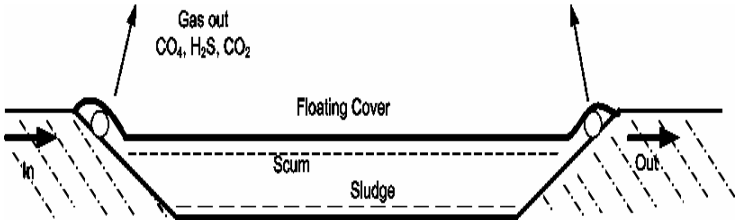
Geosynthetics in Wastewater Treatment

Prepared by M. Sadlier

Geosynthetics are used in various applications in waste water facilities. The most common use is in lagoons operating with anaerobic and aerobic processes. Other applications include enhanced evaporation of wastewater and sludge dewatering by permeable geotextile geotubes.

Anaerobic Lagoons with Covers

When wastewater with a reasonably high organic load is kept in a lagoon for several days an active anaerobic sludge accumulates at the bottom of the lagoon. In an uncovered lagoon the anaerobic digestion activity takes place at the base of the lagoon and the activity near the surface tends to be more aerobic.



These lagoons can be covered with a geomembrane floating cover to:

(a) enhance the anaerobic digestion activity by the exclusion of air (oxygen)
(b) enable the harvesting of gas (especially methane) which can be used as a fuel
(c) reduce the effect of odour from the anaerobic activity

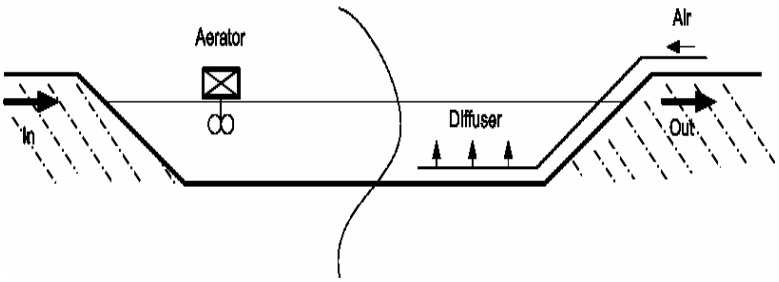
Generally these lagoons will take wastewater with BOD of 400 to 5000 kg/cum and the output effluent will have the BOD reduced by 90 to 95%. Detention time is normally 4 –7 days. The anaerobic process is largely self propelled and the only mechanical input is that required to feed wastewater to the lagoon and force its exit at an overflow outlet. There may be a need for systems to deal with excessive accumulations of sludge (base) and scum (surface under cover) but this will depend on the nature of the wastewater and the dynamics of the system.

Aerobic (Aerated) Lagoons

Aerated systems use either surface aerators or diffuser systems to introduce air into the wastewater and this results in consumption of the organic content of the wastewater which is mostly released as carbon dioxide.

These aerobic systems require considerable mechanical input to operate the aeration system and further work may be needed to remove excess sludge from the base from time to time. Typically these systems take wastewater with BOD in the order of 500 to 1500

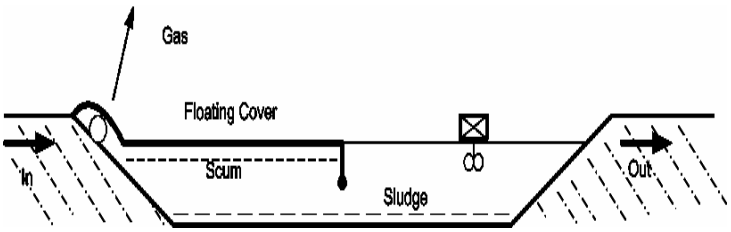
kg/cum and the output effluent will have the BOD reduced by around 90%. Detention time is normally 4 –7 days.



Combined Anaerobic and Aerobic Lagoons

Many wastewater plants make use of anaerobic and aerobic systems as a combined or two part process. This can be readily achieved in one lagoon using a specially designed geomembrane floating cover.

These combined systems have a capacity to take wastewater with BOD of 5000 kg/cum and to achieve an output effluent less than 100 kg/cum. Total detention times would be in the order of 10 days although some systems use final 'polishing' lagoons or grass filtration/irrigation. These combined systems have the capability for the gas to be used on-site to provide power which can be used for the aeration energy input.



Applications for Geosynthetics

The applications for geosynthetics in these lagoon systems are essentially associated with the liner system and with the floating cover system but there are many variations that may be chosen according to circumstances.

(a) Liner Systems: geosynthetic clay liners with soil or concrete covers or geomembranes can be properly specified for liner systems.

(b) Cover Systems: Cover designs may vary with factors such as the intended operation of the cover with respect to effluent levels, gas collection and associated factors, as well as the construction restrictions which may limit the cover design options.

(c) Enhanced Evaporation: a typical dark geomembrane with shallow wastewater over it will see the wastewater temperature rise with solar radiation creating an enhanced capacity for evaporation. This is used in wastewater disposal and for salt and mineral extraction processes. A floating cover over the wastewater will prevent growth of waste volume in the wet season as well as enabling fresh water to be gathered from the cover.

(d) Sludge Dewatering: geotubes were initially developed as a construction tool enabling the used of dredged sands to build groynes and the like. These filtration properties can also be used to take sludges with high water content and rapidly dry them to a solid state which allows truck transport without dripping.

About the IGS

The **International Geosynthetics Society (IGS)** is a non-profit organization dedicated to the scientific and engineering development of geotextiles, geomembranes, related products and associated technologies. The IGS promotes the dissemination of technical information on geosynthetics through a newsletter (IGS News) and though its two official journals (Geosynthetics International - www.geosynthetics-international.com and Geotextiles and Geomembranes - www.elsevier.com/locate/geotexmem). Additional information on the IGS and its activities can be obtained at www.geosyntheticssociety.org or contacting the IGS Secretariat at IGSsec@aol.com