



Technology Description

The technology is known by the trade name “Pirana”. The purpose of the Pirana System is to restore the hydraulic capacity of Biomat clogged infiltrative soils surrounding the disposal fields of septic systems. It is a patented design and methodology that utilizes an airlift column to aerate and circulate effluent within a septic tank or treatment vessel for the express purpose of generating an active culture of introduced bacterial species contained in the Pirana Blend facultative bacterial formula. A wrapping of cusped plastic is contained within the unit that provides a substantial surface area for colonization by the introduced facultative bacteria as a fixed film. The Pirana Blend contains spores of several Bacillus facultative bacteria species that are introduced into the Pirana by suspending a porous sack of the blend in the air column within or above the Pirana unit. The facultative bacteria spores immediately become active and migrate out of the porous sack, circulate through the Pirana unit and colonize the fixed film media.

The unique design of the Pirana mixes the effluent and the air within the Pirana prior to passing over the fixed film so that it is foam like as opposed to rising air bubbles within a liquid. The issue of very depletable dissolved oxygen (DO) within a liquid for aerobic treatment is of no consequence in the Pirana System. The Pirana Blend bacteria are constantly bathed in “food” rich effluent and essentially non-depletable oxygen. The airlift design circulates between 20,000 and 30,000 gallons of liquid a day through the Pirana unit. As a consequence the organic contents of the tank are quickly digested, dramatically reducing the organic load to disposal fields receiving this effluent.

By design, the effluent stream leaving the Pirana septic tank contains a rich population of Pirana Blend facultative bacterial species, capable of changing their metabolism in the absence of oxygen from an aerobe to an anaerobe (facultative) and surviving the course through an anaerobic disposal field and remaining viable. These facultative species in the Pirana Blend culture, when in an anaerobic metabolism, have shown a substantial ability to digest the muco-polysaccharide slimes, referred to as Biomat, that typically clog the infiltrative soils of disposal fields. This process of digesting the Biomat removes the clogging and restores the hydraulic capacity of the infiltrative soils needed for proper septic system function. Continued operation of the Pirana will guarantee the hydraulic capacity of the infiltrative soils.

A secondary and substantial claim for this device is that the Pirana Blend facultative bacteria species are also denitrifying bacteria. These facultative bacteria species in the Pirana Blend are tolerant of ammonia toxicity in concentrations typical of septic systems treating waste from human activity. When generated in a septic tank with the Pirana unit, these facultative bacteria do not cause the nitrification of ammonia within the tank. In fact, because of the unique relationship between the design of the Pirana unit and the Pirana Blend facultative bacteria species, the process of operating the Pirana

within a septic tank inhibits the nitrification process typical of other aeration technologies. Just like a non-aerated, conventional anaerobic septic tank, ammonia remains as ammonia. When the effluent stream containing ammonia and the rich population of facultative anaerobic bacteria arrive at the aerobic soil zone of the disposal field, nitrification of ammonia typically takes place. Additional carbon is normally needed for denitrification. This carbon is provided in the residual carbon contained in the rich population of facultative bacterial biomass within the effluent. This stimulates a rapid denitrification of virtually all ammonia. With some manipulation of different bacterial species, this denitrification process can be achieved in the septic tank prior to disposal.

Protocol Suggestions

The Pirana unit and the method of using the Pirana Blend culture of *Bacillus* facultative species represents a new form of technology for operating a septic system that is distinct from the category described as “Aerobic Treatment Units” (ATUs). ATUs are concerned about levels of treatment, translated as reducing BOD and TSS leaving a treatment tank. ATUs are designed to be installed after an anaerobic septic or settling tank and to treat the minimal organic waste load leaving these tanks. The design of the Pirana System is to install the Pirana device within the septic tank. The Pirana aerobically provides treatment as a consequence of growing Pirana Blend facultative bacteria using the waste entering the septic tank. This provides access to all of the organic “food” entering a septic system and allows for a greater abundance of facultative bacteria leaving the septic tank to restore the hydraulic capacity of the infiltrative soils around the disposal field.

Parameters used for verification of ATU performance are not applicable to the Pirana. No claims are made for BOD or TSS reduction in the Pirana septic tank since the necessity of delivering a viable stream of inoculated bacteria to the disposal field requires some residual BOD or TSS, as measured by conventional techniques. In most Pirana installations, higher BOD and TSS measurements are considered an indication of efficiency. The Pirana unit is designed as an appliance that is retrofitted within tanks that can be of any size or configuration. Therefore, no standardization of the system is either desirable or possible.