WASTE WATER TREATMENT

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Abstract
The paper presents the importance and the necessity to increase the efficiency of cleaning process of the residual waters from waste industry. There are presented the methods of treatment of the residual wastewaters, in order to find the best condition and parameters treatment process.

Key words: wastewater, sludge, process, reactor, toxicity factors, biomass

INTRODUCTION

The concepts of sustainable development suppose solving the problems which appear in a present activity, so that, not to appear negatively aspects of that in the future. It was created, generally, of late, the opinion that, wastewater meaning environmental destroys especially surface and underground water and because of this has to be treated.

The indispensable element of our entity, water is so daily present so as to considering always conveniently and indispensable.

Of course, is only an opinion!

Even that has the big quality permanently to regenerate, water resource of Terra and – especially – from our country aren't not far so big as to justify an inadvertent management.

Even that the Blue Planet disposes of 1, 4 billions km^3 of water we have to keep in mind that only cca. 1% of this quantity is containing in surface water.

The Romania water consumes is cca. 20 billions m^3/year; a part of the used water is returned in mainstreams, but, through impurities contain contribution, this fact determined sometimes pollution of these.

The waste water contributes in a sizable measure to such as negatively aspect.

To these wastewaters resulted from landfill are added water from industries and all of them are discharged, finally, in mainstreams.

These short presentations of this situation make – consider – in vain any supplementary argumentation of necessity of efficiently treatment of waste water, the problem which people with a long time ago realized and try to solve them through different treatment process, and, of course, before like these water was discharge in mainstreams.

MATERIAL AND METHOD

Now, let's see, how to remove the settling solids from the wastewater. This is achieved through settling tank. It comprises of the following units: sedimentation tanks: either plain or chemical precipitation, describing a septic (Imhoff) tanks and how this activate the sludge digestion in.

This is carried out with the objective to remove suspended mineral and organic matter from sewage after the wastewater has been subjected to pass through screens and grit chamber.

These are the units in which sedimentation is brought about. The lighter organic sewage solids, which settle in the sedimentation tanks, are termed as sludge, while the sewage that has been partially clarified by the settling out of the solids is known as the effluent. Both sludge and effluent should be further treated in order to make them stable and unobjectionable.

The settlement of the solids may either be caused by gravity or by aggregation or flocculation of sewage-particles. If the coagulating chemicals are not added in the sewage, the tanks are referred as plain sedimentation tanks. whereas, if chemicals are used for the purpose of bringing the finer suspended and colloidal solids into masses of large bulk, thus hastening the settlement process, these are then known as chemical precipitation tanks. The chemicals used are alum, lime, ferric chloride, ferric sulfate, chlorinated copper, etc.

RESULTS AND DISCUSSIONS

Sedimentation is accomplished either in horizontal-flow or vertical-flow tanks. The former are usually rectangular and the latter circular.

In a rectangular tank, sewage enters continuously at one end and passes at the other end, generally over a weir. Sludge is removed manually into sludge-digestion tanks. The scum formed at the surface is removed by the mechanical scraper with the aid of a second blade called skimmer, through a scum trough.

In the case of a circular or upward-flow tank, sewage enters at the center, rises vertically to be drawn off by flowing over a peripheral weir arranged at the surface. Such tanks are particularly designed to make use of the principle of flocculation whereby, small colloidal particles are agglomerated into bulky wooly masses, which are more easily settled as sludge on the bottom of the tank.

Mechanical scrapers collect the sludge, concentrating it towards the center, from where it is removed for further treatment. The effluent flowing over the outlet weir is collected in an outlet pipe for further treatment.

When only raw sewage is to be treated in these tanks, they may be generally termed as primary settling tanks or primary clarifiers.

While when a sewage that has received secondary treatment, as in trickling filters or aeration tanks, is to be treated in them, then they may be called as secondary settling tanks or secondary clarifiers.

For the sedimentation tanks, the capacity in water supply is determined by the volume of sewage-flow and the required detention period:

1. detention period: 1 to 3 hours. Longer periods result in higher efficiency than shorter periods but too long a period induces septic conditions and should be avoided.
2. velocity of flow: about 30 l/sec.
3. surface loading: it may be noted that the overall range of surface loading between 30,000 to 50,000 l/m/day is in conformity with that used in case of horizontal flow and vertical flow sedimentation tanks.
4. liquid depth of mechanically cleaned settling tanks should not be less that 2.1 m, and for the final clarifier for activated sludge, not less than 2.4 m.

The second unit is describing a septic (Imhoff) tanks. Designed by Karl Imhoff of Germany, an Imhoff tank is an improved septic tank in which the incoming sewage or influent is not allowed to get mixed up with the sludge produced. And, the outgoing sewage or effluent is not allowed to carry with it large amount of the suspended matter as in the case of a normal septic tank.

In a double chambered Imhoff Tank, the upper chamber is called the sedimentation tank or flowing through chamber, through which sewage flows at a very low velocity and the lower chamber is the digestion chamber in which anaerobic or septic decomposition occurs.

Solids of the sewage settle to the bottom of the sedimentation chamber through the sloping bottom walls (slope 5 vertical to 4 horizontal). They are made to fall in the digestion chamber through an entrance slot at the lowest point of the sedimentation chamber of the Imhoff Tank. The slot is trapped or overlapped in such a way that the gases generated in the digestion chamber cannot enter the sedimentation chamber.

A gas vent, also called scum chamber is provided with the digestion chamber to take care of the gases escaping to the surface. The chief gas is methane (CH_4) having a considerable fuel value and may, therefore, be separately collected for use.

In order to prevent particles of sludge or scum from penetrating into the sedimentation chamber, the sludge and scum must be maintained at a distance of at least 45 cm below and above the slots respectively. The free or clear zone in the Imhoff Tank is called neutral zone.

The digestion chamber in an Imhoff Tank is made up of two or three inverted cones called hoppers with sides sloping (1:1) so as to concentrate the sludge at the bottom of the hopper. The sludge is removed periodically through sludge-pipe, the flow being under a hydrostatic pressure of 1.2 to 1.8 m. All the sludge is not removed; only the lower layers which are completely decomposed are withdrawn, leaving some sludge to keep the tank seeded with anaerobic bacteria.

To permit uniform distribution of settled solids throughout the length of the digestion chamber, so as to utilize the storage capacity in the greatest measure, arrangements for reversing the direction of flow through the Imhoff tanks are commonly made.

Fig. 1. An original circular Imhoff tank constructed in 1914
(www.keystone-alliance.com/.../ P1190008.jpg)

In designing an Imhoff tank, the following design points may be noted.

(1) Sedimentation chamber:

a. Retention period = 2 hours (usually)

b. Flowing through velocity = 30 cm/min

c. Surface loading = 30,000 liters/m2/day.

d. Length (should preferably be) not to exceed 30 m, so as to provide good sludge distribution. Length to width ratio is 3:1 to 5:1.

e. Depth should as far as possible be kept shallow, to permit particle falling to the slot before reaching the end of the sedimentation chamber. In practice, a total depth between 9 - 10.5 m for the tank is considered sufficient. Greater depth involves difficulty of excavation.

(b) Digestion chamber of the Imhoff Tank:

a. the surface area of the scum chamber should be 25 - 30 per cent area of the horizontal projection of the top of the digestion chamber. Ample space for the escape of gases is necessary so as to prevent troubles due to foaming. Width of a vent should be at least 60 cm.

Now, we have to see and explain *the differences in sedimentation tank design for filtering suspended solids*. Sedimentation is accomplished either in horizontal-flow or vertical-flow tanks. The former are usually rectangular and the latter circular. In a rectangular sedimentation tank design, sewage enters continuously at one end and passes at the other end, generally over a weir. Sludge is removed manually into sludge-digestion tanks. The scum formed at the surface is removed by the mechanical scraper with the aid of a second blade called skimmer, through a scum trough.

In the case of a circular or upward-flow sedimentation tank design, sewage enters at the center, rises vertically to be drawn off by flowing over a peripheral weir arranged at the surface. Such tanks are particularly designed to make use of the principle of flocculation whereby, small colloidal particles are agglomerated into bulky wooly masses, which are more easily settled as sludge on the bottom of the tank. Mechanical scrapers collect the sludge, concentrating it towards the center, from where it is removed for further treatment. In this sedimentation tank design, the effluent flowing over the outlet weir is collected in an outlet pipe for further treatment.

When only raw sewage is to be treated in these tanks, they may be generally termed as primary settling tanks or primary clarifiers. While when sewage that has received secondary treatment, as in trickling filters or aeration tanks, is to be treated in them, then they may be called as secondary settling tanks or secondary clarifiers.

The third unit explains that *activated sludge process* is an aerobic biological process that uses microorganisms in a completely mixed reactor to remove organic materials from a wastewater stream. The biomass in the reactor is approximately 95% bacteria and 5% protozoa and higher organisms. Microscopic observation of the activated sludge microorganisms is useful for the detection and diagnosis of operational problems such as bulking and foaming, and can also be used as an indicator of toxicity problems.

The biological use of wastewater microorganism is in secondary treatment involving the components of removing, stabilizing and rendering harmless, very fine suspended matter, colloids and dissolved solids of the sewage, that come from the sedimentation tank, where most of the matter in suspension has been removed. In some cases, effluent from sedimentation tank may be good enough for disposal if the dilution is great. However, in most cases, oxidation of the organic rotten matter with the help of wastewater microorganism is necessary.

CONCLUSIONS

Prior to incorporating secondary treatment technologies with Imhoff tanks, these processes should be brought up to a uniform standard that provides optimum performance of the Imhoff tank system themselves.

Initials factors within the scope of an improvement plan would include: initiate proper information and maintenance procedures for the system with record keeping, begin installation of appropriate pre-treatment for Imhoff tank that lack these systems, and optimize flow distribution through the Imhoff tank to provide ideal detention times for removal of settling particles and sludge digestion.

This action will go along way to improve both the performance of the Imhoff tanks and usable service life.

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