Health & Test Data - Clivus Multrum

(This page is periodically updated)

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Questions

Testing

NSF Certified

LR 27697

NSF certified

The Clivus Multrum conforms to all the requirements of the NSF Standard 41 for Wastewater Recycle/Reuse & Water Conservation Systems, and has been granted Seal No. 8551 (National Sanitation Foundation Evaluation and Testing from 1982). For details of models and testing according to Standard 41 go to http://www.nsf.org/

Compost End-Product

Fertilizer value
The end-product from a Clivus Multrum Composting system consists primarily of a liquid which has been processed through filtration in the composting tank. This compost "tea" contains all the basic plant nutrients (N,P,K) as well as micro-nutrients which are also removed from the soils by harvesting.

Health considerations
A Clivus Multrum composting system produces safe-to-handle end-products but needs a start-up period during which all the basic composting processes can get into balance. After a relatively short introduction period (generally a matter of weeks) the liquid end-product will be both odor-free and generally with an undetectable level of human pathogens (here indicated by fecal coliforms). The longer the Clivus system has been in operation, the more stable its performance and fertilizer by-products can be expected to be. The solid compost should be left in the system for as long as possible (as long as there is room for the addition of fresh compostables, this could be decades). In other words, an almost full tank works the best. One part of the biochemical transformation taking place in the Clivus involves oxidation of ammonia to nitrite and nitrate (portions of a process known as nitrification). Both nitrite and nitrate are highly toxic to human pathogens. It is this part of the process that is responsible for rendering the end-products safe. Safe end-products do not require complete nitrification but only enough to effect "sterilization".

The following table gives examples of tests made on both older and newer Clivus systems.

Table 1 End-product from Clivus, Fecal Coli

Test site	Clivus type	Install. yr	Visits/yr	Lab/Date	Fec Coli

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Nevada Highw,Dept.	Large Tank	1982	34000	(1) 1983	7 /gram
Wildlife Prairie Park	Large Tank	1978	14000	(2) 1981	<2 /g
Hushåll i Pennsylv.	Small Tank	1976	7000	(3) 1981	35 /g
Sweden, 7 tanks*	Large Type	Before 1972	Varying use	(4) 1976	Undetected**
Sweden, 7 tanks	Large Type	Before 1972	Normal use	(5) 1972-75	Undetected**
Broadmoor,Natick***	Large Type	1988	-	J1992	<10 /100ml
	-	-	-	-	
NSF's Standard					<200/g
Septage (for compar.)	-	-	-	-	100,000 /g

(1) Sierra Environmental Monitoring Inc., Rena, Nevada
(2) Microbe One, Ann Arbor, Michigan
(3) National Sanitation Foundation, Ann Arbor, Michigan
(4) Center for the Biology of Natural Systems, Wash. University, St Louis, Missoury

* Test performed at CBNS, Washington University, St Louis MO. the extensive investigation is summarized below.
** According to standard methods
*** Test by State of Vermont, Department of Environmental Conservation

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Table II Liquid-End Product

Test Site	Yr inst.	Use/yr	Lab /yr	Fecal Coli	Lab/yr	N(tot) g/l	Size
Wildlife Park, IL	-78	14,000	(1) -79	0	(3) -82	9.4 g/l	L
Shelly Ridge, PA	-80	6,000	(2) -81	2	-	-	M
Camp Archb., PA	-80	8,000	(3) -81	0	(3) -82	2.7 g/l	M
Hawk Mtn, PA	-76	20,000	(4) -82	6	(4) -82	6 g/l	M (2 tanks)
Kain Park, PA	-79	14,000	(4) -82	43	(4) -82	5.5 g/l	M
Blanford Cent .,MI	-81	14,000	-	-	(3) -82	3.2 g/l	S
Residential, MI	-78	3,000	(6) -80	3	-	-	S

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Residential, MI	-73	6,000	(5) -74	0	(5) -74	7.4 g/l	M
EPA stand swimm				<200/100ml			
Septic Tank Effl		Normal	Typical	430,000			

(1) Peoria Illinois,County Health Department
(2) Quality Control Laboratory, Southhampton, PA
(3) Seewald Laboratories, Williamsport, PA
(4) Alchemis, Inc. Bath, PA
(5) Process Research, Inc. Cambridge, MA
(6) Microbe One, Ann Arbor, MI

Analysis from the liquid storage tanks at Susedalens rest area (built and maintained by the Swedish Highway Administration) serving the E6 (outside Falkenberg).

Date of sampling 980420
Arrived SMI 980421
Sample by Ulf Hedin
SMI numbers:
S44 Inside storage tank, Susedalen East side
S45 Inside storage tank, Susedalen West side

The samples were taken from two different collection tanks for the liquid end-product from the Clivus treatment systems. Samples were taken on both sides of the Highway (east and west side)

Parameters	S44	S45
pH	8,60	9,09
Coliform bacteria./mL	<10	<10
Thermostable Coliform bacteria/mL	<10	<10
E Coli/mL	<10	<10
Fecal streptococci /mL	<10	<10
Clostridia /mL	30	1

The low concentration of indicator organisms show that there is absence of fecal contamination and that the treatment process has worked. There is a small number of Clostridium which need not be from fecal matter.

The Institute for Contagious Disease,
Water and Environmental Laboratory, April 24 -98

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[signed TAS/Görel Allerstam]

Thor Axel Stenström / Görel Allestam
Chefmikrobiolog, PhD / Biomedicinsk analytiker

Long Term Dependability, Peak Loading and Intermittent Use.

The empirical basis for Clivus Multrum operational claims is composed of more than 5000 units installed since all over the world from 3 - 50+ years [in Sweden]. It is worth mentioning that the original units from 1939 - 40 are still in operation i Tyresö outside Stockholm Sweden (see <http://clivusmultrum.com/Public.html>). We can safely say from this experience, that the process demonstrates long term stability, is able to cope with peak loads (up to 10 times the normal loading) as well as intermittent and seasonal use. This stability is the result of the large volume of the composting mass and of the long time allowed for completion of the process. We also want to caution that other manufacturers of "Composting Toilets" are using the name generically as if any design with that name performs as the original. This has sometimes dramatically proven not to be true. Almost all products can perform well short term and under consistant circumstances. Clivus Multrum is designed to work well when conditions are nearing the extreme (both no-use, which could through heating and venting turn the mass into a solid brick or peak-use for extended periods, which could result in a very unpleasant anearobic sludge).

Analysis of Vent Gases

Carbon dioxide and water vapor are the major gaseous products of aerobic composting. The amount of these two gases found in the Clivus Multrum vent gas are the same as the amount expected to be present, based on the rate of air flow, temperature, and amount of material depositied daily over an extended period.

Methane was measured in Clivus vent gas and was found to be the same as ambient outside air. Tests were also carried out for five undesirable gases which might conceivably be present in the exhaust air from aerobic or anaerobic composting. None were detected in significant amounts. The amounts present in Multrum exhaust can be compared with federal Ambient Air Quality Standards and/or NIOSH Workroom Safety limit. Sulfer dioxide, ammonia and hydrogen sulfide are each well below the workroom safety limits.

Table III Vent Gas Data

Gas	in Clivus vent gas	Fed. Air Quality Stand.	NIOSH* workroom lim.
		None (ambient is	

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Carbon dioxide	0.2%	0.04%)	0.5% safety limit
Water vapor	Å95% relative humidity	-	-
carbon monooxid (respiratory tox.)	none detected (<8 ppm)	9 ppm	50 ppm
sulfer dioxide	none detected (< 1 ppm)	0.03 ppm	5 ppm
hydrogen sulfide	0.5 ppm	none	10 ppm
ammonia	3 ppm	none	25 ppm
methyl mercaptan (bad odor)	none detected (<2.5 ppm)	-	-
methane (explosive above 10,000)	4 ppm	none	ambient (0-4 ppm)

*NIOSH is short for the National Institute of Occupational Safety and Health.

Analysis for the above gases, excepting methane was carried out by the Center for the Biology of Natural Systems, Department of Biology (CBNS) Washington University, St Louis, Missouri using unico 400 Precision Gas Detector Pump, manufactured by Unico Environmental Instruments, Fall River, MA. Two separate Multrum units were tested and the results were averaged. Methane analysis was carried out for one Multrum unit by Environmental Research and Technology Inc. Conc. MA by collecting four separate 9 liter samples and analyzing them for methane using a baseline chromatograph equipped with a flame ionization detector.

Contact us per mail:
Clivus Multrum Intern. AB,
Ålberga Boställe
610 50 Jönåker
Sweden

Tel: +46-155-72310
Fax +46-8-770 04 33

Email us at carl@websida.com

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