

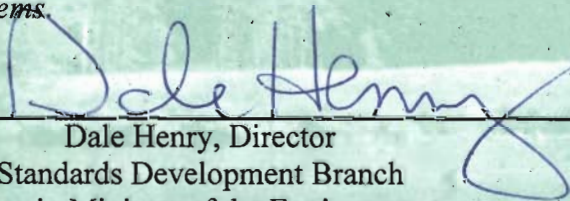
CERTIFICATE

OF TECHNOLOGY ASSESSMENT

ECOFLEX™ and BIOSEG™ Wastewater Treatment Technologies (Premier Tech Environment)

Based on a review of the data and the information submitted in support of the technologies, the ministry concludes that the ECOFLEX™ and BIOSEG™ Wastewater Treatment Technologies may be applied to the treatment of sewage to achieve up to a tertiary level of effluent quality.

The specific applications of the ECOFLEX™ and BIOSEG™ Wastewater Treatment Technologies will require a site-specific engineering design to ensure compliance with the intended performance requirements. The necessary environmental approvals under the Ontario Water Resources Act (OWRA) or the Environmental Protection Act (EPA) would be required on a case-by-case basis. For specific installations, it is necessary that a proponent follow the instructions identified in the Guide to apply for Municipal & Private Sewage Works and/or Industrial Sewage Works. A pre-submission consultation with the ministry's regional office is required to correctly identify the environment needs for effluent quality which may be above tertiary level of effluent quality for sensitive ecosystems.


Dale Henry, Director
Standards Development Branch
Ontario Ministry of the Environment
(April 2008)

New Environmental Technology Evaluation Program

Promoting the development and application of new environmental technologies



ECOFLEX™ and BIOSEG™
Wastewater Treatment Technologies
(Premier Tech Environment)

Notable Aspects of the Technology

Technology Description

- ✓ The *Ecoflex™ Wastewater Treatment Technology* (WTT) consists of a primary reactor (septic tank), a dosing chamber and the *Ecoflex™ Textile Biofilter* (see Figure 1).
- ✓ The *Ecoflex™ Textile Biofilter* is a package bed filter composed of a series of vertical layers of attached growth filtering media composites that utilize a combination of geotextile and peat material prepared in rolls (US patent 6,602,407, European patent 1301441, Canadian patent 2,410,541), where septic tank effluent is sprayed under low pressure.
- ✓ The *Ecoflex™ WTT* uses physical, biochemical and biological processes to treat septic tank effluent.
- ✓ The septic tank effluent trickles through the highly porous media which provides a high surface area to volume ratio for microbial attachment and the design features provides for naturally aerated conditions.
- ✓ The flow is split into three channels equally then the filtrate is collected for discharge or recirculation.

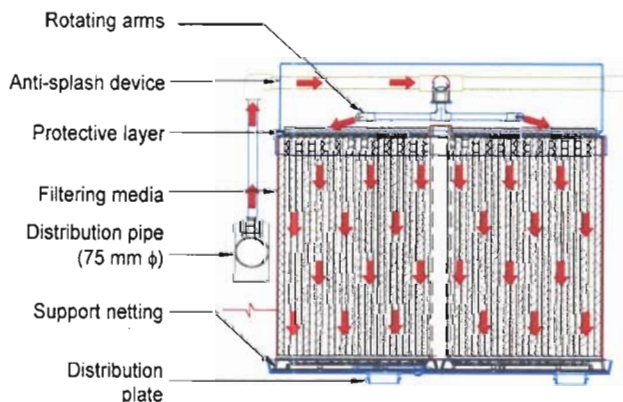


Figure 1. Ecoflex™ filter module.

- ✓ Each roll is 600 mm high and has an effective surface area of 0.5 square metres.
- ✓ The standard unit is a fiberglass container with 10 rolls.
- ✓ The *Ecoflex™ Wastewater Treatment Technology* can be equipped to recirculate flows back to the primary tank (septic tank) to promote denitrification where denitrification to reduce nitrate discharges is required.
- ✓ The *Bioseg™ Wastewater Treatment Technology* is a modular recirculating trickling tower (see Figure 2) that can be applied in series or parallel systems depending on the required treatment capacity, strength of wastewater and desired quality of the final effluent.
- ✓ The modular recirculating trickling towers are made of concrete and come in two (2) cross sections 1.2m × 1.2m or 1.6m × 1.6m.

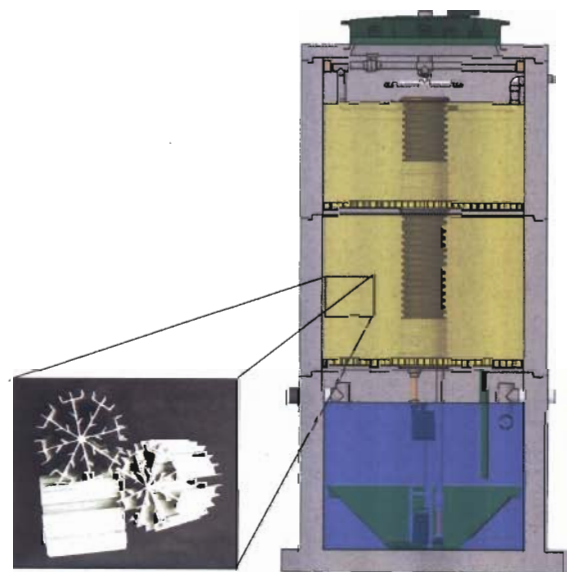


Figure 2. Bioseg™ tower module.

- ✓ The media consist of recycled PVC plastic 75 to 125 mm long with internal wings (snowflake shape) providing an average contact surface area to volume ratio of $180 \text{ m}^2/\text{m}^3$.
- ✓ The media is loaded forming a minimal height of 1.75 m to provide sufficient contact time.
- ✓ The modular recirculating trickling tower perform biological treatment based on attached biological growth suitable for municipal and high organic strength wastewater treatment applications.
- ✓ The wastewater is sprayed over the top of the media via rotating arm (similar to the Ecoflex™). The wastewater percolates through the media and is collected at the bottom of the basin.
- ✓ The percolate is recirculated from two (2) to four (4) times before discharge. Sedimentation of the biological solids (sludge) that have detached from the media is completed at the base of the each tower and in a separate settling tank following the units. The collected sludge can be returned to the primary settling tank or pumped to a separate sludge tank.

Range of Operating Conditions

- ✓ The Ecoflex™ packed-bed textile filter system is well adapted for the treatment of wastewater flows less than $25 \text{ m}^3/\text{d}$.
- ✓ The combination Bioseg™-Ecoflex™ system is suitable for the treatment of domestic and high organic strength wastewater at the optimal flow range of 20 to $150 \text{ m}^3/\text{d}$ and 10 to $50 \text{ m}^3/\text{d}$, respectively.

Applications

- ✓ Ecoflex™ and Bioseg™-Ecoflex™ combination system have been installed or tested on several different sites including:

- A seasonal lakeshore residence in northern New York state (part of the US EPA Demonstration Project at a treatment capacity of about 1900 L/d flows since October 2004)
- 5 residences in Quebec with the system in operation since 2003
- Testing for certification under NSF 40 Standard (March 2007)
- Veolia testing at CSTB site in France (November 2006)
- Forest worker commercial camp in northern Quebec 2007
- Used to polish landfill leachate after an anaerobic/aerobic treatment operated since 2001 at different landfill sites in Quebec. Summary results are presented below:

L.E.S de St-Flavien	St-Flavien, Quebec (2001)	21 m^3/d
L.E.S. de Nouvelle Beauce, Phases 1 and 2	Frampton, Quebec (2001 and 2007)	45 m^3/d
L.E.T. de Val d'Or	Val d'Or, Quebec (2006)	143 m^3/d

Bioseg™-Ecoflex™

- A restaurant facility treatment system with a capacity of $17 \text{ m}^3/\text{d}$ located at Masson-Angers, Quebec and operated since 2005.
- A Inn facility treatment system with a capacity of $60 \text{ m}^3/\text{d}$ located at Notre-Dame du Portage, Quebec and operated since Summer 2007.
- ✓ The application of the Bioseg™ include domestic wastewater and high organic strength wastewater from restaurants and other food preparation establishments.
- ✓ The Ecoflex™ filter can be used to treat domestic or commercial wastewater from various sources such as office buildings.
- ✓ The technology is considered viable at treatment of up to 25,000 litres per day and can be used on individual residences to treat up to 4,725 litres per day.
- ✓ Figures 3 and 4 show a treatment configuration schematic for the treatment of septic tank effluent using the Bioseg™ trickling tower and Ecoflex™ textile filter in combination following an equalization tank and dosing tank, respectively.



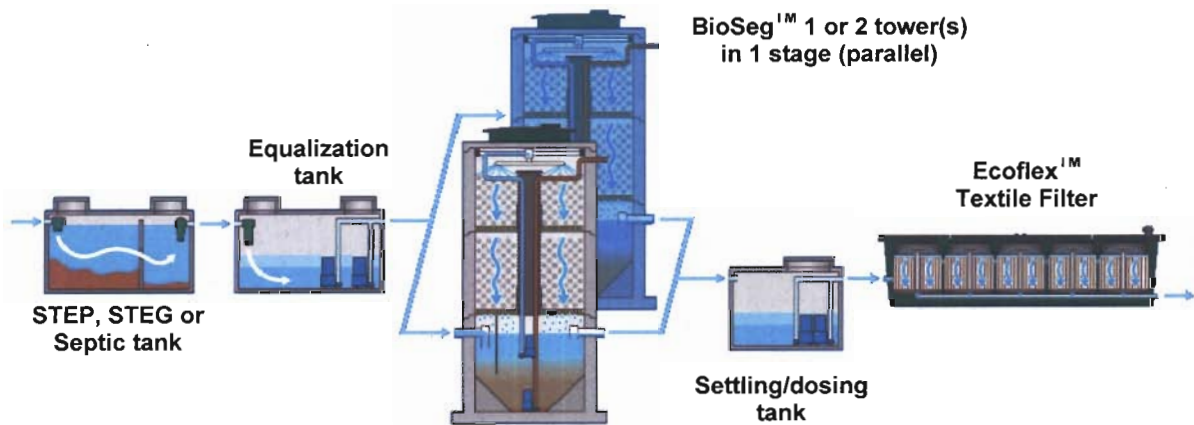


Figure 3. Schematic of a typical System II, BioSeg™ - Ecoflex™ chain of treatment for domestic wastewater applications

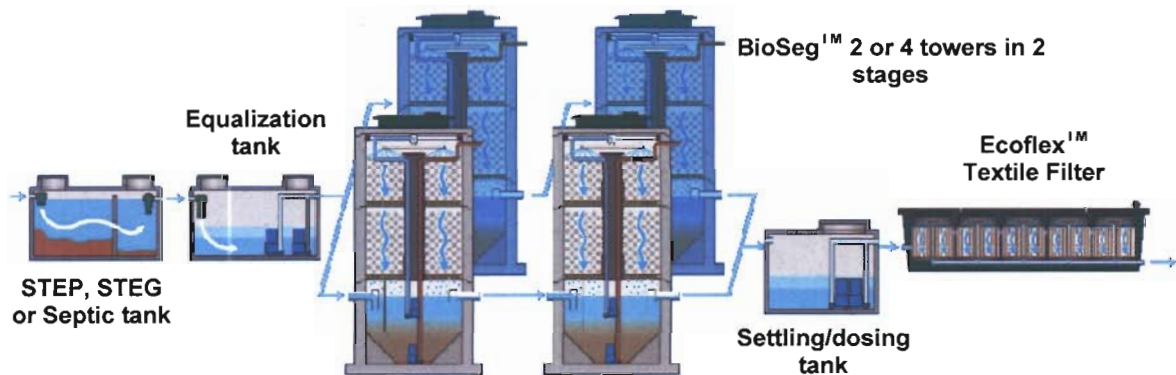


Figure 4. Schematic of a Typical System III, BioSeg™ - Ecoflex™ chain of treatment for high strength wastewater applications (e.g. restaurants)

Process Design and Expected Performance of Systems I, II and III

✓ The average performance of System I with process configuration is provided below.

✓ System I Configuration

- STEP, STEG or septic tank
- Equalization tank
- Ecoflex™ Textile Filter

✓ System I Summary NSF 40 Results

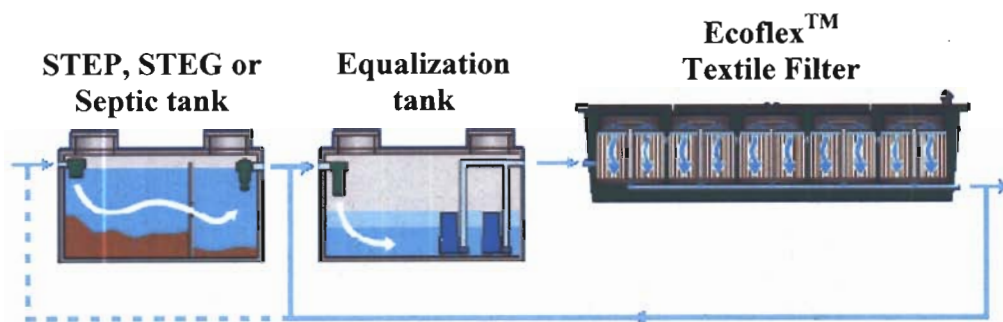
- Ecoflex system of 2 m² (4 filter modules)

design for 3 bedrooms application (6 persons)

- Flow rate applied during the 26 week of testing: 1900 L/d.
- Hydraulic loading rate on the filter (excluding recirculation): 946 L/(m²-d)
- Organic loading rate applied on the system (at septic tank inlet): 494 gBOD₅/d (equivalent to 8.2 persons)

Parameter	Raw Wastewater	Treated Effluent*
TSS (mg/L)	360 ± 210	3 ± 4
BOD ₅ (mg/L)	260 ± 120	3 ± 5
TN (mg/L)	39 ± 7	10 ± 5

* Average of 109 results for TSS and BOD and 46 results for TN



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Figure 5. Schematic of a System I configuration with an Ecoflex™ Textile Filter typical of a residential application.

Results from 5 residences installed in the Province of Quebec

Site (Samples)	Number of Bedrooms	Filter Surface Area (No. of Filter Modules) (m ²)	Period of Operation (months)	Hydraulic Loading Rate (L/m ² .d)	Final Effluent	
					TSS (mg/L)	BOD ₅ (mg/L)
1 (n= 30)	3	2 (4 filter modules)	46	362	5 ± 4	5 ± 2
2 (n=35)	3	2 (4 filter modules)	41	290	5 ± 3	8 ± 4
3 (n= 11)	2 x 4	6 (3 x 4 filter modules)	30	88	5 ± 4	9 ± 3
4 (n= 13)	4	2.5 (5 filter modules)	28	344	5 ± 3	8 ± 2
5 (n= 13)	4	2.5 (5 filter modules)	28	584	3 ± 2	5 ± 3

Detailed results for “Ferme Rouge” restaurant

Parameter	Septic Tank Effluent				Final Effluent			
	Average	Median	Minimum	Maximum	Average	Median	Minimum	Maximum
TSS (mg/L)	83	80	40	154	2.9	1.5	1.0	11.0
CBOD ₅ (mg/L)	371	358	241	536	5	5	<2	9
NH ₄ (mg N/L)	41.6	42.0	24.1	70.0	11.1	4.9	0.1	40.5
Fecal coliforms (1000 x counts/100 mL)	57.4	66.0	0.3	480.0	164	116	< 10	6,880*
Oil and grease (mg/L)	14.9	12.0	7.3	34.0	1.0	0.8	0.6	3.3

Note: * Disinfection is not part of the process and high values of maximum Fecal coliforms counts can be expected.

✓ A System II Installation

Treatment system receiving sewage from 200 Seat Restaurant

- System in operation since October 2005 (515 d)
- Average daily flow 15 m³/d (3,300 l/gpd)
- Average daily organic loading of about 5.48 kg CBOD₅/d

System design data

- A 5 m³ grease trap
- 54.3 m³ septic tank of with effluent filters
- 45 m³ equalization basin of about
- Two serial fed BioSeg™ towers (2 stages) of 1.22 m × 1.22 m × 4.60 m high containing each a total plastic media volume of 5.3 m³

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- Organic loading rate (OLR) of 11.70 gCBOD₅/ (m²·d) on the first stage 5.85 gCBOD₅/m²·d on the global system
- Settling tank having an average hydraulic loading rate (HLR) of 5 m³/m²·d (102 lgpd/ft²)
- Two Ecoflex™ filtering media rolls (total surface of 1.0 m² or 10.8 ft²) receiving 39% of the flow treated by the trickling filter unit with a HLR of 1960 L/m²·d (40 lgpd/ft²)
- No recirculation (single pass configuration)

✓ A System III Installation

Treatment system located at Notre-Dame du Portage, Quebec :

- System in operation since Summer 2007
- Seasonal application (May to November)
- Average daily flow of 60 m³/d
- Average daily organic loading at septic tank effluent of 18.0 kgCBOD₅/d

System design data

- 90 m³ septic tank with effluent filters
- 30 m³ equalization basin
- 4 x BioSeg™ towers (2 × 2 stages) of 1.6 m × 1.6 m with a media cell height of 2.0 m containing each a total media volume of 5.0 m³
- Settling tank rated at 5 m³/m²·d (122.8 gpd/ft²)
- 7 x Ecoflex™ modules of 10 filtering media rolls each fed in parallel with a total surface area of 5.0 m² per module and a corresponding hydraulic loading rate of 1714 L/m²·d
- Single pass configuration (no recirculation)

Review Qualifier

This letter is not to be considered an approval or implied approval of this treatment system and it in no way removes or limits the obligation to obtain the necessary environmental approvals under the *Ontario Water Resources Act or the Environmental Protection Act* for surface water and groundwater discharges. Such approvals are required and take into account the site-specific considerations and environmental impact constraints on a case-by-case basis.

Appendix

The submitted information included:

- ✓ Application for a NETE Certificate.
- ✓ Report consisting of:
 - NSF/ANSI Standard 40 – Residential Treatment Systems, Final Report: Premier Tech Environment; EFX-400B-1 Wastewater Treatment System (No. 06/09/2015/060) dated September 2007
 - Ecoflex™ Textile Filter – Technical Document, October 2007
 - Bioseg™-Ecoflex™ System – Technical Document, October 2007
 - Brochure: Ecoflex™ Textile Filter
 - Bioseg™-Ecoflex™ Performance Data From Restaurant Ferme Rouge

