BIOREMDIATION

Chapter (9)

Part (2)

- More specifically about cleaning of the difference type of environment one of (soil cleaning), contaminated soil .

- Of the two strategies ??.

- Ex situ bioremdiation :- to take contaminated soil two anther location for treatment and must be removed.

- In situ bioremdiation):- leave contaminated material in the same place. And(very large contaminated).

Soil Cleanup

- Ex situ bioremediation – removing chemical materials from contaminated area to another location for treatment

- In situ bioremediation – leaves contaminated materials in place preferred because less expensive and large contaminated Areas can be treated at one time Stimulate microorganisms in the contaminated soil or water..

- (In situ bioremdiation):-

- Approaches that require aerobic degradation methods often involve (bioventing) Pumping air , H2O2 into the contaminated soil May growth be uses to add fertilizers to stmulate and degrading actvites of indigenous bacteria (Not always the best solution).

- Most effectve in sandy soils which allow microorganisms and fertilizing materials to spread rapidly Solid clay and dense rocky soils not typically good .

• Contamination with chemicals that persist for long periods can take years to clean.

• Note:-H2O2, Hydrogen peroxide.

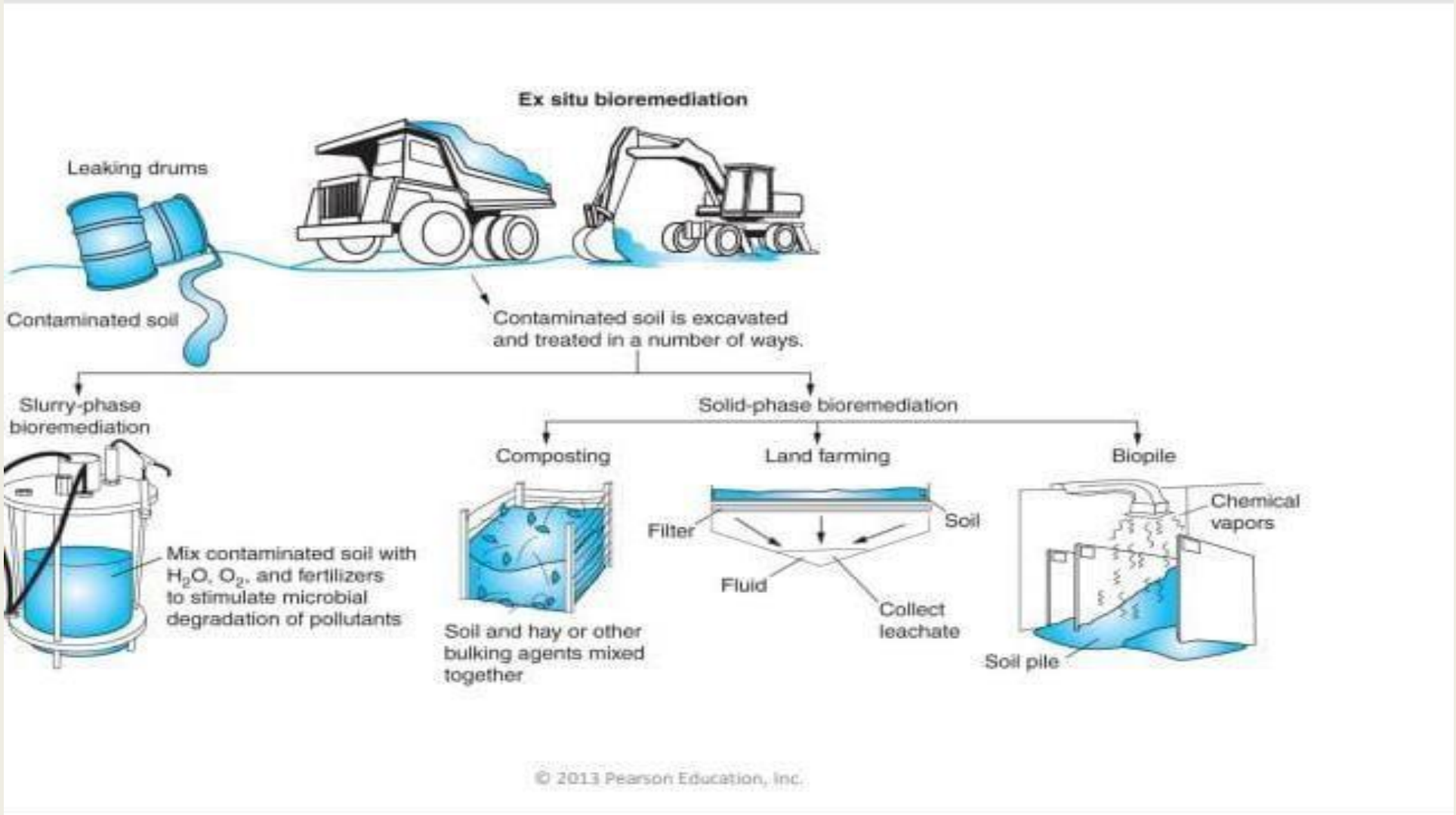
• Ex situ bioremediation) can be faster, and more effective two major types of Ex:-

1- Slurry phase bioremdiation
Moving to another site, then mixing the soil with water, fertilizers, Etc.
in large bioreactor.

• Good for smaller amounts of well known contaminants •

2- Solid phase bioremdiation •

(Composting)– degrades food and garden waste,Land farming ,Biopiles.



- Ex situ bioremdiation :

- The idea Contamination soil well be removed in ti treatment plant Contaminated soil is excavety and treat in number of ways :- And of figure slurry soil mix fertilizer with O2,H2O, Stimulate biodegradation pollutant.

- So, this soil Contains indigenous bacterial well can are able degrade the pollutant or toxic so we well like (bioreactor), inside the bacterial try of bacteria increase the number of bacteria or anther.

- The start biodegradation the Contamination after the soil degrade the soil

- solid phase bioremdiation:-

of similar natural process.

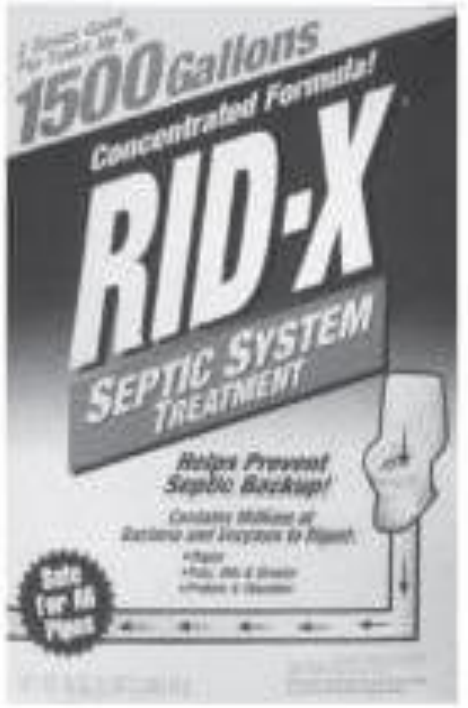
land Thin layer soil these soil filter we allow demovement soil the filter. Farming biopileof Contamination.

And this examples:-

9.3 Cleanup Sites and Strategies

- Biopiles

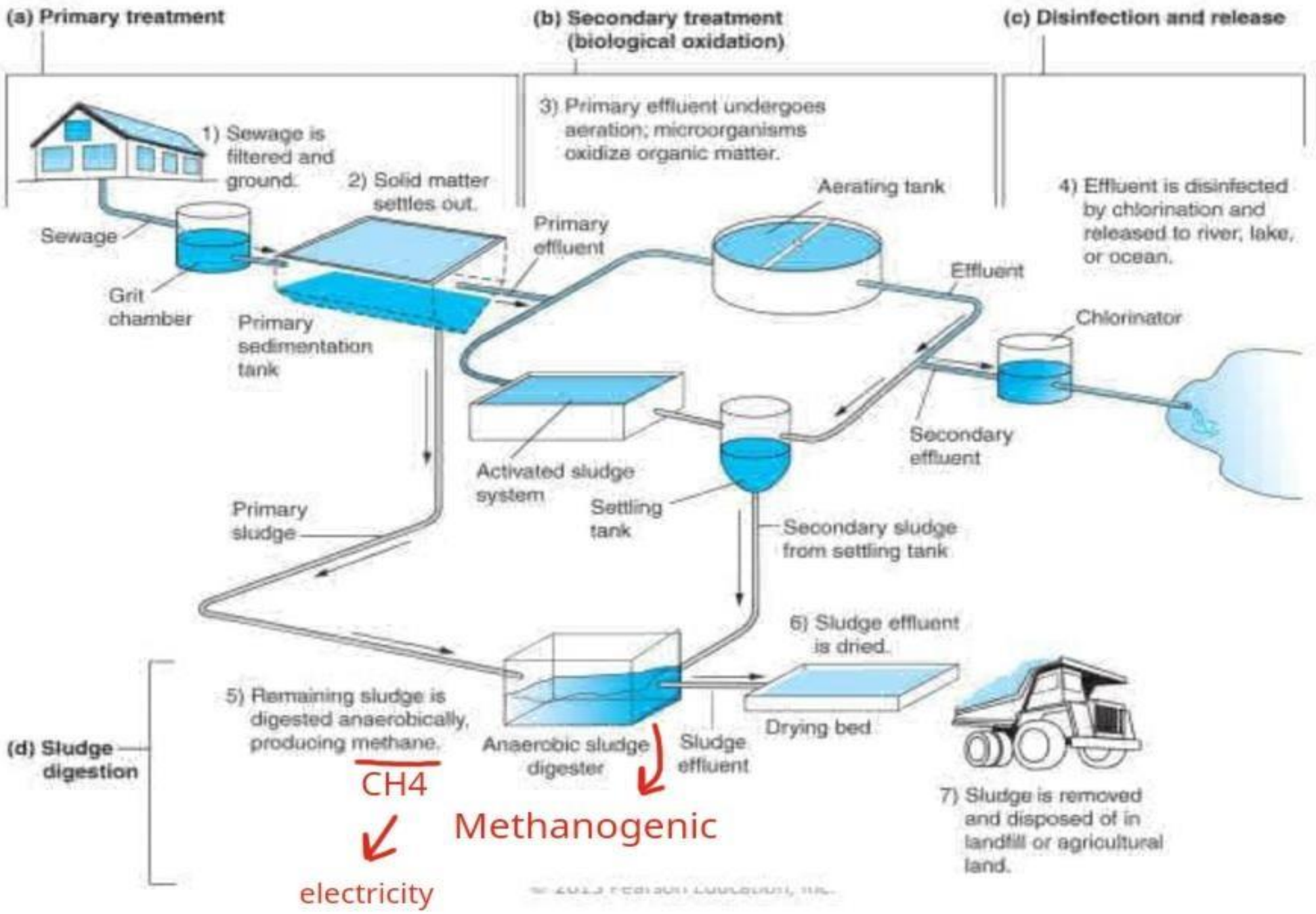
- Septic Tank Additives



- Clean up site and strategies. Bioremediation of Water Seway, domestic Industrial,storm sewage Wastewater treatments

  Groundwater cleanup.

- All *of* this type water waste, must be clean . Human Water enjennring active.


(a) Primary treatment
(b) Secondary treatment (biological oxidation)
(c) Disinfection and release
1) Sewage is filtered and ground.
2) Solid matter settles out.
3) Primary effluent undergoes aeration; microorganisms oxidize organic matter.
4) Effluent is disinfected by chlorination and released to river, lake, or ocean.
Sewage
Grit chamber
Primary sedimentation tank
Primary effluent
Aerating tank
Effluent
Chlorinator
Activated sludge system
Settling tank
Secondary effluent
Primary sludge
Secondary sludge from settling tank
6) Sludge effluent is dried.
5) Remaining sludge is digested anaerobically, producing methane.
Anaerobic sludge digester
Sludge effluent
Drying bed
7) Sludge is removed and disposed of in landfill or agricultural land.
(d) Sludge digestion
CH4
Methanogenic
electricity

- sewage from coming house the factory they waste , the treatment plant and the first step fillter sewage large object well be removed only water small susbinding matter well be cut small species'.

- First filter and well be enter grit chamber so, in this grit chamber allows basically only small susbinding matter in the sewage ti enter plant .
- The next step (sedimentation tank) they well stills down in botton the tank they waste water soluble organic matter well and move the next stage .

- Secondary treatment (biological oxidation) the two major strategies degrade the organic matter found in they waste water could the primary effluent and these two tank 1-activated studg system 2-Aeratng tank

- Aerobic bacterial waste waste degrade any biological organic matter soluble in they waste water.

- After organic biological degrading and second settling tank these solid susbinding matter , could be sittlied collect in to anther tank ,and this tank collect they presipated solid sittle primary sedimentation tank and secondary sedimentation tank and so before Aerobic oxidation biological oxidation after Aerobic oxidation and there are collected in this tank and the settling tank material primary sludge and secondary sludge from settling tank after Aerobic degrade .

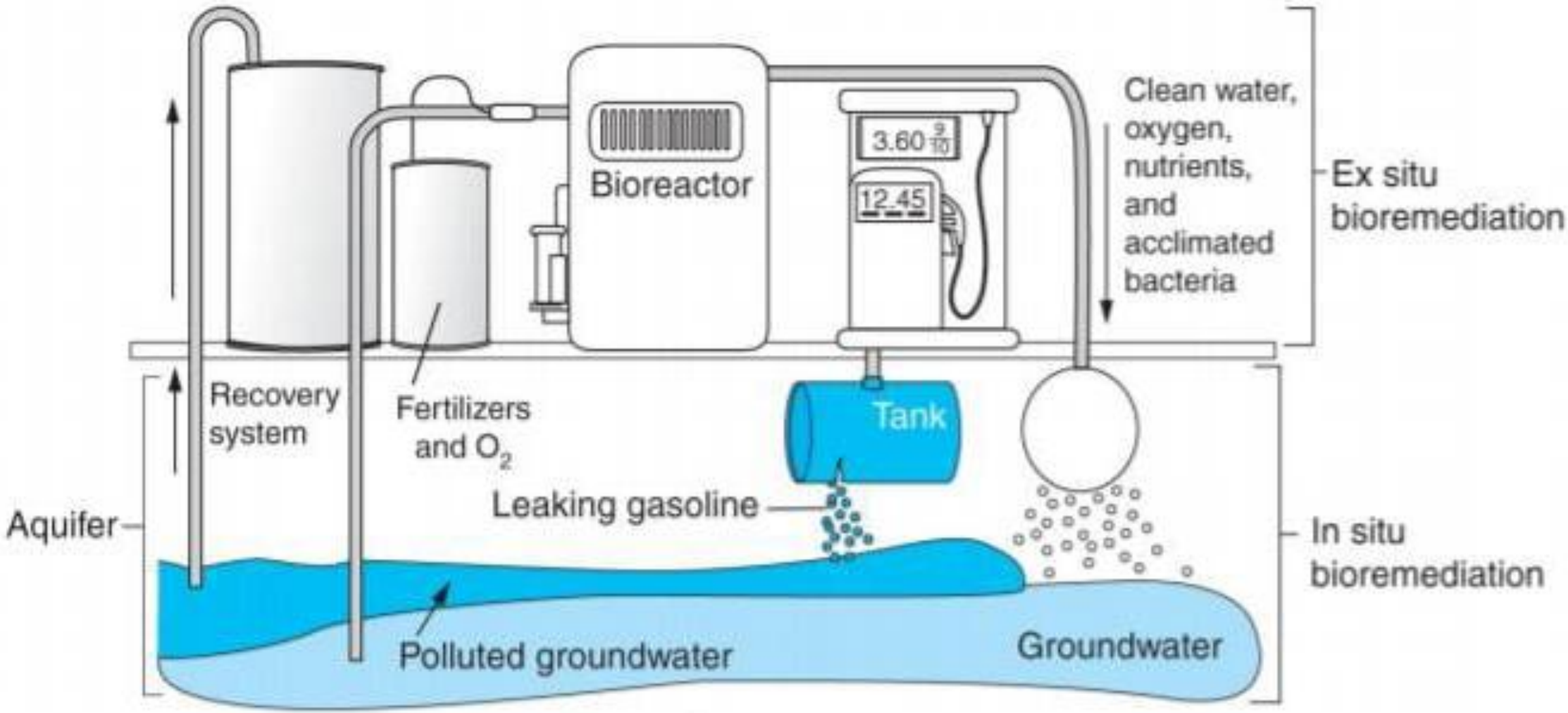
- And the sludge well be digester Anaerobic by bacterial have inside sludge (methanogenic bacterial) CH4 ,gas e lectricity produce.

- Step sludge digestion type of secondary treatment using anaerobic bacteria biological . Fertilizer = سماد
- Primary effluent :-after sedimentation grit chamber (physical).
- Secondary effluent :- after biological ones well be treatment chemicals by added chlorinator make sure that this water free organisms make sure bacteria not life

Chlorinator :-kill the most bacterial

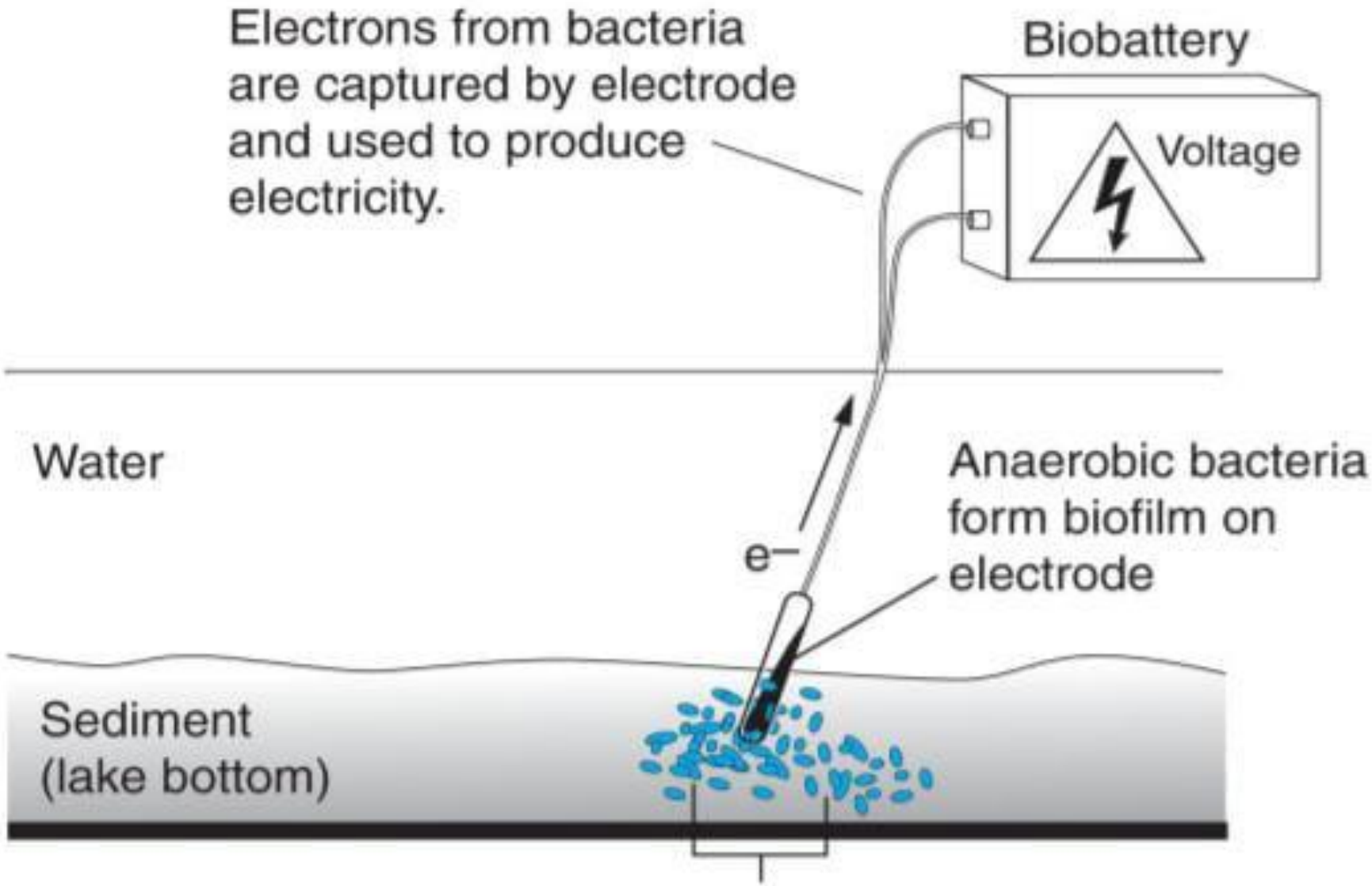
- Add sometimes extra Contamination step by secondary effluent (UV light), physical and disinfect removed all bacterial could be lecture agree

9.3 Cleanup Sites and Strategies



- Could be Pollutants and the water clean up is to pump ground water out into large tank , its bioreactor inside he has contaminated ground water we could add of Course be sum native indigenous bacterial or microbes in the fertilizer and O2 , Allows increase number so process clean up ground water in we pumps back the Water from bioreactor this water be clean up 1-oxygen,2-nitrogen,acclinanted Bacteria large number.

- So, we have both Ex situ bioremdiation happening of ground water and the same time we doing In situ bioremdiation pump back Water Contains oxygen turning wastes into energy methane gas used to produce electricity.
- Soil nutrients can be sold commercially as fertilizers Anaerobes in sediment that use organic molecules to generate energy electrigens electricity generating microbes. •



- Idea that sedimentation are rich nutrients and rich Anaerobic bacteria oxidation organic molecules in the sedimentation and some probe electricity could be sediment and they microbes well take electron from organic matter and we give the electrodes well carried into biobattery , this basic like take electricity from the degredation from the organic matter from of sedimentation .

9.4 Applying Gene:cally Engineered Strains to Clean Up the environment.

- Many indigenous bacteria cannot degrade certain types of chemicals, especially Very toxic chemicals

- Organic chemicals produced during the manufacture of plastics and resins Radioactive compounds

- Recombinant DNA technology has enabled creation of GM organisms with the Potential to improve bioremdiation.

- Petroleum-Eating Bacteria Created in 1970s

Isolated strains of pseudomonas from contaminated soils

contained plasmids that encoded genes for breaking down the pollutants.

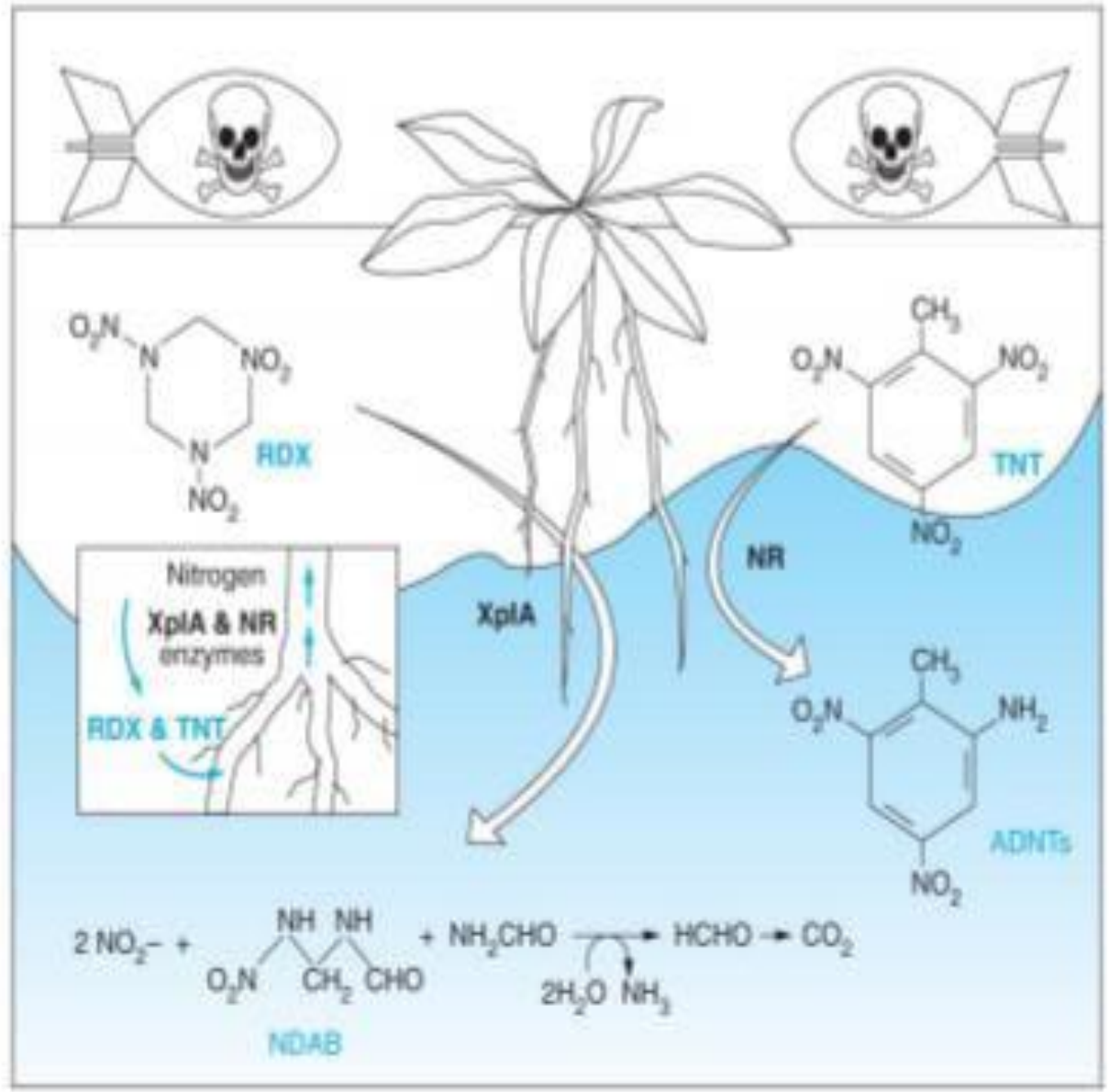
- Bioaugmention added genetically engineered maby microbes help , indigenous Removed chemical Pollutants.
- E. Coli to clean up heavy metals (Copper, lead, cadmium, chromium, and mercury)

- Biosensors – bacteria capable of detec3ng a variety of environmental pollutants.

- Genetically Modified Plants and Phytoremediation Plants that can remove RDX and TNT .

- Phytoremediation of toxic explosives using transgenic plants

- Phytoremediation of Toxic Explosives Using Transgenic Plants



- Some plants have be geneticlly enjennring to degrade these chemical so example , enzyme the degredation RDX and degredation TNT less toxic of course these chemical we type of ores soil after activation.

- Notes:-Some plants and some enzyme could be utilized clean soil the contaminated Chemical Plant Arabidopsis thaliana ,model plant .So, this enzyme nitroreductare.

- Recovering valuable metals (Copper, nickel, boron, gold).

- Many microbes can convert metal products into metal oxides or ores

Useful for recovery of metals from waste solutions from industrial Manufacturing ProcessMay be used to harvest precious metals.

Bioremediation of Radioactive Wastes

- The US Department of Energy has identified over 100 sites

Contaminated by weapons production or nuclear reactor Development.

Most radioactive materials kill microbes, but some strains have

Demonstrated a potential for degrading radioactive chemicals

No bacterium has been identified that can completely metabolized,

Radioactive elements into harmless products.