

**PHYTORID TECHNOLOGY FOR CAMPUS WASTE WATER TREATMENT****<sup>1</sup>Mr. S. A. Ghatge, <sup>2</sup>Prof. P. A. Hangargekar, <sup>3</sup>Prof. S. C. Wadane**

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**ABSTRACT**

Phytorid technology is artificial wastewater treatment system of shallow experimental tanks, ponds or channels that are planted with locally available wetland plants. They work on natural capacity of plants to treat wastewater from different sources. In view of rising concern about pollution of water bodies due to discharge of waste in them, it is necessary to initiate alternative thinking as conventional methods through STPs (Sewage treatment Plants) have had limited success. In recent years the application of specifically designed wetland based technology which is popularly known as Phytorid technology for treatment of wastewater- municipal, urban and agricultural, is becoming widely acceptable. The technology has been found to be very effective in water pollution control as it functions as water 'pollutant sinks' for sediments, nutrients and metals. It treats the wastewater in natural manner without the use of chemicals. Phytorid technology is an improved wetland system for treatment of wastewater. The main objective of application of phytorid technology is to provide and boost a simple, feasible, practically sound, eco-friendly and cost effective technology for wastewater treatment and its reuse.

**Keywords:** *Phytorid technology, Constructed wetland, Wastewater treatment, eco-friendly and cost effective waste water technology.*

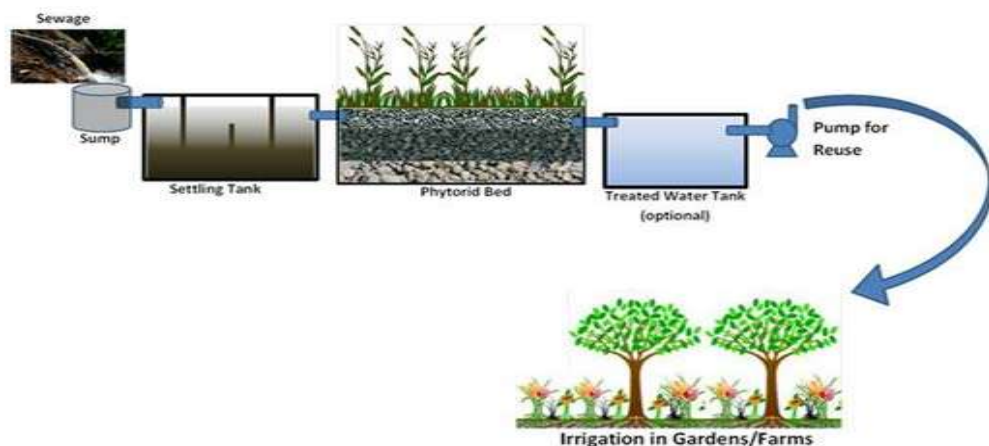
**INTRODUCTION**

In present scenario most of our water bodies, surface as well as groundwater are suffering from pollution by manmade activities. Most of the water resources are polluted by discharge of domestic sewage. Due to indiscriminate discharge of wastes the pollutant load often exceeds the natural ability of that water body to remove the undesirable material or dilute it to a harmless form. Presence of sewage promotes the growth of phytoplanktons. This excessive growth depletes the oxygen of water which adversely impacts the aquatic faunal population. Sewage mostly contains a large number of inorganic and organic impurities cysts of pathogens, bacteria and viruses causing waterborne diseases such as cholera, dysentery, hepatitis, typhoid, gastroenteritis, enteric fever and malaria etc.

The municipal sewage systems used in developed countries are often too expensive to build and operate in the developing world where low-cost, low-tech alternatives for treating wastes are needed. One option is effluent sewerage, a hybrid between traditional septic tank and full sewer system. Another alternative is to use natural or artificial wetlands to dispose of wastes. Wetland waste treatment systems are now operating in many developing countries. A wetland, by definition, must maintain a level of water near the surface of the ground for a long enough time each year to support the growth of aquatic vegetation. Marshes, bogs, and swamps are the examples of naturally occurring wetlands. The system of planting aquatic plants such as reeds or bulrushes in a wet substrate medium for water recycling is called a "Constructed Wetland (CW)" or "Artificial Wetland" or "Human Engineered Wetland".

The first artificial wetlands were built in the 1970s. By the early 1990s, there were more than 150 constructed wetlands treating municipal and industrial wastewater in the United States. Since then, various designs of constructed wetland systems have been developed and thousands of facilities are currently in use in Europe,

Australia and the United States. Recent years have seen the proliferation of constructed wetland systems in Africa and Asia. Wastewater treatment in constructed wetlands occurs by several mechanisms such as dilution with rainfall, chemical reactions and biological activity that transforms and filters the wastewater. They can often be an environmentally acceptable, cost-effective treatment option, particularly for small communities. CW's are designed especially for the pollution control and exist in locations where natural wetlands do not present. Generally, two types of CW's are in common use today such as surface flow and subsurface flow. Reed beds are a particular type of constructed wetland usually consisting of a gravel-filled container or bed planted with reeds. Wastewater flows through the gravel and reed-roots and is purified by the actions of millions of bacteria, fungi and algae (micro-organisms) that digest the sewage. They can be used in several ways: sewage treatment companies commonly use reed beds as a polishing stage at rural works following conventional treatment to give a cleaner effluent. Reed beds also effectively provide complete sewage treatment for households and small communities not served by main sewerage. The water hyacinth, for example, can remove phenols, fecal coli forms, suspended particles and heavy metals including lead, mercury, silver, nickel, cobalt, and cadmium from contaminated water. In the absence of heavy metals or toxins, water hyacinths can be harvested as a high-protein livestock feed. It can also be harvested as a feedstock for methane production. Reed-based wetlands can remove a wide range of toxic organic pollutants. Duckweeds also remove organic and inorganic contaminants from water, especially nitrogen and phosphorus. Performance data suggested that a well designed reed bed system can remove more than 98% of the organic matter in sewage, 60–80% of the nitrogen and up to 60% of the phosphates. **Water hyacinth (*Eichhornia crassipes*), Duck weed (*Lemna spp*), *Spirodela spp*, *Wolffia spp*** among others are plants that have proven to be highly efficient in removing a wide range of pollutants, suspended materials, BOD, nutrients, heavy metals and pathogens.



### Mechanism of working of Phytorid System

### IMPORTANCE OF PHYTORID TECHNOLOGY

The main purpose of sewage treatment is to provide a simple, feasible, practically sound, eco-friendly, maintenance free and cost effective technology, which can handle the sewage treatment leading to reuse of treated water for purposes like gardening. Treatment efficiencies for the removal of faecal colliforms, BOD, COD, Nutrients are up to 95 percent which is greater than traditional chemical methods. It is very cost effective

technology compared with the traditional waste water treatment method, since it utilizes the natural vegetation and rhizosphere, microorganism; it is eco-friendly method of treating sewage. The quality of treated water is comparable to irrigation standards.

### A SIMPLE SOLUTION FOR BIG PROBLEM

The main purpose of STP is to provide a simple, feasible, practically sound, eco-friendly, maintenance free and cost-effective technology, which can handle the sewage waste water treatment leading to reuse of treated water for purposes like gardening.

PHYTORID is a scientifically developed systematic treatment methodology for waste water.

- i. PHYTORID combines Physical, Biological and Chemical processes.
- ii. Works on gravity
- iii. No electric power requirement
- iv. Scalable technology
- v. Ease in maintenance
- vi. Adds to aesthetics
- vii. Cost effective

### TYPICAL DESIGN FEATURES

The general concept design for the Phytoid system can be modified as per specifications and land availability. The sub-surface flow type, Phytoid system is proposed for the treatment of sewage or domestic wastewater which will consist of a basin or a channel which a barrier to prevent seepage, but the systems\cells\ beds contain a suitable depth of porous media. A primary treatment facility would also be constructed along with basic for a effective removal of solids and thus reduces the marginal BOD. The porous media also supports the root structure of emergent vegetation. The design of the Phytoid system assumes that the water level in the cells will remain below the top of the filter media. The vegetation to be utilized for the said Phytoid system is very important. Various species of aquatic plants have been utilized to attain maximum efficiency in the treatment of domestic wastes. These include species like Phragmites australis, glyceria maxima, Typha spp, Scirpus spp, other common grasses etc.

### ADVANTAGES OF PHYTORID TECHNOLOGY

- i. Treatment efficiencies for the removal of faecal coliforms, BOD ,COD , Nutrients are up to 95 percent which is greater than traditional chemical methods
- ii. It is very cost effective technology compared with the traditional waste water treatment method, since it utilizes the natural vegetation and rhizosphere, microorganism; it is eco-friendly method of treating sewage.
- iii. The quality of treated water is comparable to irrigation standards.

### QUALITY OF TREATED WATER

The treated water will meet the quality suitable for gardening, washing, and flushing purpose. Treated water will also meet the discharge standards. Specified by Maharashtra Pollution Control Board.

**Performance of Phytoid for sewage water treatment**

Pollutant	Performance (% removal)
Total suspended solids	75-95
BOD	70-80
COD	60-75

Total Nitrogen	60-70
Phosphate	50-60
Fecal Coliforms	85-95

## CONCLUSION

- i. Treated sewage water through Phytorid Sewage treatment plant can safely utilized for the gardening/irrigation.
- ii. Pollution load of raw sewage water varies with the location and season.
- iii. Use of raw sewage water for irrigation may cause soil and groundwater pollution problems.

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