

# Wastewater re-used successfully At Ontario truck stop

by David Harsch, P.Eng., Iggy Ip, Craig Jowett, Kyle Straw and Heather Millar

A Husky Oil truck stop near London, Ontario needed to expand its facility to accommodate a larger restaurant. This meant an increase in design flow from 19,000 L/day to 56,000 L/day, thereby requiring decommissioning of the existing facultative lagoon and the construction of a new wastewater treatment system.

Space limitations, nitrogen loading, and lack of groundwater supplies required an innovative design by K. Smart Associates. This resulted in the design of a sewage treatment plant that re-uses the treated effluent immediately inside the facility for toilet and urinal flushing.

The sewage design (Figure 1) included a Waterloo Biofilter (WBS) and slow sand filtration, which was a scaled-up version of CMHC's Toronto Healthy House, in which wastewater is re-used for shower and toilet flushing.

Grease traps intercept the kitchen wastewater and prevent fats, etc. from entering the treatment system. Toilet wastewater enters the septic tanks, providing solids separation and anaerobic fermentation before exiting out into the balance tank. The balance tank is sized to store peak flows and allows the Biofilter to be dosed evenly throughout the day, providing more efficient removal of organic matter, suspended solids, and ammonium. Half of the treated Biofilter effluent is recirculated to the septic tanks for improved treatment and denitrification.

The remaining Biofilter effluent passes through the MS Filter (ozonation, up-flow charcoal and down-flow sand filtration) located inside the treatment building and is further disinfected with chlorine before being re-used for toilet flushing inside the truck stop (Figures 3 & 4). This polishing process removes traces of solids, disinfects, and removes the brown colour that occurs in re-used sewage due to build-up of recalcitrant lignins and tannins. To keep plumbing free from bioslime, ~0.2 ppm chlorine residual is added, and back-flow preventers are installed in the facility to operate the toilets with potable water in an emergency.

When recycled water demand is low or when the MS Filter is being overloaded, treated wastewater overflows are pumped to a disposal bed, with less water and less nitrogen than normal.

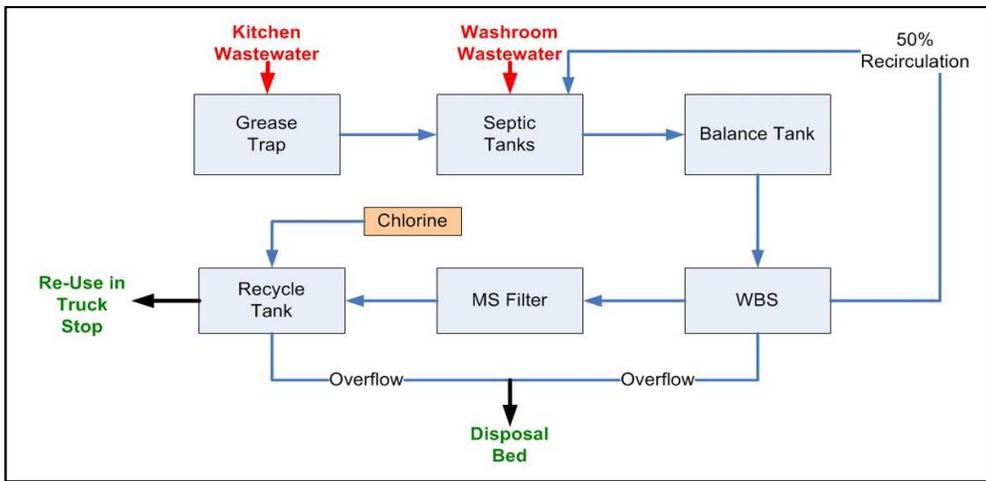


Figure 1. Belmont Husky Oil re-use system process

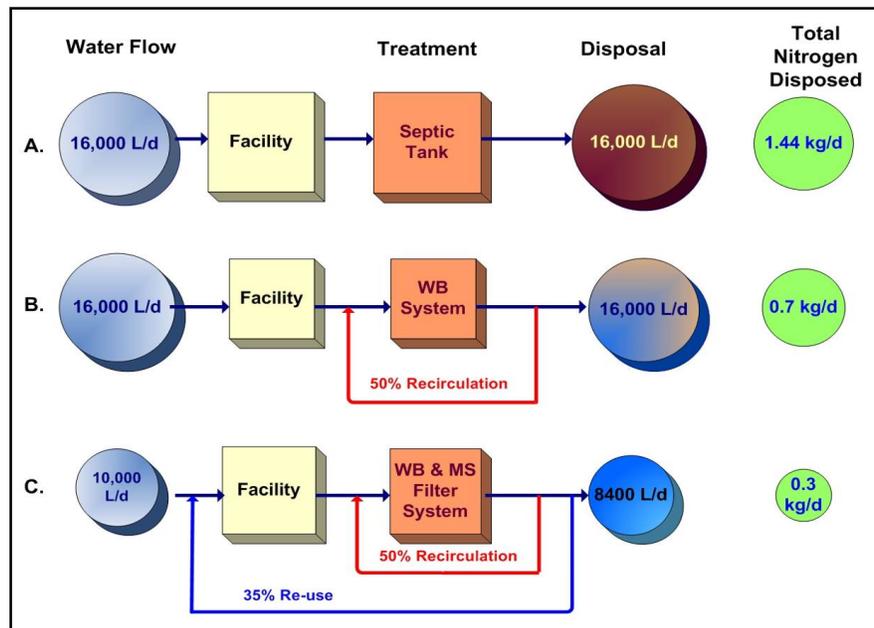


Figure 2. Re-using wastewater means that a lower volume is disposed of, lessening the mass nitrogen loading on the environment

## Ontario Ministry of Environment Requirements

The re-use system was approved by the Ontario Ministry of the Environment (MOE), who were open to this innovative concept which alleviates several problems. It reduces the size of the in-ground disposal field, reduces nitrogen loading in the groundwater, and reduces the demand for potable water supply by an estimate 60 to 70 percent. A comparison of the daily mass

nitrogen loading onto the environment of three systems (traditional septic system, WBS without re-use and a WBS with re-use) is shown in Figure 2.

For this toilet re-use, the MOE effluent criteria are cBOD and TSS <10 mg/L, and fecal coliforms <5 cfu/100mL. No phosphorus or nitrogen limitations are required, except to monitor the discharge to the disposal bed for nitrogen loading.

## Operations and maintenance

Rockwood Geological Engineering operates and maintains this treatment system with regularly scheduled pump-outs of grease traps and septic tanks; inspecting system components; taking weekly samples of sewage and effluent; tracking wastewater and recycled flows; and optimizing treatment performance.

A key feature for the client is that the recycled wastewater must be aesthetically pleasing for customer satisfaction, and this in turn requires consistent treatment.



*Figure 3. MS Filter ozone generation unit.*



*Figure 4. Treatment plant consisting of two SC-40 Biofilter units adjacent to the building housing the MS Filter*

This implicit safeguard increases cooperation between the owners and the operators. When owners have more at stake, they ensure that cleaning procedures and kitchen practices are optimized to minimize the stress on the treatment system. This holistic approach to O&M where optimization consists not only of 'tweaking' the mechanical components, but also the in-house practices, ensures that the influent wastewater is easier to treat and the practice of re-use is successful.

## The future of re-use in Canada

With proper design, O&M, and a progressive and conscientious user, the Belmont Husky Oil is an example that re-use is a viable component that can be incorporated into sewage system designs for large commercial applications. The implicit nature of a re-use system not only decreases the impact on the environment but also provides safeguards ensuring that the system is thoroughly optimized to protect public health and safety, through consistent treatment performance.

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