Evaluation of the Aquatron Biological Toilet System.

This summary is based on report 53-05 (in Norwegian) from The Norwegian Centre for Soil and Environmental Research (Jordforsk). Written by Roald Aasen and Jens Christian Køhler.

The report evaluates the Aquatron biological toilet system and how this system applies to the Norwegian marked for sanitation solutions and to regulations managing discharge from toilets. The current documentation on Aquatron is briefly evaluated. The effect of ultra violet (UV) radiation on waste fluid was measured.

Technical background. Inspection and sampling of Aquatron installations.

Aquatron International AB was founded in 1992 to develop and market the Aquatron Biological Toilet System. Aquatron is a product for handling the waste from water closets (WC) in all-year residences and vacation homes. The system consists of a cyclone separator without moving parts or requirements for electricity, a composting bio chamber for solid waste and a UV-unit that radiates the waste fluid and the drainage from the bio chamber. If so desired the WC may have urine diversion and collection of urine in a separate storage tank.
The evaluation of the available Aquatron documentation from 1986 to 2003 showed that it is extensive and that it covers critical factors in the system such as the separation efficiency and the effect of UV radiation on flush fluid and drainage. The documentation shows that if the effluent from Aquatron is combined with greywater infiltration solutions the extra load of sludge in the filter bag is estimated from maximum 5 % to less than 1 % and that the number of thermotolerant coliform bacteria (TCB) does not exceed levels found in the greywater. The design of the UV-unit ensures that the radiation is effective and kills TCB even when they are associated with particles in the waste fluid. This is critical to avoid massive bacteria loads in the effluent during e.g. diarrhea. The technical and material standard of the components, installation guidance, their performance and degree of separation are approved by the Swedish Institute for Technical Approval (SITAC).

Aquatron systems in regard to Norwegian legislation and regulations.

Five installations (Aquatron models 4x200, 4x300 and 1200) in Norway and Sweden were inspected by Jordforsk in agreement with Aquatron International / Amberes AB from February to April 2005. Reduction of TCB by UV radiation was measured in four waste water samples. One compost sample from the bio chambers was analysed for heavy metals, nutrients and TCB. The results confirmed previously reported reduction of TCB after UV radiation by 99.9999-99.929 % to a level that are commonly found in greywater. The heavy metal content in the solid waste was within class II according to Norwegian regulations. The solid waste can therefore be used as a fertilizer. After the inspections it is our impression that the Aquatron installations are well functioning systems. As described in the installation guidance it is especial critical that the Separator-unit is levelled and that the slope and length on the incoming pipe is correct to ensure a good functionality of the system.

Evaluation of the Aquatron system documentation and conclusions.

Our general conclusion on the Aquatron system is that it is a well documented and functioning system. The available analyses show that the UV-unit reduces the number of TCB in the effluent to a level lower than those found in household greywater from kitchen, shower and washing. This enable WCs equipped with the Aquatron system to be connected to a greywater treatment unit that infiltrate the treated effluent in the ground. The need for a septic tank and regular draining by septic trucks can therefore be eliminated if a sludge collector is installed in the treatment unit. WCs can thus be installed in homes that are inaccessible by truck.
The Aquatron system combined with urine diversion is a suitable technology for nutrient recycling. With the Aquatron system urine and compost can be used in the gardens as fertilizer and soil conditioner according to local regulations. The Aquatron system has the potential to meet the strictest regulations for phosphorus, organic matter and nitrogen removal from the effluent.
The installation and use of Aquatron systems in Norway is in compliance with Norwegian regulations for direct infiltration in suitable ground or in combination with greywater treatment solutions like sludge removal and filtration.

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