and monitor the incoming sewage, the treatment process and the final effluent.



Sludge

Wastewater Treatment Regulations

Clean water has been a concern nationwide since the early 1970's. In 1972, the U.S. Congress adopted the Clean Water Act to protect the waters of the nation. Through this act, the U.S. Environmental Protection Agency and corresponding state agencies were given the responsibility to regulate activities that threaten the quality of the nation's water resources.

In the Federal Clean Water Act, Congress adopted a comprehensive water policy for the nation and set as a national goal the elimination of pollutant discharges to the navigable waters of the U.S. by 1985. An interim goal was set to insure that all navigable waters would be fishable and swimmable by 1983.

To reach these goals, the U.S. Congress established a regulatory framework:

- No one has the right to pollute the navigable waters of the United States. Dischargers are required to obtain permits.
- Permits shall set limits on the concentration of the pollutants being discharged. A violation of the limits carries a penalty of fines or imprisonment.
- The best technology available shall be used to control the discharge of pollutants.

Each state, through a designated regulatory agency, issues discharge permits and enforces the discharge limits.

The Ohio Water Quality Standards (Ohio Administrative Code 3745-1-04) specify that all surface waters of the state must be free from the following pollutants as a result of human activity: suspended solids, floating debris, color, odor, toxic substances and nutrients that create nuisance growths of weeds and algae.

Permits for wastewater treatment systems serving single family homes, two- or three-family dwellings are issued by local health departments. Permits for all wastewater treatment systems serving more than 2 homes or buildings larger than a 3-family dwelling are issued by the Ohio Environmental Protection Agency.

Two different permits are issued by the Ohio Environmental Protection Agency. All systems must first obtain a Permit to Install (PTI) before a treatment plant can be constructed. The Permit to Install is issued after the plans for construction, operation and management are examined to insure that the receiving stream will be protected.

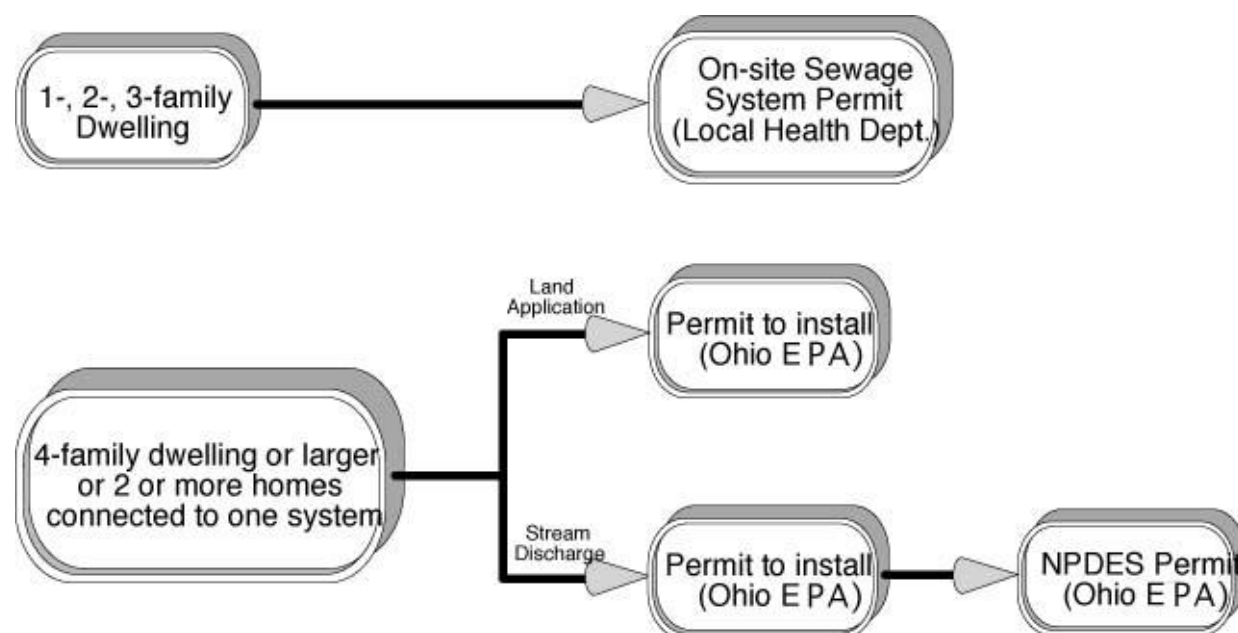
If the discharge from the treatment plant enters a stream, a NPDES permit is required. The NPDES permit specifies the maximum allowable level of total suspended solids, biochemical oxygen demand, nutrients and bacteria that can be discharged to a stream as well as the minimum level of dissolved oxygen that must be present in the discharge. The levels specified in the NPDES permit are determined by the condition of the receiving stream. Therefore, NPDES permits are subject to change every 5 years as water quality concerns change throughout Ohio.

Discharging raw sewage from a dwelling is considered a public nuisance (Ohio Revised Code 3767.13). For systems serving a 1-, 2- or 3-family dwelling, the local

health department is the responsible regulatory agency. The penalty for creating a public nuisance is a third degree misdemeanor which is punishable by not more than 60 days in jail and/or a \$500 fine. In addition, the violator may be required to remove the sewage from public or private property or the waters of the state.

Discharges of pollutants from a multiple dwelling is under the jurisdiction of the Ohio Environmental Protection Agency. Discharges may be liable for civil penalties of up to \$10,000 for each day of violation (Ohio Revised Code 6111.07). In addition, criminal penalties can be assessed up to \$25,000 or up to one year of imprisonment or both (Ohio Revised Code 6111.99). A "Connection Ban" can also be issued by the Ohio Environmental Protection Agency which prohibits the construction or installation of home sewage disposal systems when it is shown that pollutants from new homes will be discharged into the waters of the state (Ohio Administrative Code 3745-11).

In 1995, the Ohio Environmental Protection Agency issued 25 administrative orders totaling \$80,000 in fines to Ohio communities for wastewater treatment violations. Also in 1995, 6 cases were referred to the Ohio Attorney General for action. Thirty-two Attorney General's cases were resolved in 1995, with penalties totaling \$1,235,000.





Some of Tests inside Plant

Finally :

In the summer, the amount of water inside plant decrease , and this constitutes a danger to her because it must not be less than the flow of the plant for a certain extent, so they recycle treated water to the plant again .

*attached some of wastewater requirements after entry and before entering the plant from government .

.. The End ..