



ENVIRONMENT

Technological Innovation



ABSTRACT

Systèmes Ecobox Inc. and their partner Ecobox-Mabarex have developed a fully organic wastewater treatment system for isolated dwellings (i.e. not connected to a sewer system). This **Advanced Secondary Treatment** system meets the most stringent effluent standards, and the performance of the Ecobox technology has been certified by the Bureau de normalisation du Québec (BNQ) and Canada's Environmental Technology Verification (ETV) Program.

Ecobox technology utilizes aerobic digestion to treat wastewater. The treatment train consists of a septic tank and an Ecobox system, with a built-in flow-control tank.

Ecobox is an effective, ecological alternative to domestic wastewater treatment for isolated dwellings.



WASTEWATER

ECOBOX™: A BIOLOGICAL ALTERNATIVE FOR ADVANCED SECONDARY TREATMENT OF DOMESTIC WASTEWATER FROM ISOLATED DWELLINGS



HIGHLIGHTS

Technology

- Organic, compact, stand-alone system
- Support medium fosters rapid biomass growth
- Flow management (prevents hydraulic shock loads)
- Easy to install

Environment

- Eliminates over 99% of fecal coliforms
- Removes over 98% of CBOD₅ and over 97% of TSS
- Support medium partially made of recycled non-biodegradable plastic
- Produces low levels of sludge
- BNQ and ETV certified purification performance

Saving

- Low maintenance costs
- Estimated life cycle of over 40 years
- Low energy consumption

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Performance Claim Verified by the ETV Program



PROJECT OBJECTIVE / PHASES

The Ecobox technology was developed to replace conventional processes with an effective treatment system that protects groundwater quality. The main goal was to create a compact treatment system requiring very little maintenance while remaining cost effective and safe for the environment.

History:

2000: Initial prototype developed in cooperation with company Procédés OxydH₂O

2002: Obtained certificate of authorization from the Quebec Ministère de l'Environnement

2003: Prototype adjusted after testing and analysis of wastewater upstream and downstream of the installation.

2004: BNQ testing begins

2005: End of testing period

2006: BNQ certification of system performance and safety

2006: ETV Program recognition obtained and application process initiated to obtain U.S. National Sanitation Foundation certification.

BACKGROUND

Homes not connected to municipal sewer systems or collective sanitation plants cannot discharge their domestic wastewater into the environment unless it has been treated.

Conventional treatment systems typically consist of a septic tank and leaching fields with absorption trenches or a seepage bed. Over time, though, the gradual build-up of sludge in the system compromises its sanitary performance and adversely affects compliance with environmental standards.

Ability to use conventional septic systems may also be limited by lot size, soil infiltration capacity and groundwater levels.

TECHNOLOGY

Ecobox is an aerobic biological treatment system using a process that consists of fostering the growth of the indigenous microorganisms present in the wastewater, which attach themselves in large numbers to a support medium in order to treat the wastewater.

The wastewater comes out of the septic tank and is directed to the Ecobox, which is made up of a flow-control tank, a bioreactor and a clarifier.

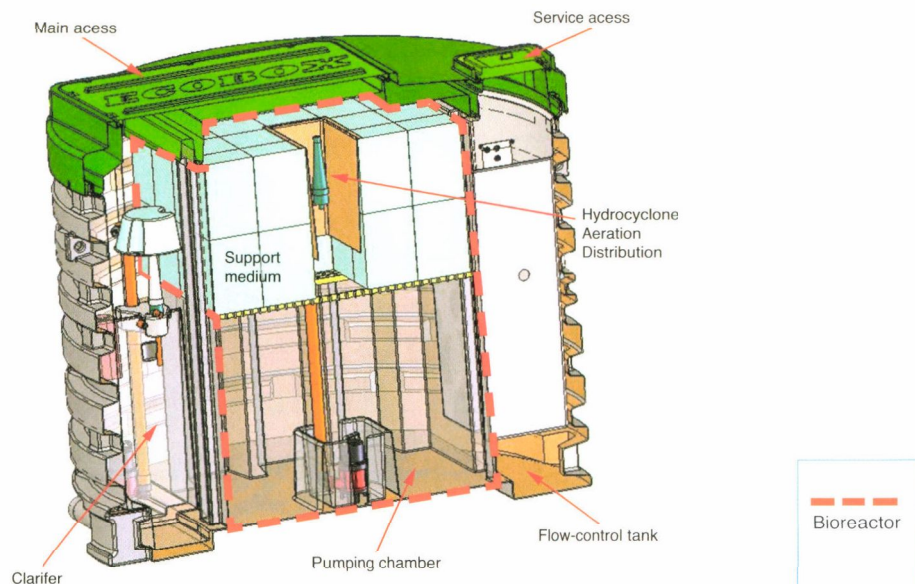
- The flow-control tank feeds the bioreactor at a constant rate.
- The Ecobox bioreactor, in which digestion occurs, consists of a pumping chamber, a biomass support medium and a

series of hydrocyclones that ensure consistent dispersion of the water over the surface of the entire medium. The treatment process does not require any additional air, oxygen, chemicals or bioaugmentation product.

- The clarifier, made up of several separate chambers, ensures the particulate matter is decanted before the water is released from the reactor into the environment, either into a seepage bed or, where permitted, directly into the stream.

The entire system takes up very little space (approximately 4.6 m³) and is designed for all soil types and land configurations.

SECTIONAL VIEW OF THE ECOBOX SYSTEM



RESULTS

To demonstrate system performance and obtain NQ 3680-910 certification, an Ecobox system was installed at the BNQ testing facility in Lac Saint-Charles near Québec City.

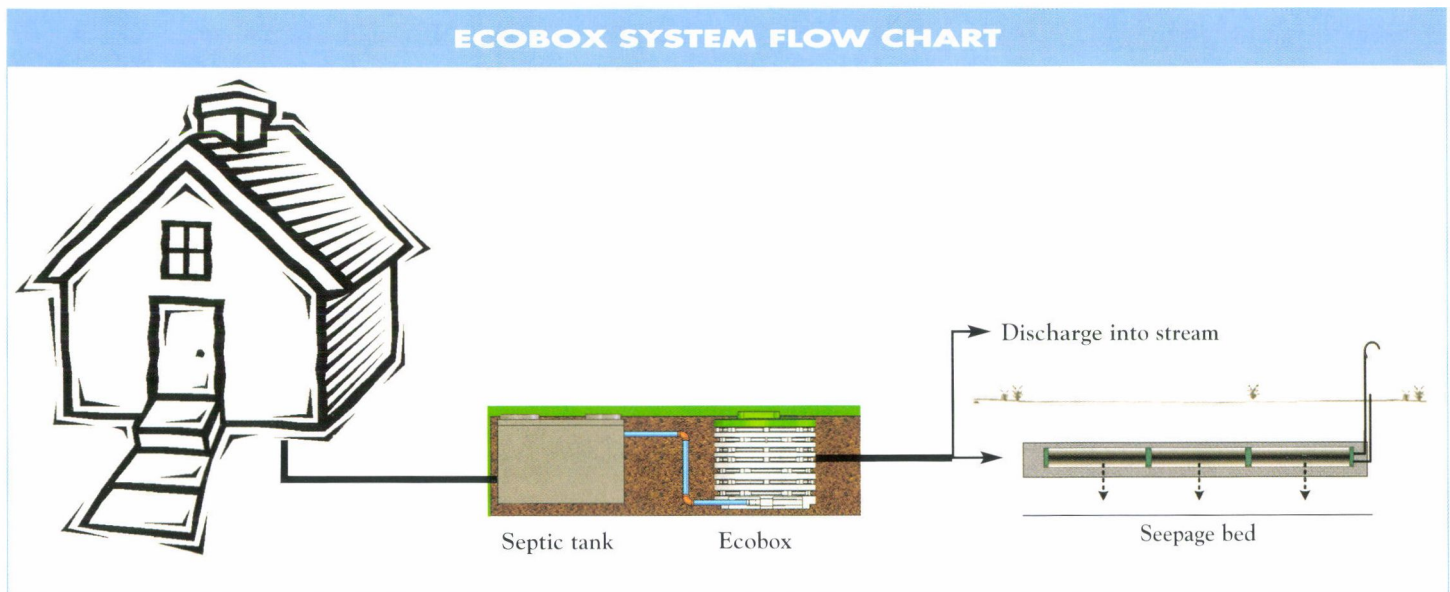
The test site received a constant, steady flow of wastewater equivalent to that of an isolated dwelling for a period of 12 consecutive months. Effluent analysis revealed that the Ecobox system delivered treatment

performance exceeding Quebec environmental discharge standards for this type of dwelling, even during shock loading.

WASTEWATER TREATMENT PERFORMANCE OF ECOBOX SYSTEM				
Parameters	Typical mean concentrations (Inlet)	Typical mean concentrations (Outlet)	Standard for effluent from isolated dwellings*	Mean treatment performance (%)
Fecal coliform count (UFC/100 mL)	3 100 000	20 800	50 000	99.3
Ammonia nitrogen (mg/L)	40.2	8.04	10	80.0
Five-day carbonaceous biochemical oxygen demand - CBOD ₅ (mg/L)	235	4	15	98.3
Suspended solids - SS (mg/L)	235	5	15	97.9
Total phosphorus (mg/L)	6.92	4.66	-	33.0
Total nitrogen (mg/L)	50.8	9.6	-	80.0
Nitrites-nitrates (mg/L)	-	8.76	-	-

- Typical flow rates at inlet to Ecobox bioreactor ranged from 1228 to 1440 L/d.
 - Results based on analyses carried out by BNQ of 235 samples taken from the Ecobox installation at the test facility operating under heightened conditions over a consecutive 12-month period.

* Regulation respecting waste water disposal systems for isolated dwellings for an advanced secondary treatment system, Standard: NQ 3680-910 (Ministère du Développement durable, de l'Environnement et des Parcs du Québec)



POTENTIAL AND LIMITATIONS

Potential

- Media adaptable to load or flow to be treated
- System certified for isolated dwellings (1- to 6-bedroom homes)
- Maximum treatment capacity of 2160 litres per day
- Ecobox system performance not affected by outside temperature
- Above-ground installation available
- Discharge into seepage bed or directly into stream, depending on applicable regulations
- Wastewater may be re-used for irrigation
- Custom-design system for volumes exceeding 3240 litres per day*
- Organic process can treat commercial, institutional and community wastewater (e.g. groups of isolated dwellings, hotel complexes, etc.).*

* Not BNQ / ETV certified

Limitations

- System cannot tolerate large concentrations of chemicals
- Pump needs occasional replacement
- Electrical power source is required (uses 3 amps)
- Manufacturer's use and maintenance instructions must be followed

INFORMATION

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