SCD Probiotics®

Case Study Summary – Evaluation of Odor Control Results from a Surface Flux Chamber Testing Conducted with SCD ScentGuard™ on Liquid Waste Material
Waste Treatment – Odor Reduction (CSS-048-05)

Industry: Waste treatment
Products: SCD Scent Guard™ (Formerly sold as SCD Odor Away™)
Application: Product applied topically to liquid waste material

Highlights

- SCD ScentGuard's odor control properties were tested in a composting operation
- Quantitative analyses of odor emissions indicated control efficiencies of 76% within 1 hour of application and 96% after 8 days

Introduction

Landfill leachate is defined as all water that has been in contact with waste stored in a landfill. It is caught in a drainage system and undergoes special wastewater treatment. Depending on the substances present, appropriate wastewater technology must be employed. If untreated leachate enters a body of water, it is an environmental hazard. SCD Probiotics® has developed an all-natural product—SCD ScentGuard—to treat leachate in wastewater treatment plants.

This technical case study describes the bench-scale testing that was conducted to assess SCD ScentGuard's odor control capability on a waste leachate material. The study's objective was to provide quantitative odor control efficiency data for the SCD ScentGuard product as applied to a leachate waste material.

Methodology

SCD ScentGuard (SG) was applied to a leachate waste material in a bench scale study perthe following specifications: 1:200 spray (topical) application three times per day for 48 hours followed by 1:1,000 spray (topical) application once per day for six days.

Measurements were made on the leachate in four stages: without SCD ScentGuard application (uncontrolled odor flux), within one hour after the first application of SCD ScentGuard, after the last 1:200 application of SCD ScentGuard, and at the end of the 8-day study, after 1:1,000 of SCD ScentGuard was applied per day.

Quantitative odor control testing was performed on 5 gallons of leachate in a 30-gallon steel wash tub (plastic lined). Odor flux measurements were performed using the USEPA surface emission isolation flux chamber (flux chamber), operated following the USEPA protocol and at equilibrium conditions in the flux chamber.

Screening level testing was conducted, including a hydrocarbon concentration assessment following EPA Report # 600/8-87-036 and dosimeter (color indicator tubes) for ammonia. Following the screenings, a tedlar bag sample was collected for offsite analysis for olfactory odor by ASTM Method E-679-91 analyzed on an Odor Science and Engineering facility. The uncontrolled testing provided the denominator in the odor control efficiency expression per waste type.

After the uncontrolled waste test and sample collection, SCD ScentGuard odor control was applied following the manufacturer's recommendations, and the bench scale reservoir was tested using the same measurement technology and protocol for up to eight days. Time-dependent testing included testing at Hours 1 and 48, and Day 8. The testing protocols that were used are described in the project specific Standard Operating Procedure. Sampling activities were recorded on the field data sheet. The equipment was then prepared for the next test location and steps 1) through 8) were repeated.

Results

A summary of the bench-scale testing is shown in Table I. This table represents a field record of the activities demonstrating the bench scale protocol. All field data for the surface flux chamber testing (screening) for VOCs and ammonia are presented in Table II in concentration units (ppmv). All quantitative odor data, percent odor control data, and qualitative odor flux ((D/T)/m2, min-1) data are presented in Table III.

Surface flux data, for a surface area source, are calculated using measured target compound concentrations and flux chamber operating parameter data (sweep air flow rate of 5.0 liters per minute [or 0.005 m^3/min] plus adjective flow [m^3/min], surface area of 0.13 square meters [m^2]).

The actual air emissions from the test materials can be calculated by multiplying the flux by the surface area of the source in support of estimating air emissions from petroleum waste during an excavation scenario. The flux is calculated from the sweep air flow rate Q (cubic meters per minute [m^3/min]), the species concentration Yi (micrograms per cubic meter [µg/m^3)], and exposure to the chamber surface area A (square meters [m^2]), as follows:

$$Fi = (Q)\ (Yi)\ /\ (A)$$

Table I: Summary of Bench Scale Testing Information

TIME	DAY	ACTIVITY
0625	Day 0	Conduct uncontrolled flux test on leachate
0710	Day 0	Apply SG to 5 gallons of leachate; 1:200; conduct 1-hour flux test
1505	Day 1	Apply SG to 5 gallons of leachate; 1:200
2220	Day 1	Apply SG to 5 gallons of leachate; 1:200
1600	Day 1	Ship odor samples to the lab for analysis (24-hour hold time)
0600	Day 2	Apply SG to 5 gallons of leachate; 1:200
1500	Day 2	Apply SG to 5 gallons of leachate; 1:200
0540	Day 2	Apply SG to 5 gallons of leachate; 1:200
0545	Day 2	Apply SG to 5 gallons of leachate; 1:200, conduct 48-hour test
0625	Day 2	Apply SG to 5 gallons of leachate; 1:200, final 1:200 application
1600	Day 3	Ship odor samples to the lab for analysis (24-hour hold time)
0815	Day 3	Apply SG to 5 gallons of leachate; 1:1,000
0815	Day 4	Apply SG to 5 gallons of leachate; 1:1,000
0815	Day 5	Apply SG to 5 gallons of leachate; 1:1,000
0905	Day 6	Apply SG to 5 gallons of leachate; 1:1,000
0710	Day 7	Apply SG to 5 gallons of leachate; 1:1,000
0824	Day 8	Apply SG to 5 gallons of leachate; 1:1,000, conduct 8-day test
1600	Day 8	Ship odor samples to the lab for analysis (24-hour hold time)

Table II: Summary of Bench Scale Testing Information

DAY	TIME	TEST	PID (ppmv)	FID (ppmv)	NH_3 (ppmv)	SAMPLE ID
Day 0	0625	Uncontrolled Flux	12	45	0.7	SG-UNC-01, -02
Day 0	0735	Controlled Flux, Hr. 1	7.5	54	0.3	SG-C-03
Day 2	0545	Controlled Flux, Hr. 48	4.8	62	<0.1	SG-C-04, -05
Day 2	0615	Media Blank	NA	NA	NA	SG-C-06
Day 8	0824	Controlled Flux, Day 8	21	ND	0.2	SG-C-07, -08

Note – All samples collected in replicate except Hour 1

Table III: Summary of Bench Scale Odor Flux Data and Control Efficiency

TEST	SAMPLE ID	AVERAGE ODOR CONCEN-TRATION (D/T)	CONTROL EFFICIENCY (%)	ODOR FLUX ((D/T)/m^2, min^{-1})
Uncontrolled Flux	SG-UNC-01, -02	9,607*	N/A	370
Controlled Flux, Hr. 1	SG-C-03	2,295	76%	88.4
Controlled Flux, Hr. 48	SG-C-04, -05	693*	93%	26.7
Media Blank	SG-C-06	10	N/A	N/A
Controlled Flux, Day 8	SG-C-07, -08	385*	96%	14.8

Note – All samples collected in replicate except Hour 1; reported as an average value (*)

Concentration data was used in the calculation of control efficiency since emission rate data is not needed for the evaluation of control efficiency, given that the flux chamber is operated in an identical fashion for both the uncontrolled tests and the controlled tests. Odor flux data can be used to estimate offsite odor impact as input to a dispersion model representing the odor source.

Conclusions

Odor flux testing was performed with the intent of establishing SCD ScentGuard's odor control efficiency on the leachate waste material. The following is a summary of activities and results associated with this objective:

- Surface flux measurements of odor were measured from the leachate wastewater, with and without the application of SCD ScentGuard, using the USEPA recommended surface flux chamber technology. This technology quantitatively measures flux of odor and VOCs at the test surface.
- Field quality control data indicate acceptable data quality for the field analyzer. Field and laboratory quality control data indicated acceptable data quality for the offsite analytical methods. System blank and replicate odor data indicated acceptable method performance.
- The results of the quantitative analysis of odor emissions indicated control efficiencies ranged from 76% to 96%, with increasing odor control efficiency over time, as indicated below:

EMISSIONS TEST	% Control
Leachate Waste Material	
1:200 SG Application; Hour 1	76%
Seven, 1:200 SG Applications; Hour 48	93%
Six, 1:1,000 SG Applications; Day 8	96%