Simple sedimentation

Surface waters contain sand, grit, silt and other suspended solids which can damage pumps, block filters, clog pipes and filter screens, reduce storage capacity and reduce the effectiveness of disinfection.

Sedimentation can remove significant amounts of suspended solids from water. Numbers of pathogenic (disease-causing) microorganisms are also commonly reduced as they are often attached to particles and will be removed with them. Fine silt or clay particles are unlikely to be removed unless coagulating chemicals are added to the water and a type of settling tank used. Coagulation, flocculation and clarification in water treatment are described in Fact Sheet 2.13.

Grit chambers and channels

Grit or coarse suspended solids can be removed in a grit tank or channel. These are essentially coarse sedimentation tanks in which the water flows at a maximum velocity of 0.75 m/sec. The retention time of the tank need only be a few minutes. Finer suspended matter can be reduced by passing the water slowly through a settling tank.

Simple settling tank

A sedimentation tank is designed for a specific retention time, ensuring flow with minimum turbulence. The design and arrangement of inlet, outlet and baffle structures are important. In addition, the design must allow for the removal of solids which have accumulated at the bottom of the tank. This is most commonly achieved by positioning a large diameter drain valve at the lowest point of the tank. The floor of the tank should slope towards this valve so that solids tend to flow towards this point. A typical simple settling tank is shown in Figure 1.

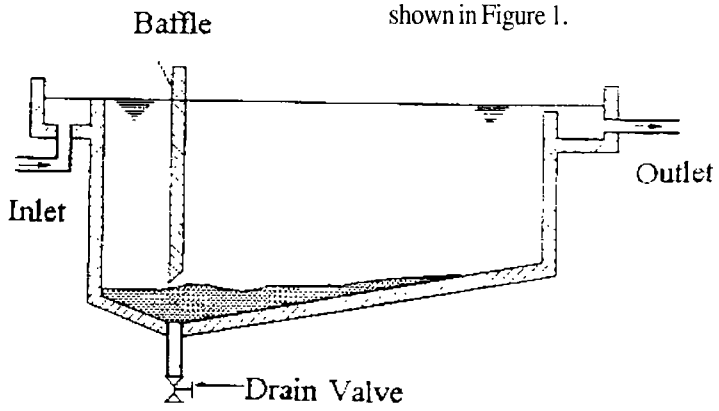

Figure 1. Simple settling tank

The retention time of water in a sedimentation tank is usually about two hours.

Sanitary inspections of simple settling tanks

Sanitary inspections of simple settling tanks should be carried out regularly to ensure that the tank is regularly and properly cleaned and that it is functioning correctly (see Fact Sheet 2.1). The key points and observations to make during a sanitary inspection are :

- The drain valve should be functional and greased.
- The floor of the tank should be regularly cleaned.
- The turbidity of the water at the outlet should be 70-90 per cent lower than the turbidity of the raw water. If the turbidity reduction is less than 50 per cent the tank should be drained and cleaned.

Key design features

Typically the inlet structure of the settling tank will include a perforated vertical baffle a little way forward from the inlet pipe to distribute the water evenly across the tank. Water must flow evenly into the tank to avoid turbulence and areas of stagnation. There may also be a weir across the width of the tank before the baffle. The rapid transit of water across the tank must be avoided as the retention time will be too low to allow the suspended solids to settle out.

The settling zone *is the area where the solids settle to the bottom of the tank. The important feature is the retention time of the water here. For most waters a minimum retention time of two hours is required to remove over 50 per cent of the suspended solids in the raw water. Theoretical and real retention times are often different because of poor settling tank design.*

The outlet *of a settling tank is a weir which collects clarified water from the top layer of the tank after the settling zone.*

The sludge zone *is the area where the solids accumulate at the bottom of the tank. It should slope towards the drain.*

Operation and maintenance of simple settling tanks

Regular maintenance of simple settling tanks is limited to removal of the accumulated solids. This can be done by means of the drain valve connected to the lowest point of the settling tank.