Transportable, Communal Sewage Plants
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On-Site Construction Limitations

Whether treating sewage at a Southern Ontario golf course or at a small village in northern Saskatchewan, on-site construction is constrained by wet or freezing weather, by coordinating trades, by lack of supply houses for specialized equipment, and even by unwelcome input from 'local experts'. Supervision and quality assurance costs rise sharply when on-site assembly is required, and unassembled treatment plants cannot be shipped world-wide with confidence.

Communal BIOFILTER systems using multiple polyethylene tanks each rated at 5 m^3/day installed inside a garage-type building are successfully treating sewage for disposal or re-use. However, this configuration is effective only within a 200-km transport distance; beyond that, quality assurance and supervision costs are problematic.

Transportable, Plug & Play Container

A self-contained and fully assembled transportable unit that doubles as both the building and the tanks inside was developed to enable BIOFILTER systems to be installed anywhere in the world with optimum quality assurance. The basic shell is the standard ISO shipping container that is modified into an insulated, corrosion-proof, and waterproof treatment plant containing filter medium, spray manifold, air ventilation, drains, and control room (Figures 1 & 2).

These SC-20 (20') and SC-40 (40') units are shippable to site as ISO containers by land and sea, then placed on a suitable foundation, connected to plumbing and electricity, and operated as is. The vagaries of weather, assembly instructions, local labour, and trades' schedules are minimized. Substantial cost savings compared to the building + tanks system are realized due to less construction and installation cost, less supervision, and less scheduling time. The SC-40s look right at home at a truck stop and trailer park, and can be made attractive enough for even the highest-end golf courses around Toronto, usually placed in the maintenance area "next to the dumpster".

SC-20 and SC-40 BIOFILTERS

Figure 1 shows a cut-away view of an SC-20 BIOFILTER. The filter medium fills the main filter room above the air chambers (tunnels) and is dosed in an overlapping spray pattern by a series of helical nozzles spaced along the forcemain manifold hung from the ceiling. Nozzles and filter medium are serviced by way of access hatches on the roof.

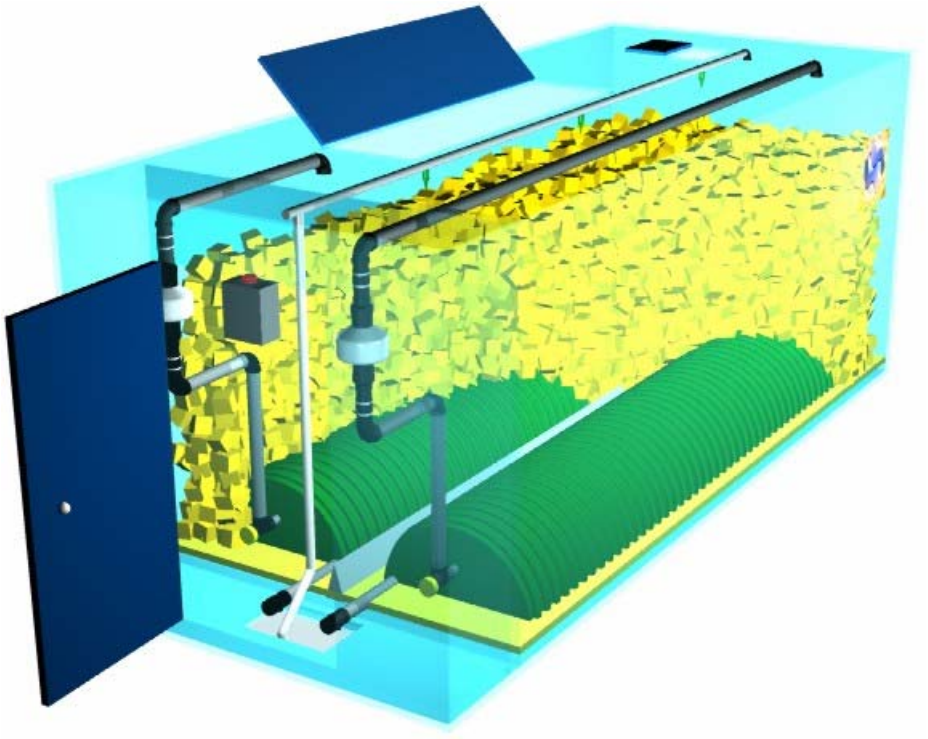

Figure 1. SC-20 cut-away showing roof access hatches, spray nozzles, and air chambers covered by absorbent filter medium in filter room, and fans, forcemain, drains, and control panel in control room. The SC-20 is suitable for 15-20 m^3/day peak design flow, with the SC-40 and SC-40 'high-cube' rated at 30-40 m^3/day and 33-44 m^3/day, respectively.

Septic tank effluent sprayed over the absorbent filter medium percolates slowly down through the medium, and is renovated by facultative and aerobic micro-organisms. The treated effluent drains onto the floor of the filter room, where a longitudinal divider directs the flow out through the control room, with one drain returning to the septic tank, and the other going to disposal.

Variable-speed air fans in the control room continuously suck air from the air chambers and blow into the filter room above the medium, with fresh air entering through an orifice on the suction side of the fan. Passive vents on the roof of the filter room allow escape of stale air, and can be fitted with charcoal filters if required.

The control room (Figure 2) contains plumbing and electrical connections, air fans, light, forcemain and cleanout, effluent drains, and typically the control panel for the pumps. Options in the control room include space heater and lights, self-priming pump, air filter, ultraviolet disinfection unit, and alum-dosing tank.

Figure 2. SC-40 being assembled in the plant, showing control room through access door, with drains, forcemain, space heater, and ventilation fans.

Figure 3 shows one of a dozen SC-40s now in operation, with this one placed on a ‘sono-tube’ foundation on the banks of the South Saskatchewan River in north-central Saskatchewan. The unit is treating sewage from the village of St. Louis prior to surface discharge. Despite -49°C temperatures this past winter, and influent sewage temperatures of only 2-3°C, the unit operated without problem for cBOD and TSS, the parameters of interest. Besides villages, other SC-40s are treating campgrounds, trailer parks, golf courses, and truck stops.

Figure 3. SC-40 installation at St. Louis, northern Saskatchewan, which operated successfully down to -49°C.

'Piggy-Back' Configuration

The SC series containers can be modified to operate as septic tanks and pump tanks as well, for a fully transportable system that can be operated without other suppliers, and can be moved to a new location if desired. Raw sewage is pumped to the first septic tank where it travels longitudinally to the far end of the tank, then back again before exiting the tank. The longitudinal flow character optimizes settling and retention time, and minimizes short-circuiting from inlet to outlet. The septic effluent is designed to enter a second SC septic tank, or more, depending on the design flow of the communal system.

The final septic effluent exits to the SC pump tank where low-maintenance, self-priming pumps dose the BIOFILTER SC-40s placed 'piggy-back' on top of the septic and pump tanks. Drains out of the BIOFILTER SC-40s are directed to the septic tanks below for recirculation and to the pump tank for disposal or re-use.

Conclusions

Experience with the transportable communal sewage system is very positive and is being welcomed by design engineers as a straightforward means of controlling quality of installation and operation in remote locations. On-site installation vagaries and costs are minimized and operations are more predictable.