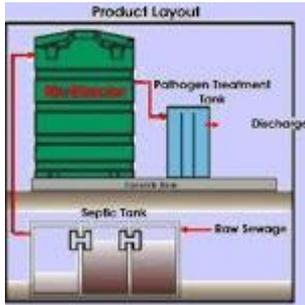


Waste Water Treatment Plants

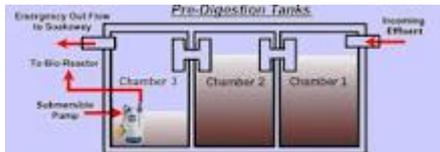


The Scarab Treatment System consists of three major components to treat Waste Water:

1. **Pre-digestion in the form of Septic Tanks**
2. **Bio-Reactor**
3. **Pathogen Treatment**

1. Septic Tank

The plumbing that leads from all the household toilets and sinks, connects to a main waste line which exits the foundation and then connects to the septic tank. The function of this pipe is to transport household waste to the septic tank.



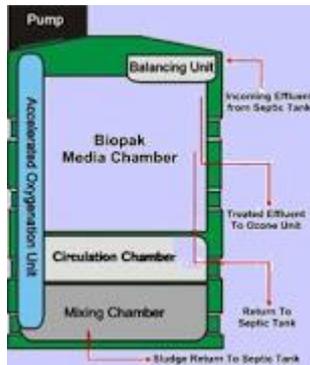
The septic tank is a watertight vault in which the anaerobic purification process begins. In the tank, density automatically separates the sewage into three layers. The topmost layer is called "scum". Scum is composed of materials that float on water such as grease, oil, and fats. The middle layer consists of liquid and suspended solids. The bottom layer is called "sludge". The sludge is denser than water and is derived from much of the solid portion of sewage waste. In the first chamber of the septic tank a balance occurs, resulting in the presence of anaerobic bacteria thriving in the three above mentioned sewage layers.

Through the normal metabolic activities of these resident bacteria, liquification of the scum and sludge layers occur. In other words, bacteria causes organic materials, from both the scum and the sludge layers to be broken down into smaller sized substances. When this material has been broken down far enough it will be taken into the liquid layer as a suspended solid or other soluble organic compounds. In the second chamber these solids, of very small organic materials continue to be degraded while in the liquid layer. Only the liquid layer in each chamber is passed onto the next section, the scum layer is blocked from the effluent pipe by an invert junction. By this process the effluent in the third chamber of the septic tank is relatively free of solids. The third chamber is also host to a submersible pump for the delivery of effluent to the Bio-Reactor. A return from the Bio-reactor to this chamber also facilitates de-nitrification and organic phosphate removal. Finally an emergency outflow is installed to soak away along with a high level alarm (if fitted), in case of an electrical or pump failure.

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2.Scarab Bio-Reactor

The submerged Fixed Film type Bio-Reactor is comprised of the following main components:



- Balancing Unit

The Balancing Unit has been designed to regulate the hydraulic loading of the Bio-Reactor. This is done in such a way that only a fixed volume of effluent is delivered to the Bio-Reactor at any given time, thus eliminating hydraulic variance and ensuing continuous optimum performance. Any temporary abnormal variance in the hydraulic loading is stored in the final chamber of the Septic Tank until such time as the Bio-Reactor is able to process the additional effluent.

- Mixing Chamber

Incoming effluent from the Balancing Unit is introduced into the Bio-Reactor in the Mixing Chamber. The anaerobic effluent is mixed with the partially aerated effluent in the base of the Bio-Reactor and allows for the removal of the heavier settled solids which accumulate on the base of the Bio-Reactor for return to the first chamber of the Septic Tank for Further degradation.

- Pump and Circulation Chamber

Partially aerated effluent is delivered from the Circulation Chamber to the Accelerated Oxygenation by way of the circulation pump. Each litre of effluent is circulated and re-oxygenated numerous times in order to achieve optimum oxygen saturation.

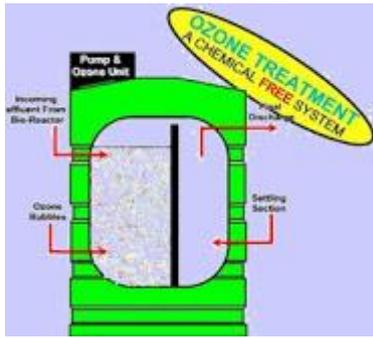
- Accelerated Oxygenation Unit

The Accelerated Oxygenation Unit performs the function of supplying oxygen to the effluent in the Bio-Reactor. The mixing of air and effluent under pressure, allows the effluent to efficiently absorb oxygen with a longer retention time and carry it throughout the Bio-Reactor to facilitate the optimum growth of Bio-Mass. The output from the Accelerated Oxygenation Chamber enters the Mixing Chamber. Once the effluent is sufficiently oxygenated, being lighter than incoming effluent, it then rises into the Biopak Media Chamber.

- Biopak Media Chamber

The Biopack Media Chamber is randomly packed with Biopack units to facilitate anchorage for the Bio-Mass population. The high surface area to volume ratio allows for the optimum biomass per unit of volume achievable. This chamber has two outlets, one for the final treated effluent and one for de-nitrification. The final effluent is then passed on to the Ozone unit. A small portion of this nitrate rich effluent from the Bio-Reactor is then returned to the first chamber of the Septic Tank for de-nitrification and organic phosphate removal.

3.Pathogen Treatment



This final stage of the process is comprised of an aeration pump which delivers ambient air to the Ozone generator for the production of Ozone and for internal cooling. Ozone gas is then bubbled through the final effluent to effectively remove any remaining pathogens. In some cases the Settling section of the tank is substituted with Biopak to allow stilling prior to discharge. The use of Ozone has multiple effects on the final effluent, it not only removes all the pathogens but also the slight coloration from treatment in the Bio-Reactor along with the earthy smell which is

normal in this type of treatment plant.

* Scientific Information

The Scarab Treatment System has not altered the scientific and biological process utilized in the treatment of domestic effluent. We only facilitate all the processes. Many systems throughout the world utilize a similar process of aerating the effluent from the Septic Tank. Some systems (Lilliput) use blowers and fine bubble diffusers in a submerged Bio-Reactor, other package type plants use open air rotating drums for the aeration of the effluent from the Septic Tank.