COMPACT WASTE WATER TREATMENT PLANTS

GENERAL INDEX

1. INTRODUCTION

Several processes currently used for wastewater pollutants lose their characteristics, and can be returned to the stateless nature of them, pouring them into the ground, ditches, streams, etc...

Adequate treatment to achieve the decontamination of these waters is biological treatment, which is that they undergo a natural process of transformation, digestion, through which there are a number of biochemical, for which the transformation of an organic substances into other components.

For this process takes place in optimal conditions, the facility must meet certain characteristics that allow microorganisms to perform their duties without interruption in all waters to be treated.

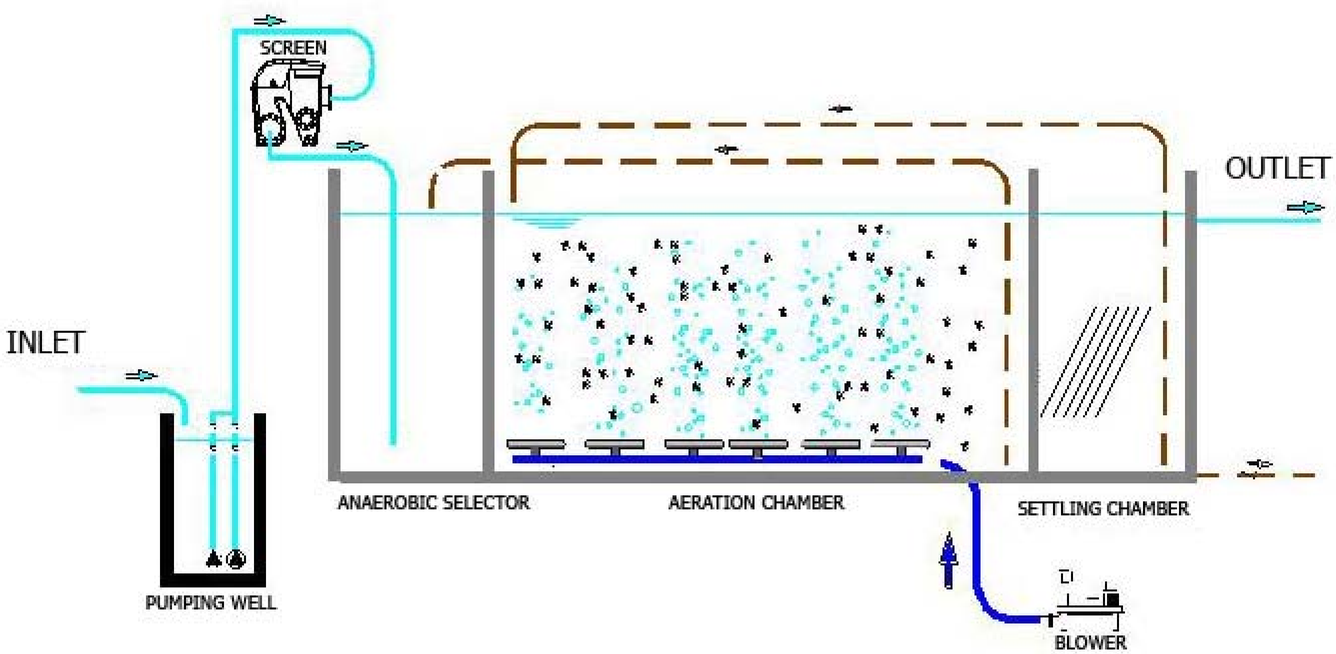
Our family of compact WWTP meets first, versatility, so it can adapt to different flow rates and working conditions. Also, the nature of this family of WWTP and assembly is simple as well as the cost of maintaining them.

This family of compact WWTP is the solution for treating wastewater from small and medium towns as they are simple and economic.

2. PROCESS DESCRIPTION

The treatment process consists of a pretreatment followed by biological treatment and sedimentation reaching the final effluent discharge parameters required by the European Community

The stages of the treatment are:



2.1. PUMPING TO SCREENING

The treatment plant requires a pump to overcome before the difference in height between the exit of water from the well pump and the entrance to the pretreatment.

2.2. SCREEN

Its mission is to remove solids drag the water to avoid clogging and mechanical problems at the facility. The screen will be located at the top of the biological treatment tank to avoid pumping transported by gravity wastewater biological treatment.

2.3. BIOLOGICAL TREATMENT

Biological treatment is performed in a tank divided into two chambers: anaerobe chamber and aerobic chamber.

Anaerobe Chamber:

This camera produces the decomposition of organic and inorganic matter in the absence of molecular oxygen. In the anoxia chamber the soluble and colloidal organic matter is transformed into volatile acids, in turn, are transformed into methane and CO_2. Different types of bacteria produce acid fermentation and methane.

During anaerobic digestion, much of the content of nitrogen and phosphorus is released in soluble form. At this stage in the absence of oxygen, some heterotrophic bacteria are capable of consuming oxygen from the nitrates, which reduce nitrogen releasing free. This process is called denitrification.

The denitrification is carried out by facultative heterotrophic bacteria and therefore uses BOD as a source of organic carbon and energy for the synthesis and nitrate (NO3-) as a source of oxygen.

$$NO_3^- + BOD \Rightarrow N_2 + CO_2 + H_2O + OH^- + \text{News Cells}$$

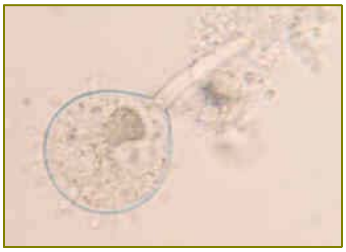
Aerobic Chamber:

The biodegradability of a wastewater is determined as the ratio of biochemical oxygen demand and chemical oxygen demand. This index follows the substance to be purified is susceptible or not to be filtered through biological degradation.

The type of biological treatment is carried out is called activated sludge, the most widely used in wastewater treatment. Is to cause the development of a bacterial culture dispersed in the form of floc (activated sludge) in an aerated tank fed with the effluent has to be purified. The aeration is to dissolve the oxygen in the mixed liquor in order to meet the oxygen requirements of wastewater treatment aerobic bacteria.

The aerobic biological treatment of wastewater is, in a first phase, lead to the development of bacteria that gather in films or flocs, and that physical action or physical-chemical pollution retain and feed on it. In a second phase, usually separated by sedimentation of sludge produced.

The bacteria are responsible for the cleaning is achieved at this stage of purification. Their food is organic matter which concerns us delete. Coalesce into colonies, called biological flocs where different types of live bacteria with the food. Bacteria in their activities require oxygen to breathe.



Naturally the more pollution we introduce the number of bacteria grows to a limit that requires us to remove excess. You then proceed to purge the biological sludge.

The limit is reached when the amount of existing bacteria consume more air than we can provide. It is therefore important that this setting is very well sized. Pumping air into the aeration tank on the other hand means the most important energy source in the plant. This wills shock absorbers optimized systems such as fine bubble diffusers.

To improve the process employs organic filler. Padded, microorganisms adhere to an inert carrier through which the wastewater percolates. The filling can support higher organic loads than other systems, translating this into a smaller volume of biological reactor is estimated that about four times reduced when compared with some activated sludge.

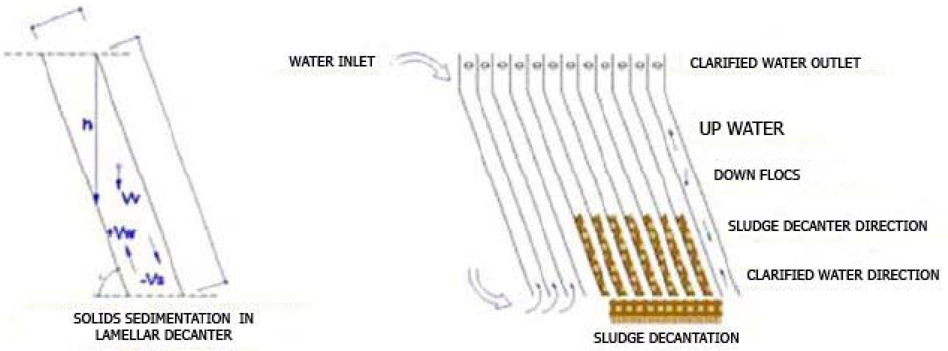
Biological fillers such reactors are continuously in motion, caused by air injection and water recirculation. These ‘carriers’ offer large surfaces for microorganisms to grow up.

Their use offers the possibility to increase the capacity of existing plants or to reduce the volume when the new plants have to be designed. Another advantage is the low sensitivity to variations of organic loading as is common within the water treatment plants.

2.4. FINING, LAMELLAR DECANTATION

At this stage the bacteria are added in colonies and form flocs decanted biological sludge. This settling is called laminar settling as they used a package comprising several lamellar FRP plates placed in parallel and with an inclination of 60° which increases the effective area of settling of suspended solids. The treated water flows through a weir located in the settling tank and the sludge is recirculated to the aeration tank, to keep it a sufficient concentration of purifying bacteria.

The surplus (excess secondary sludge) is removed from the system and discharged through the bottom of the tank through a purge valve.



3. UNIT DESCRIPTION

3.1. PUMPING WELL

The pumping well includes two submersible sewage pumps with lowering device, automatic anchor, hoist for removal of pumps and level measurement.

3.2. SCREEN

The screens are installed high pressure rotary screens are manufactured in GRP. The mesh size of them is 0.15 mm. The screen will be located at the top of the biological treatment tank to avoid pumping transported by gravity wastewater biological treatment.

3.3. BIOLOGICAL TREATMENT

Biological treatment is performed in a tank divided into three cells: selector anaerobic, aeration chamber and settling chamber. The tank is fitted with access ladders and walkways that allow periodic inspections of the interior components of the tank.

Anaerobic Selector: This camera is held denitrification. It is composed of trap grids consisting of cylinders of 250 mm in diameter made of sheet steel perforated 4 mm pitch. These screens will be installed for the passage of water from the anaerobic selector chamber aeration.

Aeration chamber: consisting of a grid diffuser fine bubble membrane that provides the oxygen needed for biological process. The supply air grille diffusers are made by means of blowers. The team is equipped with two blowers (1 + 1 reserve). The air line is equipped with valves for each branch of diffusers.

In the chamber is an inert carrier through which the wastewater percolates. In this chamber there is a retention grid inert medium consisting of 250 mm diameter cylinder made of sheet steel perforated 4 mm pitch. They are installed to allow water and retain the inert support.

Settling chamber: After biological treatment, water flows by gravity to the clarifier lamella usually installed on the same module as the biological treatment.

Tilted lamellae generate a flow that facilitates the separation of clean water and mud. Sedimentation is caused by the gravity because the microorganisms have a dense structure and form rapidly settling flocs.

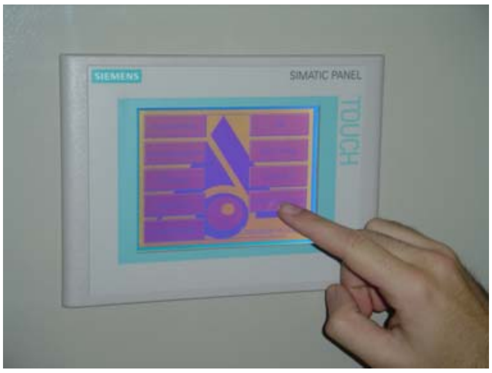
The clarified water rises slowly between the lamellae to reach the exit ports of treated water, while the mud sediments deposited at the bottom of the decanter, which has a funnel.

One of the advantages of lamellar decanters they do not need energy and require very little space for installation.

3.4. ELECTRICAL CABINET AND AUTOMATION

Equipment includes a control cabinet, metal construction, IP55 protection, and installation of power, handling and marking of all electrical consumption elements of the installation.

Be used for system monitoring and control from a PLC which is displayed on display run times, pump and alarm status, there is the possibility of manual and/or automatic and may be changed working times.



4. EQUIPMENT TECHNICAL SPECIFICATIONS

Biological compact plant family design is presented in the following table:

HE	MODEL	COMPACT UNITS NUMBER	BIOLOGICAL VOLUME (M3)	TOTAL POWER KW
100	PBC-100	1	9	7,75
200	PBC-200	1	17	8,35
300	PBC-300	1	26	8,95
500	PBC-500	1	43	9,55
600	PBC-600	1	51	11,55
700	PBC -700	2	60	15,95
1.000	PBC -1.000	2	85	19,95
1.500	PBC -1.500	3	128	21,55
2.000	PBC-2.000	3	170	30,55

5. MAINTENANCE AND EXPLOITATION

One of the main arguments in favor of these plants is that they require little maintenance. Similarly, the management tasks that enable the smooth operation of the facilities are also very low due to the simplicity of operation and the ability to self-regulation and adaptation to changes (both hydraulic and pollutant load) that are capable of withstanding.

In any case, it is important to ensure the smooth operation of the WWTP carrying out the few preventive maintenance tasks and Plant Conservation (and to the schedule set) required facilities.

5.1. MAINTENANCE AND CONSERVATION OPERATIONS TO MAKE

As mentioned, the optimal operation of plants is guaranteed if you periodically perform a minimum maintenance and facility maintenance. Such operations, as well as the frequency with which any, are:

Operation	Frequency
Review dumping well	Biannual
General cleaning inside the tank	Quarterly
Cleaning lamellar decanter	Weekly
General check operation	Weekly

5.2. COMPACT WWTP EXPLOITATION

Exploitation costs of these plants are minimal. The simplicity of the system involves very little technical direction and very little maintenance and conservation staff.

These plants are equipped with a small number of equipments so that investment in spare parts, lubricants, oils etc. is minimal.

The amount of sludge generated in the process of purification is low so the cost of dehydration and/or disposal of these will be lower in comparison with other systems.

5.3. COMPUTING OF ENERGY CONSUMPTION FOR WWTP

Below this is a table of estimated energy consumption calculated for WWTP:

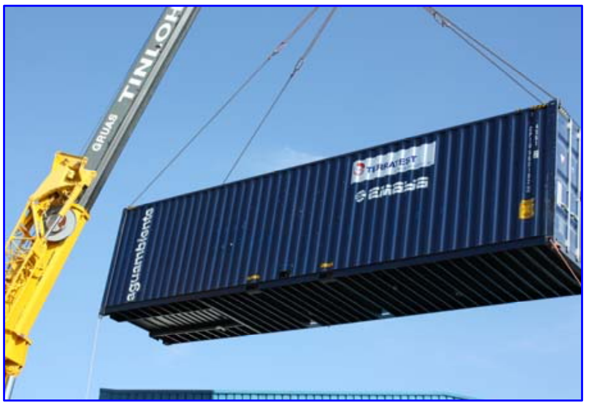
MODEL	EQUIPMENTS			TOTAL KW	TOTAL CONSUMPTION KW/day	TOTAL ENERGY COST (€/ day)
	Pumping (2 Units)	Screen	Blower (2 Units)			
PBC-100	0,6	0,55	3	7,75	**81,20**	**5**
PBC-200	0,9	0,55	3	8,35	**83,60**	**5**
PBC-300	1,20	0,55	3	8,95	**86**	**5**
PBC-500	1,5	0,55	3	9,55	**88,40**	**5**
PBC-600	1,5	0,55	4	11,55	**112,40**	**7**
PBC-700	2,2	0,55	5,5	15,95	**154**	**9**
PBC-1.000	2,2	0,55	7,5	19,95	**202**	**12**
PBC-1.500	3	0,55	7,5	21,55	**208**	**13**
PBC -2.000	4	0,55	11	30,55	**300**	**18**

** Estimated cost €/Kw an hour is 0,06 €*

6. SUMMARY BENEFITS OF THE WWTP

Finally this is the some benefits of the WWTP:

- Fast installation.
- Easy transport.
- Reduced space.
- Minimum cost of management.
- Easy to expand WWTP.
- Minimum visual impact.



7. AGUAMBIENTE PRESENCE IN ARAB COUNTRIES

★ Countries where Aguambiente it has customers.