CONTAINERISED SEWAGE PLANTS

The treatment of sewage and biodegradable effluents has become essential in order to maintain the quality of rivers and ground water and protect the quality of the water used by the population. Whether water is used for drinking purposes or for recreation only, the need for proper sewage treatment cannot be denied.

Our Sewage Systems Technology cover applications from a single household to settlements of maximum 5000 people. Our systems have been proven in operation throughout Southern Africa after development of the system some 20 years ago. From the initial basic designs, the technology has been developed to cover a larger number of applications, using new equipment and new materials of construction to the current system where the systems offer long-term low cost solutions to the treatment of sewage and effluent.

Our Sewage Systems offers the civil consulting engineer, the town planner, the developer or even the householder a low cost solution. Costs are reduced, effluent quality is guaranteed and operational costs minimised.

The basic technology used in the Sewage Systems Tech. is the activated sludge process. This applies to both small and large processing plants and the difference lies in the arrangement and enhancement of the various sections of the process.

The activated sludge process is a natural process and nature offers us a unique solution to treat sewage. It has been used for many years, and has been proven to be effective if plant design is correct and operation levels maintained.

Plant design principles

The design of the sewage process technology is based on the continuous treatment of sewage. This is in contrast to a number of batch systems currently available in the market.

The continuous treatment of sewage ensures that effluent quality remains constant even with varying incoming flow characteristics. Designed for maximum flow, the plant can handle the low volumes that it may receive during the day and the high peaks that are typical of early morning and evenings for domestic applications. The same applies to industrial and mining plants where flow will peak significantly during shift changes.

Our plants specifically have been designed to handle these daily peaks. This is in contrast with many plants designed by experienced engineers, who have been only involved in large municipal plants. Our extended experience in this field has allowed us to design for the actual conditions in practice.

The standard elements of an activated sludge plant include the following steps;

- Anaerobic digestion of the raw sewage
- Aeration section where oxygen is supplied and aerobic bacteria break down the sewage and remove ammonia from the effluent
- Clarifier where the biological sludge (bacteria) and the clear effluent are separated so that the sludge can be returned into the process and the clear effluent can be allowed to exit the plant
- Disinfection of the clean effluent to ensure that all ecoli are removed.

Our Technology offers various designs which incorporate the above basic requirements. In all cases the plants flow through the process continuously and by gravity so that some attenuation of flow occurs though the plant improving the settling characteristics in the clarifier.

Effluent standards

For South Africa the local Water Act specifies two main standards, which can also be applied in most international cases. (SA Government Gazette 20526 of 8 October 1999, Department of Water Affairs publication No.1191 in terms of Section 39 of the National Water Act No 36 of 1988)

The main effluent specification is General Limit, which is the standard used for irrigation and discharge in most rivers. If however large dams or ecologically sensitive areas are present, both phosphate removal and special denitrification is required. The latter is termed Special Limits.

Some of the main characteristics of both standards are shown in the enclosed table.

PARAMETER		GENERAL STD	SPECIAL STD	UNIT
Faecal coliforms	Guaranteed	1000	0	Per 100ml
	Normal	0		
Chemical Oxygen Demand (COD)				
	Guaranteed	75	30	mg/l
	Normal	50		
pH	Guaranteed	5.5 – 9.5	5.5 – 9.5	
	Normal	6.0 – 7.5	6.0 – 7.5	
Ammonia as Nitrogen				
	Guaranteed	6	6	mg/l
	Normal	2 – 3		
Nitrate/ Nitrite as Nitrogen				
	Guaranteed	15	1.5	mg/l
	Normal	10		

Chlorine as free chlorine	0.25	0	mg/l
Suspended solids	25	10	mg/l
Ortho-phosphate as phosphorous	10	1 AVERAGE 2.5 MAXIMUM	mg/l

Other specifications can be handled but will require additional equipment.

It is clear from the above that the basic process used in our plants is basic and simple and does not require special equipment or specialised operators.

Pre-assembled container plants

The main advantage of this design is that the plant is fitted in a container which can be shipped to site and limited assembly is required on site so that no special technicians or engineers are required to install and commission the plant.

This system is ideally for the export of plant to outlying areas where transport facilities are limited and construction cost are extremely high.

The capacity of the plant is now limited by the container itself. Although we can combine various containers to design plant of larger capacities, the standard container plant is fitted in a 12m container and can handle a total average flow of 30 000 litres per day assuming the sewage is standard domestic sewage. The figure can alter slightly depending on the final design.

This capacity is suitable for applications such as small mines, construction camps, lodges and nature reserves and many more.

The Sewage Container plant has a number of special features to ensure long term trouble free operation:

The container sides are internally fully covered with fibreglass so that no internal corrosion of the plant will occur. Sewage is very corrosive and even painted surfaces will show problems after a short period of time.

The container is also reinforced internally so that it is capable of handling the liquid loading. This is achieved by the installation of additional steel beams designed by our structural engineer.

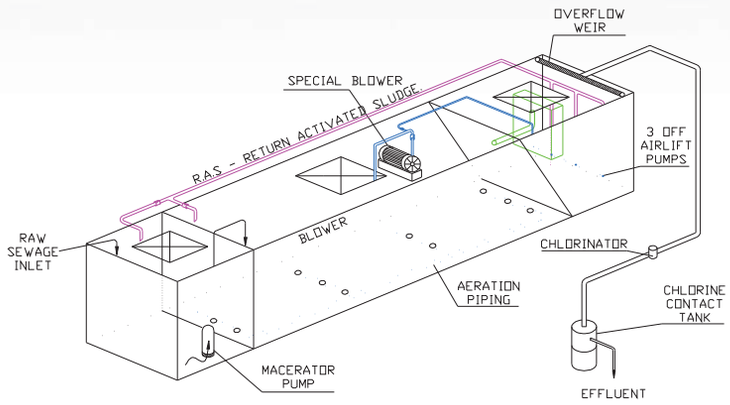
The container is baffled so that all the above mentioned sections of a sewage plant are incorporated in one unit. This excludes the chlorine contact tank which is supplied loose and has to be positioned next to the container.

The reason for separating the chlorine contact tank is that we use a special pill chlorinator to disinfect the effluent. This unit can take up to 10 pills at a time so that daily replacement of chlorine pills is not required. Pills are safe and inexpensive, especially in outlying areas.

To ensure that the operators do replace pills when required, we believe that access should be easy and the placement of this unit next to the container achieves this goal. Hypo dosing systems can also be supplied.

Or for special cases ozone treatment is possible as an alterative.

The overall plant is shown in the drawing below;



The various plant sections can be identified in the plant above. Some of the other aspects that make the plant different and easier to operate, are:

We include a macerator pump in the anaerobic section so that any foreign materials are macerated at this point so that they do not affect the aeration or clarifying sections.

Aeration is achieved by special diffusers to ensure that oxygen is transferred from the air into the liquor. The air is supplied by a special blower positioned on top of the container. This blower is shipped internally and needs to be connected on arrival. All equipment and instructions are supplied.

The use of air as the means of aeration has another advantage in that because we supply excess air at all times, no odours are generated in the plant. This is in contrast to surface aerators, which tend to cause odours due to the formation of small droplets. The plant can thus be installed close to existing facilities.

The settler/clarifier also uses special design features. Besides the sloping sides to ensure that solids are collected in the bottom of the tank and no voids are present, a special stilling box is installed to ensure that flow in the clarifier is even and settling efficiency is optimised.

The sludge collected in the settler has to be recycled back into the main process. The use of pumps would require special operating skills and will generate additional maintenance costs. The Sewage Container uses a number of special airlift systems, so that the blower is used to recycle the sludge in the plant.

Again to ensure that no solids are left in the clarifier, we use multiple air lift pumps. This is important as any sludge not returned will go anaerobic and anaerobic sludge floats and will flow out with the clear effluent reducing effluent quality significantly

ADVANTAGES OF OUR SEWAGE SYSTEMS

- Stop pollution of soil, groundwater and rivers
- Save on water costs by using plant outlet for irrigation
- Less expensive than sewage pumping plant
- Water born sewage now available to a larger section of our community
- No or infrequent collection of sewage/sludge by municipalities

In case of the ***Sewage Container*** plant, additional advantages are;

- no major installation on site
- easy to transport as transport routes are generally available
- short delivery times
- plant can be moved at a later stage, such as may be the case with construction sites