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B - GRADE

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR: 2020-21

A SUMMARY REPORT

Course Name: ENVIRONMENTAL ENGINEERING

Name of the Resource Person: Mr.CH.Sridhar AEE/RWS Dept/Sathupally Sub Division.

Gap Identified: Biological and chemical treatment using with different filtration methods

No. of Students attended: 45 members

Summary: On the first day of the session (i.e 17-07-2021) Mr.CH.Sridhar AEE/RWS Dept/Sathupally Sub Division, delivered a lecture on the basics of Introduction to the course of Environmental Engineering. Delivered a lecture on Biological and chemical treatment using with different filtration methods and the concepts related to the Biological treatments include two main technologies: bioremediation and phytoremediation. Bioremediation exploits the ability of microorganisms to degrade and detoxify organic contaminants. Two general approaches are commonly used: biostimulation and bioaugmentation. In the afternoon session, he explained the practical exposure of biological treatment uses living bacteria to do the bulk of the purification while chemical treatment uses chemical reactants to accomplish the work

Wastewater treatment involves multiple stages of filtration and purification to return treated water to a specified quality. Newer water treatment processes can create a greener, cleaner and safer working environment by replacing harmful chemicals, and by enabling recycling, reclamation, or reuse of water that would otherwise be wasted. Multiple water treatment systems are used on the production line to facilitate this, with biological systems and alternatives to chemical-based systems being the most common, capable of supporting significant flow rates with very little downtime.

Report:

Pollutants do biological and chemical wastewater treatment systems removing:

When it comes to understating which technologies might make up your wastewater treatment system, one important factor in making that decision will come down to the type of contaminants that need to be removed**.** These are some of the ways biological and chemical treatment can help.

Biological treatment systems:

Biological wastewater treatment systems are best at removing things that are easily biodegradable. For example, things used in your garden or kitchen that are made up of carbohydrates, polysaccharides, starches, sugars, proteins and edible fats (like lipids or plant-based oils). To this list, we can also add hydrocarbons (like ethane, hexane, pentane, octane, and nonane), as well as smaller aromatic compounds (like benzene, toluene, xylene, and simple phenols) which are also simple compounds that are easy for bacteria to break down and digest.

Chemical treatment systems:

Pollutants removed with chemistry are typically toxic soluble metals (like aluminum, cobalt, copper, iron, mercury, nickel, lead, and zinc). Bacteria aren't effective at removing these contaminants, but treating these metals chemically by adding either calcium hydroxide or sodium hydroxide helps form insoluble metal hydroxides that can precipitate out of the water solution.

Industries like mining and steel-making or oil and gas—wherever a facility is using raw materials from the earth that, as a byproduct, have a wastewater bearing these kinds of compounds—will generally use chemical rather than biological wastewater treatment technologies.

Biological and chemical treatment systems:

If your facility's contaminants are more complex, like certain polymers or poly nuclear links, etc., these tend to be harder for the bacteria to degrade. In these cases, chemistry can be used in the preliminary wastewater treatment phases to break down non degradable compounds by oxidizing them partially and converting them from their polymer (or more complex form) to their monomer or dimer (or simpler form) so the bacteria can take over and treat the rest of the broken-down molecules from there. In these cases, you might use advanced oxidation chemistry, like ozone or hydrogen peroxide, to precede the biological component.

A combination of chemical and biological wastewater treatment might be required where industrial streams are highly concentrated with hydrocarbons, such as in certain refineries. These problematic streams are segmented out for chemical pretreatment—where a bulk of the toxicity is removed—then join the streams going to the biological plant, but this doesn't happen often.

There are a few cases where you must choose between either biological or chemical treatment, for example with removing selenium. Historically, it has been removed chemically by adding reducing agents and adsorbents, but it can also be removed biologically with anoxic nitrate-reducing bacteria.

Differences in system processes:

The technologies of choice are largely dependent upon the pollutants that need to be removed. As mentioned above, each of these methods only removes certain pollutants efficiently, so you're often required to use one technology or the other.

Although treatment methods can vary, in biological wastewater treatment, the standard process includes**:**

- **pretreatment** to remove particulates or insoluble solids;
- **Biological treatment**, which is typically aerated but could also be anoxic (treatment methods could be anaerobic where you're fermenting down to methane, CO2, and biogas), but 95% of biological wastewater treatment is aerobic. Biological wastewater treatment uses technologies like moving bed bioreactors, fixed bed bioreactors, membrane bioreactors, biological trickling filters, rotating biological contactors, sequencing batch contactor, etc. In the biological world, you have the whole microbial kingdom to draw upon to accomplish your treatment objectives;
- **Post treatment** to clarify out bacterial solids to further purify the water.

On the other end, chemical wastewater treatment standard processes typically include**:**

- **precipitation** of the metals
- **Coagulation and flocculation;** after all the larger objects settle out, various chemicals are added to a reaction tank to remove the bulk suspended solids and other various contaminants. This process takes out all the finer particles in the water **by** combining them into heavier particles that settle out**.** The most widely used coagulates are aluminum-based such as alum and poly aluminum chloride. Sometimes a slight pH adjustment will help coagulate the particles, as well.
- **ion exchange**, which is common for drinking water applications or any other applications that require high-quality water (like recycling the water for use in other processes or making steam)
- **disinfection**, where chemicals like chlorine remove any kind of bacteria that may be in the wastewater that needs to be disinfected before it's discharged

In chemistry, though, you might have a few stages depending upon the chemical reactions and what's in the water, like adjust the pH or temperature before adding chemicals. The key objective, here, is to mix the chemical reactants with the wastewater pollutants thoroughly to optimize chemical reactions and kinetics in order to complete the treatment as quickly and efficiently as possible.