

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

To: Duane Buelow - EcoLogic

Report Number: 072412A

Date: July 24, 2012

Eden Research Laboratory

Report

From: Thomas Poth - Eden Research Laboratory

Regarding: ASTM D5511-11 68 weeks testing of EcoLogic (126) Foamed PS Food Tray with 1% Eco-One - ERL #209

RESULTS

Thermophilic testing for biodegradation, over 68 week period, of Foamed PS Food Tray sample resulted in Treated Sample - 126 (ERL #209) — 46.1% biodegradation.

METHOD

The degree and rate of anaerobic biodegradability of a plastic type material may be predictive of the period required to reduce the proposed plastic from the environment depending on the given conditions. Where disposal is considered a major issue, this test method may be useful to estimate the degree and persistence of biodegradable plastic in a biologically active anaerobic disposal situation. ASTM method D5511-11 determines the degree of anaerobic biodegradation of plastic materials in a high-solids anaerobic conditions. The test sample is exposed to methanogenic inoculum cultivated from a wastewater treatment facility's anaerobic digesters and post consumer pretreated household waste. Anaerobic decomposition in this case employs a high solids environment. High solids conditions are usually considered to be greater than 20% solids. The sample conditions remain static.

This test method is designed to yield a percentage of conversion of carbon in the sample to carbon in the gaseous form under conditions found in high-solids anaerobic digesters, treating municipal solid waste. This can be validated using change in mass of the original sample. This test method is also designed to resemble many conditions in a biologically active landfill. This method is applicable to all plastic materials that are not toxic to microorganisms present in wastewater treatment facility's anaerobic digesters that are operating on household waste.

ASTM Method D5511 determines the rate and degree of anaerobic biodegradation by measuring the volume of carbon dioxide (CO₂) and methane (CH₄), or change in mass as a function of time (days) of exposure to anaerobic-digester sludge. This method is considered an accelerated representation with respect to anaerobic environments. Landfill sites that plastics encounter in usual disposal methods are a prime example of this environment.

This method is equivalent to method ISO 15985.

INOCULUM

1. Inoculum Characteristics and Preparation
 1. Sludge from Organic Compost – Bernalillo Municipal Compost Facility & Albuquerque Municipal Wastewater Facility
 1. Fifteen day hold period observed @ 53 ± 2°C
 2. Solid Content - 47.6% - The method allows anything greater than 20%. Eden Research Laboratory conducts this test at higher solids to better simulate landfill conditions.
 3. pH - 7.5 - 8.3
 4. Volatile Fatty Acids - 1.3 g/kg
 5. Ammonium Nitrogen 1.2 mg/kg

2111 Menaul NE, Suite A

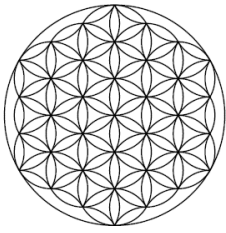
Albuquerque, NM 87107

T 505.508.3994

thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL

Total pages 13



ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

SAMPLES THEORETICAL CARBON CONTENT

Sample	Percent Resin	Percent Carbon	Percent Additive	Percent Carbon	Total
209	99	92.3	1	72.9	92.1

WEEKLY GAS VOLUMES @ STP CONTROL SET

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
Mar 17, 2011	1119.8	1105.9	1050.4	1443.7	1203.1	1309.5	7611.9	7431.5	8153.3
Mar 24, 2011	273.0	263.8	314.7	333.2	203.6	254.5	2545.0	2892.1	5117.8
Mar 31, 2011	-60.2	-111.1	-106.4	9.3	-23.1	203.6	2989.2	513.6	1786.1
Apr 7, 2011	323.9	402.6	259.1	138.8	203.6	120.3	203.6	351.7	1684.3
Apr 14, 2011	162.0	245.2	138.8	0.0	-41.6	0.0	4.6	208.2	467.4
Apr 21, 2011	87.9	435.0	286.9	0.0	374.8	647.8	32.4	485.9	495.1
Apr 28, 2011	27.8	111.1	113.4	138.8	122.6	280.0	-25.5	138.8	118.0
May 5, 2011	9.3	212.9	196.7	199.0	201.3	460.4	104.1	310.0	252.2
May 12, 2011	-4.6	101.8	101.8	111.1	101.8	226.7	-23.1	148.1	134.2
May 19, 2011	2.3	94.9	104.1	122.6	104.1	192.0	-6.9	144.4	136.5
May 26, 2011	127.3	155.0	155.0	178.2	155.0	275.3	150.4	207.3	219.8
Jun 2, 2011	115.7	83.3	106.4	138.8	87.9	245.2	111.1	120.3	185.1
Jun 9, 2011	212.9	217.5	231.4	323.9	231.4	435.0	-13.9	245.2	277.6
Jun 16, 2011	101.8	97.2	97.2	175.8	92.5	430.3	9.3	111.1	143.4
Jun 23, 2011	87.9	69.4	78.7	18.5	78.7	231.4	13.9	124.9	129.6
Jun 30, 2011	92.5	97.2	92.5	0.0	97.2	0.0	23.1	129.6	106.4
Jul 7, 2011	108.7	115.7	94.9	0.0	101.8	0.0	189.7	148.1	300.8
Jul 14, 2011	205.9	143.4	78.7	0.0	104.1	400.3	129.6	187.4	50.9
Jul 21, 2011	136.5	199.0	150.4	0.0	141.1	458.1	168.9	150.4	-6.9
Jul 28, 2011	11.6	18.5	9.3	0.0	9.3	20.8	16.2	13.9	2.3
Aug 4, 2011	-2.3	-2.3	-2.3	0.0	0.0	2.3	-4.6	-2.3	0.0
Aug 11, 2011	-2.3	-2.3	-2.3	0.0	0.0	2.3	-4.6	-2.3	0.0
Aug 18, 2011	13.9	11.6	9.3	0.0	9.3	23.1	11.6	16.2	-2.3
Aug 25, 2011	13.9	11.6	9.3	0.0	9.3	23.1	11.6	16.2	-2.3
Sep 1, 2011	-2.3	0.0	0.0	0.0	-4.6	0.0	-4.6	-6.9	0.0
Sep 8, 2011	-2.3	0.0	0.0	0.0	-4.6	0.0	-4.6	-6.9	0.0
Sep 15, 2011	6.9	55.5	11.6	0.0	13.9	0.0	11.6	11.6	-6.9
Sep 22, 2011	6.9	4.6	11.6	0.0	13.9	0.0	11.6	11.6	-6.9
Sep 29, 2011	18.5	27.8	13.9	0.0	11.6	2.3	18.5	6.9	-9.3
Oct 6, 2011	18.5	41.6	13.9	0.0	11.6	2.3	18.5	6.9	-9.3
Oct 13, 2011	37.0	83.3	64.8	78.7	74.0	74.0	37.0	37.0	157.3
Oct 20, 2011	4.6	87.9	0.0	4.6	0.0	0.0	9.3	9.3	-9.3
Oct 27, 2011	0.0	-87.9	13.9	13.9	9.3	9.3	4.6	4.6	9.3
Nov 3, 2011	0.0	87.9	34.7	32.4	39.3	39.3	9.3	9.3	13.9
Nov 10, 2011	0.0	27.8	34.7	32.4	39.3	39.3	13.9	13.9	0.0
Nov 17, 2011	-4.6	27.8	27.8	32.4	27.8	27.8	25.5	25.5	18.5

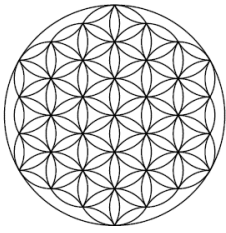
Eden Research Laboratory

Report

2111 Menaul NE, Suite A
Albuquerque, NM 87107
T 505.508.3994

thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL
Total pages 13



ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Eden Research Laboratory

Report

2111 Menaul NE, Suite A
Albuquerque, NM 87107
T 505.508.3994

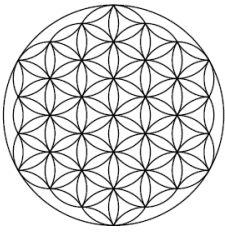
thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL
Total pages 13

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
Nov 24, 2011	4.6	9.3	0.0	0.0	0.0	0.0	25.5	25.5	18.5
Dec 1, 2011	-4.6	18.5	32.4	23.1	23.1	23.1	0.0	0.0	41.6
Dec 8, 2011	4.6	27.8	23.1	27.8	23.1	23.1	4.6	4.6	4.6
Dec 15, 2011	4.6	27.8	39.3	41.6	44.0	44.0	0.0	0.0	-13.9
Dec 22, 2011	-4.6	41.6	39.3	41.6	44.0	44.0	92.5	92.5	13.9
Dec 29, 2011	13.9	0.0	37.0	32.4	32.4	32.4	9.3	9.3	-4.6
Jan 5, 2012	9.3	32.4	18.5	23.1	23.1	23.1	11.6	11.6	-9.3
Jan 12, 2012	9.3	27.8	46.3	46.3	46.3	46.3	11.6	11.6	-9.3
Jan 19, 2012	0.0	41.6	0.0	0.0	0.0	0.0	101.8	101.8	9.3
Jan 26, 2012	0.0	41.6	0.0	9.3	4.6	4.6	18.5	18.5	-9.3
Feb 2, 2012	0.0	32.4	0.0	0.0	-2.3	-2.3	4.6	4.6	4.6
Feb 9, 2012	0.0	9.3	0.0	0.0	-2.3	-2.3	4.6	4.6	-4.6
Feb 16, 2012	0.0	37.0	27.8	27.8	23.1	23.1	4.6	4.6	0.0
Feb 23, 2012	0.0	9.3	23.1	32.4	23.1	23.1	0.0	0.0	2.3
Mar 1, 2012	0.0	4.6	18.5	18.5	18.5	18.5	13.9	13.9	2.3
Mar 8, 2012	0.0	4.6	27.8	27.8	32.4	32.4	13.9	13.9	0.0
Mar 15, 2012	-4.6	4.6	4.6	9.3	4.6	4.6	32.4	32.4	0.0
Mar 22, 2012	0.0	18.5	2.3	6.9	2.3	2.3	-4.6	-4.6	-2.3
Mar 29, 2012	4.6	27.8	2.3	6.9	2.3	2.3	4.6	4.6	-2.3
Apr 5, 2012	-2.3	18.5	55.5	55.5	55.5	55.5	92.5	92.5	0.0
Apr 12, 2012	-2.3	18.5	41.6	41.6	46.3	46.3	18.5	18.5	0.0
Apr 19, 2012	0.0	4.6	13.9	27.8	23.1	23.1	30.1	30.1	-6.9
Apr 26, 2012	0.0	6.9	18.5	13.9	9.3	9.3	30.1	30.1	-6.9
May 3, 2012	0.0	6.9	4.6	13.9	9.3	9.3	9.3	9.3	-9.3
May 10, 2012	-4.6	55.5	18.5	18.5	9.3	9.3	9.3	9.3	-9.3
May 17, 2012	0.0	27.8	6.9	4.6	9.3	9.3	9.3	9.3	157.3
May 24, 2012	6.9	27.8	6.9	4.6	9.3	9.3	-9.3	-9.3	-9.3
May 31, 2012	6.9	13.9	41.6	46.3	37.0	37.0	87.9	87.9	9.3
Jun 7, 2012	32.4	13.9	13.9	13.9	0.0	0.0	13.9	13.9	13.9
Jun 14, 2012	13.9	9.3	0.0	4.6	-4.6	-4.6	13.9	13.9	0.0
Jun 21, 2012	4.6	0.0	0.0	4.6	-4.6	-4.6	-2.3	-2.3	18.5
Jun 28, 2012	27.8	0.0	37.0	60.2	41.6	41.6	-2.3	-2.3	18.5

SAMPLE SET

Week Ending	209A	209B	209C
Mar 17, 2011	703.4	1295.6	1453.0
Mar 24, 2011	532.1	1166.1	596.9
Mar 31, 2011	2290.5	944.0	1036.5
Apr 7, 2011	2054.5	513.6	-162.0
Apr 14, 2011	314.7	286.9	259.1
Apr 21, 2011	476.6	101.8	226.7
Apr 28, 2011	222.1	157.3	2554.3
May 5, 2011	249.9	222.1	902.3
May 12, 2011	842.2	87.9	439.6



Eden Research Laboratory

Report

2111 Menaul NE, Suite A

Albuquerque, NM 87107

T 505.508.3994

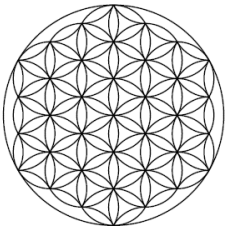
thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL

Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Week Ending	209A	209B	209C
May 19, 2011	1466.9	74.0	328.5
May 26, 2011	2554.3	69.4	148.1
Jun 2, 2011	1527.0	92.5	1286.4
Jun 9, 2011	231.4	180.5	212.9
Jun 16, 2011	134.2	69.4	124.9
Jun 23, 2011	97.2	37.0	92.5
Jun 30, 2011	115.7	78.7	106.4
Jul 7, 2011	115.7	317.0	101.8
Jul 14, 2011	46.3	772.8	27.8
Jul 21, 2011	148.1	1432.2	41.6
Jul 28, 2011	37.0	273.0	9.3
Aug 4, 2011	78.7	319.3	46.3
Aug 11, 2011	277.6	435.0	115.7
Aug 18, 2011	0.0	435.0	0.0
Aug 25, 2011	101.8	69.4	60.2
Sep 1, 2011	124.9	69.4	41.6
Sep 8, 2011	134.2	83.3	78.7
Sep 15, 2011	134.2	101.8	106.4
Sep 22, 2011	134.2	78.7	115.7
Sep 29, 2011	69.4	78.7	115.7
Oct 6, 2011	55.5	13.9	50.9
Oct 13, 2011	152.7	115.7	124.9
Oct 20, 2011	-18.5	-46.3	-13.9
Oct 27, 2011	101.8	180.5	180.5
Nov 3, 2011	249.9	222.1	189.7
Nov 10, 2011	83.3	78.7	97.2
Nov 17, 2011	97.2	115.7	120.3
Nov 24, 2011	134.2	143.4	152.7
Dec 1, 2011	9.3	13.9	0.0
Dec 8, 2011	83.3	64.8	97.2
Dec 15, 2011	152.7	180.5	134.2
Dec 22, 2011	129.6	143.4	129.6
Dec 29, 2011	171.2	162.0	199.0
Jan 5, 2012	41.6	-18.5	23.1
Jan 12, 2012	41.6	-18.5	23.1
Jan 19, 2012	23.1	49.4	-9.3
Jan 26, 2012	23.1	49.4	-9.3
Feb 2, 2012	23.1	49.4	-9.3
Feb 9, 2012	16.2	9.3	11.6
Feb 16, 2012	16.2	9.3	11.6
Feb 23, 2012	50.9	46.3	37.0
Mar 1, 2012	46.3	46.3	37.0
Mar 8, 2012	4.6	0.0	0.0
Mar 15, 2012	4.6	-4.6	0.0



Eden Research Laboratory

Report

2111 Menaul NE, Suite A
Albuquerque, NM 87107
T 505.508.3994

thomas.poth@edenresearchlab.com

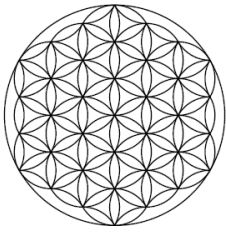
Reproduce report ONLY in FULL
Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Week Ending	209A	209B	209C
Mar 22, 2012	180.5	97.2	222.1
Mar 29, 2012	175.8	97.2	222.1
Apr 5, 2012	175.8	97.2	222.1
Apr 12, 2012	124.9	106.4	166.6
Apr 19, 2012	23.1	27.8	41.6
Apr 26, 2012	23.1	27.8	41.6
May 3, 2012	37.0	37.0	37.0
May 10, 2012	32.4	32.4	32.4
May 17, 2012	18.5	9.3	9.3
May 24, 2012	990.2	46.3	55.5
May 31, 2012	985.6	50.9	55.5
Jun 7, 2012	111.1	46.3	46.3
Jun 14, 2012	111.1	46.3	46.3
Jun 21, 2012	18.5	23.1	27.8
Jun 28, 2012	18.5	18.5	27.8

WEEKLY AVERAGE GAS QUALITY METHANE CONTROL SET

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
Mar 17, 2011	25.0	15.7	23.6	22.2	23.5	21.1	33.8	31.4	32.5
Mar 24, 2011	28.1	19.3	24.5	26.4	27.2	26.1	35.9	36.1	36.6
Mar 31, 2011	29.8	21.5	26.6	30.2	30.0	30.0	39.9	39.9	41.5
Apr 7, 2011	31.7	23.7	31.4	35.8	34.0	33.7	41.8	44.6	45.9
Apr 14, 2011	32.5	25.9	32.8	36.3	35.5	34.2	40.7	44.2	46.1
Apr 21, 2011	33.4	29.0	33.4	36.1	35.8	34.3	40.6	42.8	49.2
Apr 28, 2011	34.3	32.0	38.3	39.1	39.5	37.6	44.3	45.3	50.0
May 5, 2011	37.8	36.7	41.5	43.1	43.7	40.8	47.1	47.8	52.4
May 12, 2011	41.4	41.5	46.8	45.1	47.2	45.8	49.6	51.4	52.9
May 19, 2011	43.7	47.1	52.3	48.3	50.1	48.2	51.5	53.1	55.4
May 26, 2011	45.0	48.2	55.2	51.7	55.6	52.1	54.2	55.0	55.9
Jun 2, 2011	46.9	52.9	60.1	54.8	58.2	54.3	57.4	58.5	55.8
Jun 9, 2011	49.5	55.1	63.9	58.4	61.7	59.1	59.2	59.9	57.1
Jun 16, 2011	49.9	54.1	62.8	58.2	62.5	57.8	60.2	61.3	57.1
Jun 23, 2011	49.6	54.8	63.2	57.8	63.0	57.4	60.3	61.7	57.4
Jun 30, 2011	49.4	54.4	64.0	57.2	62.6	58.3	58.9	61.0	59.0
Jul 7, 2011	50.1	54.9	62.4	56.8	62.2	57.6	58.3	60.7	59.0
Jul 14, 2011	52.9	57.6	62.5	57.2	62.7	58.1	58.0	60.9	58.2
Jul 21, 2011	52.4	58.4	62.0	59.0	62.2	58.7	57.2	61.4	59.0
Jul 28, 2011	52.6	57.9	61.0	58.9	62.3	57.4	56.4	62.0	58.0
Aug 4, 2011	54.2	58.9	61.6	57.7	62.9	57.8	56.8	60.5	59.2
Aug 11, 2011	54.3	61.1	61.3	58.8	61.9	58.1	56.1	60.9	58.9
Aug 18, 2011	57.1	61.8	59.7	58.2	61.9	58.6	54.2	62.4	59.0
Aug 25, 2011	56.6	62.0	59.2	58.7	61.2	58.0	54.6	61.1	59.2
Sep 1, 2011	55.7	62.2	60.3	59.2	61.9	58.2	55.0	62.4	58.0



ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Eden Research Laboratory

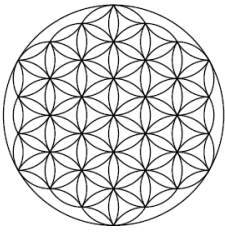
Report

2111 Menaul NE, Suite A
Albuquerque, NM 87107
T 505.508.3994

thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL
Total pages 13

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
Sep 8, 2011	55.3	61.3	59.5	58.8	62.5	58.6	54.5	62.7	58.8
Sep 15, 2011	53.9	61.4	59.0	58.8	60.8	58.3	55.8	61.8	58.3
Sep 22, 2011	53.9	60.4	60.3	60.6	59.9	59.4	55.0	62.3	55.7
Sep 29, 2011	51.8	60.1	59.9	60.8	57.9	60.0	55.8	62.0	56.6
Oct 6, 2011	51.6	59.6	59.6	61.0	58.4	59.3	54.6	63.9	54.4
Oct 13, 2011	50.5	59.0	59.7	60.8	55.7	60.7	56.5	63.7	53.5
Oct 20, 2011	49.5	59.3	57.6	60.9	54.2	61.3	56.5	63.3	53.6
Oct 27, 2011	47.6	59.6	58.2	62.3	54.4	62.0	55.7	64.1	53.3
Nov 3, 2011	46.7	60.2	59.4	62.7	53.9	61.6	55.1	63.9	52.8
Nov 10, 2011	46.6	60.1	59.3	61.4	54.8	61.1	55.7	64.5	53.8
Nov 17, 2011	48.5	58.3	58.9	61.7	53.9	60.7	55.2	64.4	52.5
Nov 24, 2011	47.5	58.8	58.8	61.6	54.9	61.4	56.6	63.4	53.1
Dec 1, 2011	50.1	59.8	58.2	61.7	56.2	61.8	57.2	62.3	53.9
Dec 8, 2011	50.6	58.6	57.7	64.0	57.7	62.6	56.4	61.9	54.0
Dec 15, 2011	50.9	58.7	55.7	64.4	58.0	63.1	56.0	61.2	55.0
Dec 22, 2011	52.6	57.8	54.9	63.5	59.0	61.8	57.9	60.2	56.0
Dec 29, 2011	53.8	58.7	55.7	64.1	59.1	63.4	57.5	59.8	56.2
Jan 5, 2012	53.2	57.9	55.1	64.5	60.6	63.8	56.7	60.7	56.3
Jan 12, 2012	53.7	58.5	55.0	64.3	60.6	64.1	57.3	59.2	56.7
Jan 19, 2012	53.9	59.1	55.6	64.6	60.3	64.2	56.7	60.8	56.2
Jan 26, 2012	53.0	58.0	54.7	63.9	61.1	63.4	57.7	60.9	58.0
Feb 2, 2012	52.9	59.0	56.0	63.1	60.1	63.4	57.9	60.5	56.0
Feb 9, 2012	52.8	57.0	55.4	62.7	59.3	63.8	58.7	62.2	56.2
Feb 16, 2012	51.5	58.0	55.1	62.5	57.9	62.6	58.9	61.2	56.0
Feb 23, 2012	50.5	56.4	55.5	61.4	57.6	62.2	60.9	62.5	55.5
Mar 1, 2012	50.7	56.8	55.9	59.6	57.9	63.8	60.0	64.4	54.3
Mar 8, 2012	49.4	55.2	56.1	59.2	55.7	63.5	60.6	64.7	54.5
Mar 15, 2012	49.3	54.9	56.4	57.5	55.4	62.6	62.0	65.2	53.3
Mar 22, 2012	48.4	54.1	57.1	58.4	56.2	62.5	62.8	64.1	54.2
Mar 29, 2012	47.9	55.1	55.9	57.8	55.0	62.0	63.0	65.6	54.7
Apr 5, 2012	47.7	55.0	56.4	59.2	55.2	63.0	62.1	64.4	54.4
Apr 12, 2012	49.5	56.3	57.5	59.6	56.9	63.2	61.8	63.9	54.8
Apr 19, 2012	50.2	55.2	57.3	59.5	57.2	62.9	62.3	62.3	53.9
Apr 26, 2012	49.9	56.9	57.6	60.3	57.9	63.2	61.9	62.5	54.8
May 3, 2012	50.5	56.6	58.5	62.1	57.5	63.6	62.1	61.8	54.3
May 10, 2012	49.7	57.8	57.7	62.7	59.0	62.9	62.7	60.1	54.9
May 17, 2012	51.8	58.2	58.6	63.9	59.1	64.3	61.1	61.1	55.9
May 24, 2012	51.7	59.0	60.5	64.6	59.4	63.9	62.7	59.5	54.5
May 31, 2012	50.9	58.4	60.3	64.2	60.0	65.0	61.1	59.5	55.3
Jun 7, 2012	51.4	58.8	59.6	65.8	60.4	64.0	61.5	58.4	55.5
Jun 14, 2012	50.7	59.3	59.2	65.4	59.3	63.5	61.1	59.5	55.6
Jun 21, 2012	51.5	58.7	58.2	65.1	60.5	63.0	61.5	59.9	56.0
Jun 28, 2012	49.5	57.8	59.2	65.1	59.4	63.3	61.9	60.2	57.4



Eden Research Laboratory

Report

2111 Menaul NE, Suite A

Albuquerque, NM 87107

T 505.508.3994

thomas.poth@edenresearchlab.com

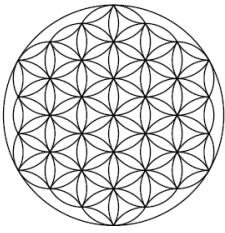
Reproduce report ONLY in FULL

Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

METHANE SAMPLE SET

Week Ending	209A	209B	209C
Mar 17, 2011	22.7	20.6	22.7
Mar 24, 2011	27.1	26.5	24.4
Mar 31, 2011	31.5	30.7	29.6
Apr 7, 2011	36.7	34.1	34.7
Apr 14, 2011	37.0	34.4	35.8
Apr 21, 2011	37.1	33.9	36.3
Apr 28, 2011	38.8	35.9	38.5
May 5, 2011	38.4	35.3	39.9
May 12, 2011	39.0	35.6	42.3
May 19, 2011	39.7	35.8	42.6
May 26, 2011	39.0	35.5	44.6
Jun 2, 2011	39.0	36.1	42.8
Jun 9, 2011	40.4	36.8	44.1
Jun 16, 2011	40.9	38.8	46.3
Jun 23, 2011	41.7	41.7	47.8
Jun 30, 2011	43.9	43.6	51.3
Jul 7, 2011	43.4	43.0	51.2
Jul 14, 2011	44.6	43.0	51.9
Jul 21, 2011	43.7	43.0	51.9
Jul 28, 2011	43.2	43.2	51.5
Aug 4, 2011	42.5	41.9	49.0
Aug 11, 2011	40.1	38.3	45.6
Aug 18, 2011	39.7	35.3	42.6
Aug 25, 2011	40.6	37.6	47.0
Sep 1, 2011	43.2	40.2	48.1
Sep 8, 2011	45.3	44.0	50.5
Sep 15, 2011	46.1	43.3	50.1
Sep 22, 2011	45.0	43.0	49.9
Sep 29, 2011	46.2	43.5	51.0
Oct 6, 2011	44.8	42.7	50.3
Oct 13, 2011	43.0	40.7	49.3
Oct 20, 2011	40.8	37.4	45.4
Oct 27, 2011	39.8	35.8	44.3
Nov 3, 2011	41.9	39.3	45.6
Nov 10, 2011	44.3	42.5	48.0
Nov 17, 2011	45.9	45.5	49.9
Nov 24, 2011	45.1	44.6	49.4
Dec 1, 2011	46.1	43.7	49.2
Dec 8, 2011	45.4	45.6	49.1
Dec 15, 2011	45.1	44.4	48.9
Dec 22, 2011	42.8	42.0	47.2
Dec 29, 2011	41.2	39.1	46.5



Eden Research Laboratory

Report

2111 Menaul NE, Suite A
 Albuquerque, NM 87107
 T 505.508.3994

thomas.poth@edenresearchlab.com

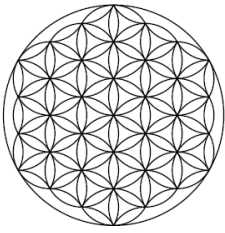
Reproduce report ONLY in FULL
 Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Week Ending	209A	209B	209C
Jan 5, 2012	40.3	35.6	42.6
Jan 12, 2012	41.2	39.0	46.4
Jan 19, 2012	44.2	43.4	49.0
Jan 26, 2012	46.0	45.8	52.3
Feb 2, 2012	45.0	45.5	50.8
Feb 9, 2012	46.0	46.6	50.6
Feb 16, 2012	45.6	45.9	52.1
Feb 23, 2012	44.6	46.3	51.5
Mar 1, 2012	42.9	43.1	48.1
Mar 8, 2012	42.2	39.8	46.0
Mar 15, 2012	38.5	37.0	42.6
Mar 22, 2012	42.2	38.6	44.9
Mar 29, 2012	42.1	40.3	47.0
Apr 5, 2012	45.7	43.9	49.3
Apr 12, 2012	45.1	42.5	48.8
Apr 19, 2012	45.0	42.5	48.3
Apr 26, 2012	44.5	42.5	47.7
May 3, 2012	45.3	42.0	48.1
May 10, 2012	41.9	41.6	47.2
May 17, 2012	40.8	38.8	45.8
May 24, 2012	39.8	36.4	44.4
May 31, 2012	40.5	37.7	46.3
Jun 7, 2012	44.2	41.4	48.7
Jun 14, 2012	45.0	43.4	50.6
Jun 21, 2012	45.9	44.2	51.4
Jun 28, 2012	44.3	43.3	50.8

CARBON DIOXIDE CONTROL SET

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
Mar 17, 2011	58.6	56.0	52.1	44.3	43.4	43.1	34.4	33.4	34.8
Mar 24, 2011	54.0	54.0	49.4	44.1	41.4	44.1	33.7	34.7	34.1
Mar 31, 2011	48.7	50.4	44.2	42.5	41.4	42.3	35.6	33.8	34.2
Apr 7, 2011	42.8	46.4	41.3	42.9	38.8	39.0	34.7	34.2	34.1
Apr 14, 2011	40.1	45.2	40.9	41.9	37.3	37.1	33.9	33.3	32.2
Apr 21, 2011	39.8	43.0	39.1	39.7	36.8	35.8	34.5	34.7	32.8
Apr 28, 2011	38.0	40.6	37.8	37.2	35.0	34.6	35.3	33.4	32.0
May 5, 2011	36.3	39.2	37.8	37.3	34.3	33.6	35.5	34.7	33.3
May 12, 2011	33.8	36.3	36.2	34.8	34.4	31.3	35.6	34.4	32.9
May 19, 2011	35.7	35.9	37.5	36.3	33.2	30.2	34.2	33.1	32.0
May 26, 2011	33.7	36.0	37.6	35.9	32.8	31.8	35.4	34.2	32.5
Jun 2, 2011	34.8	37.0	36.0	36.2	33.2	31.4	35.6	33.5	33.1
Jun 9, 2011	34.9	35.4	36.0	34.9	33.4	31.0	35.4	34.1	34.4
Jun 16, 2011	35.2	35.4	36.6	34.4	34.6	33.1	34.2	32.7	35.7
Jun 23, 2011	34.1	35.2	37.1	35.6	33.9	32.4	34.6	32.5	35.8



ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Eden Research Laboratory

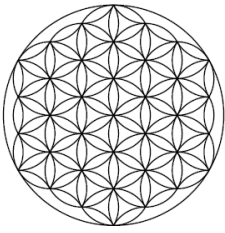
Report

2111 Menaul NE, Suite A
 Albuquerque, NM 87107
 T 505.508.3994

thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL
 Total pages 13

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
Jun 30, 2011	35.3	35.2	36.5	34.2	34.8	33.0	34.7	31.3	37.2
Jul 7, 2011	35.9	34.3	35.3	33.3	34.5	33.9	35.7	31.8	37.3
Jul 14, 2011	34.6	34.3	35.6	34.7	34.1	36.3	39.4	36.5	40.0
Jul 21, 2011	35.0	35.0	36.7	34.1	35.6	36.2	43.7	41.0	44.4
Jul 28, 2011	34.5	33.5	36.8	32.9	35.6	36.6	47.7	45.8	45.9
Aug 4, 2011	35.8	33.5	35.7	33.2	35.9	35.7	47.2	46.1	46.8
Aug 11, 2011	35.8	34.1	36.5	34.7	35.3	35.2	49.2	47.5	47.6
Aug 18, 2011	34.2	33.9	35.9	33.2	34.7	35.4	49.5	48.8	48.0
Aug 25, 2011	34.3	33.0	34.8	33.7	36.2	34.9	50.8	51.0	48.9
Sep 1, 2011	33.9	33.6	35.4	34.4	36.2	33.7	47.8	48.8	47.0
Sep 8, 2011	34.0	33.5	35.8	35.0	36.8	33.3	34.4	33.4	34.8
Sep 15, 2011	33.7	32.4	34.9	35.8	38.7	33.9	33.7	34.7	34.1
Sep 22, 2011	33.7	31.5	35.3	36.1	38.5	32.7	35.6	33.8	34.2
Sep 29, 2011	32.7	32.2	35.7	35.8	38.6	32.6	34.7	34.2	34.1
Oct 6, 2011	34.0	32.4	35.7	36.1	38.6	31.6	33.9	33.3	32.2
Oct 13, 2011	34.5	32.4	35.7	35.8	39.8	33.3	34.5	34.7	32.8
Oct 20, 2011	33.8	32.0	35.6	35.9	39.2	32.8	35.3	33.4	32.0
Oct 27, 2011	33.0	32.4	33.8	37.4	39.1	32.9	35.5	34.7	33.3
Nov 3, 2011	34.1	32.2	34.1	36.0	39.5	33.9	35.6	34.4	32.9
Nov 10, 2011	32.9	31.6	34.9	35.0	39.4	33.8	34.2	33.1	32.0
Nov 17, 2011	33.6	32.5	34.8	36.0	37.4	34.2	35.4	34.2	32.5
Nov 24, 2011	32.9	32.7	35.2	35.9	38.0	34.0	35.6	33.5	33.1
Dec 1, 2011	34.7	34.5	33.8	35.4	37.3	36.0	35.4	34.1	34.4
Dec 8, 2011	33.6	34.5	34.4	34.3	36.9	36.0	34.2	32.7	35.7
Dec 15, 2011	39.7	36.6	38.4	35.2	37.6	36.5	34.6	32.5	35.8
Dec 22, 2011	45.7	41.5	43.3	37.8	40.4	38.1	34.7	31.3	37.2
Dec 29, 2011	51.7	45.9	47.4	38.1	41.4	39.2	35.7	31.8	37.3
Jan 5, 2012	53.3	47.8	48.2	39.7	40.8	41.2	39.4	36.5	40.0
Jan 12, 2012	54.4	49.9	48.7	42.1	42.1	42.9	43.7	41.0	44.4
Jan 19, 2012	55.2	52.4	49.9	41.6	41.4	43.8	47.7	45.8	45.9
Jan 26, 2012	57.9	55.4	51.8	44.8	43.7	44.6	47.2	46.1	46.8
Feb 2, 2012	52.9	53.5	48.0	44.2	43.1	43.7	49.2	47.5	47.6
Feb 9, 2012	48.8	51.1	44.1	43.4	41.0	41.5	44.2	43.7	42.5
Feb 16, 2012	42.1	47.3	41.2	41.7	39.1	39.7	41.5	40.5	39.1
Feb 23, 2012	40.3	45.8	40.6	41.9	38.6	37.5	40.3	40.2	38.6
Mar 1, 2012	40.3	43.0	38.5	38.5	36.3	36.1	38.7	37.6	37.5
Mar 8, 2012	38.8	40.4	38.7	37.8	35.1	35.1	39.3	36.9	37.1
Mar 15, 2012	36.2	38.4	38.4	37.6	35.3	32.0	37.8	36.4	37.4
Mar 22, 2012	33.9	36.7	37.0	35.6	33.1	30.5	36.5	36.0	37.4
Mar 29, 2012	35.7	36.9	36.5	34.9	34.5	31.1	37.7	37.1	36.0
Apr 5, 2012	35.7	35.1	36.0	34.9	34.1	30.3	36.8	36.6	35.6
Apr 12, 2012	35.1	36.4	36.1	35.4	33.1	31.0	38.0	37.2	35.5
Apr 19, 2012	35.1	35.7	36.6	36.1	34.8	32.6	36.1	36.2	35.5
Apr 26, 2012	35.4	35.3	35.9	35.8	34.9	33.4	36.7	36.0	35.2



Eden Research Laboratory

Report

2111 Menaul NE, Suite A
 Albuquerque, NM 87107
 T 505.508.3994

thomas.poth@edenresearchlab.com

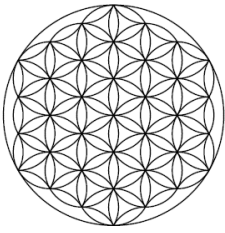
Reproduce report ONLY in FULL
 Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Week Ending	IA	IB	IC	NA	NB	NC	PA	PB	PC
May 3, 2012	35.9	36.3	35.7	33.7	34.6	32.8	36.7	35.6	34.8
May 10, 2012	34.9	34.6	37.4	33.8	34.3	33.5	35.8	35.9	35.4
May 17, 2012	35.1	35.8	36.7	34.1	35.3	33.8	34.9	34.3	34.0
May 24, 2012	34.6	35.1	36.5	34.9	35.5	35.2	36.0	35.6	34.0
May 31, 2012	34.8	33.9	36.5	33.0	34.6	35.8	33.8	34.4	34.6
Jun 7, 2012	35.9	33.9	37.1	33.9	34.7	36.1	35.7	33.5	34.9
Jun 14, 2012	34.9	34.3	36.7	33.3	35.8	35.5	34.7	33.6	34.8
Jun 21, 2012	34.8	35.4	37.2	34.2	34.9	36.6	34.5	34.6	34.8
Jun 28, 2012	36.0	35.0	35.0	33.1	34.9	35.9	35.4	33.4	34.4

CARBON DIOXIDE SAMPLE SET

Week Ending	209A	209B	209C
Mar 17, 2011	41.9	39.6	42.1
Mar 24, 2011	39.1	38.5	39.2
Mar 31, 2011	35.6	36.3	37.3
Apr 7, 2011	33.2	33.4	34.8
Apr 14, 2011	34.4	33.9	35.4
Apr 21, 2011	34.6	33.2	34.9
Apr 28, 2011	33.8	32.9	35.8
May 5, 2011	34.3	34.0	34.7
May 12, 2011	33.0	34.1	35.5
May 19, 2011	33.6	32.9	36.0
May 26, 2011	33.4	32.5	35.4
Jun 2, 2011	34.0	33.0	36.2
Jun 9, 2011	34.4	33.2	34.9
Jun 16, 2011	35.0	32.4	36.5
Jun 23, 2011	34.8	33.2	36.4
Jun 30, 2011	35.6	33.4	34.6
Jul 7, 2011	35.2	33.1	35.4
Jul 14, 2011	33.4	34.1	35.2
Jul 21, 2011	33.6	33.3	35.2
Jul 28, 2011	34.1	33.0	34.6
Aug 4, 2011	34.4	32.5	35.4
Aug 11, 2011	33.4	32.1	34.0
Aug 18, 2011	33.8	32.6	34.9
Aug 25, 2011	32.9	32.4	35.3
Sep 1, 2011	34.3	32.7	34.7
Sep 8, 2011	33.7	32.1	35.5
Sep 15, 2011	34.4	33.1	35.8
Sep 22, 2011	34.0	33.8	34.8
Sep 29, 2011	34.8	33.9	35.2
Oct 6, 2011	34.9	32.7	35.6
Oct 13, 2011	32.9	34.4	34.8
Oct 20, 2011	34.4	34.5	33.8



Eden Research Laboratory

Report

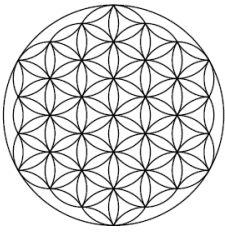
2111 Menaul NE, Suite A
Albuquerque, NM 87107
T 505.508.3994

thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL
Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Week Ending	209A	209B	209C
Oct 27, 2011	33.5	34.3	35.5
Nov 3, 2011	34.3	34.1	35.0
Nov 10, 2011	32.8	33.7	34.1
Nov 17, 2011	34.5	34.4	34.4
Nov 24, 2011	34.3	33.4	35.8
Dec 1, 2011	33.9	33.5	35.6
Dec 8, 2011	34.5	34.4	35.8
Dec 15, 2011	36.7	35.3	38.2
Dec 22, 2011	39.2	37.8	40.7
Dec 29, 2011	41.9	39.7	42.2
Jan 5, 2012	40.0	39.6	41.9
Jan 12, 2012	41.2	41.5	42.3
Jan 19, 2012	40.0	41.6	41.7
Jan 26, 2012	41.0	39.8	41.3
Feb 2, 2012	38.9	38.5	39.9
Feb 9, 2012	35.5	35.2	37.4
Feb 16, 2012	33.8	33.0	35.2
Feb 23, 2012	34.6	34.0	35.5
Mar 1, 2012	33.6	34.5	35.2
Mar 8, 2012	34.8	32.9	35.8
Mar 15, 2012	34.5	32.8	36.3
Mar 22, 2012	34.6	34.8	34.8
Mar 29, 2012	34.7	33.8	36.2
Apr 5, 2012	33.7	32.3	35.1
Apr 12, 2012	34.0	32.9	35.8
Apr 19, 2012	35.5	32.6	36.1
Apr 26, 2012	34.0	33.3	34.8
May 3, 2012	35.6	32.3	34.8
May 10, 2012	34.8	33.5	36.5
May 17, 2012	35.3	32.5	36.6
May 24, 2012	34.6	34.2	35.9
May 31, 2012	34.8	33.4	36.0
Jun 7, 2012	34.2	33.2	35.6
Jun 14, 2012	34.5	34.2	34.6
Jun 21, 2012	34.3	33.7	34.6
Jun 28, 2012	34.1	32.8	34.2



DATA ANALYSIS

	Inculum	Negative	Positive	209A - 126T - 1% EL50
Cumulative Gas Volume (mL)	4272.5	5204.2	16678.4	15148.3
Percent CH ₄ (%)	46.6	47.7	44.1	41.8
Volume CH ₄ (mL)	1992.6	2484.0	7347.6	6329.5
Mass CH ₄ (g)	1.42	1.77	5.25	4.52
Percent CO ₂ (%)	42.7	38.3	50.0	35.8
Volume CO ₂ (mL)	1823.0	1991.0	8339.5	5420.7
Mass CO ₂ (g)	3.58	3.91	16.38	10.65
Sample Mass (g)	1,000	10	10	10.0
Theoretical Sample Mass (g)	0.0	8.6	8.6	9.2
Biodegraded Mass (g)	2.04	2.40	8.40	6.29
Percent Biodegraded (%)		4.1	74.2	46.1

Eden Research Laboratory

Report

2111 Menaul NE, Suite A
 Albuquerque, NM 87107
 T 505.508.3994

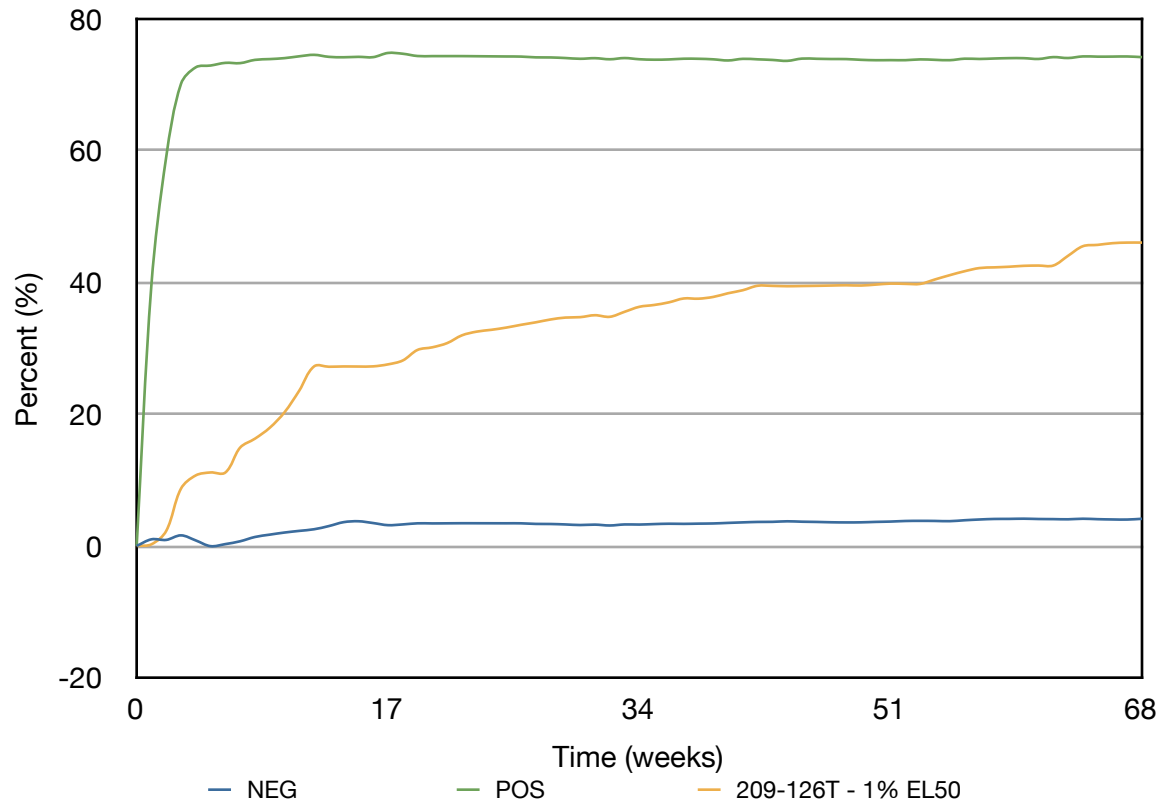
thomas.poth@edenresearchlab.com

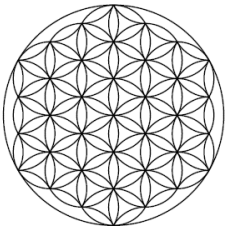
Reproduce report ONLY in FULL
 Total pages 13

CONCLUSION

Upon consideration of gas production analysis, it becomes obvious that biodegradation has occurred on the sample. It appears that a linear curves have started to develop. It seems that the treated sample is continuing to biodegrade.

Biodegradation





Eden Research Laboratory

Report

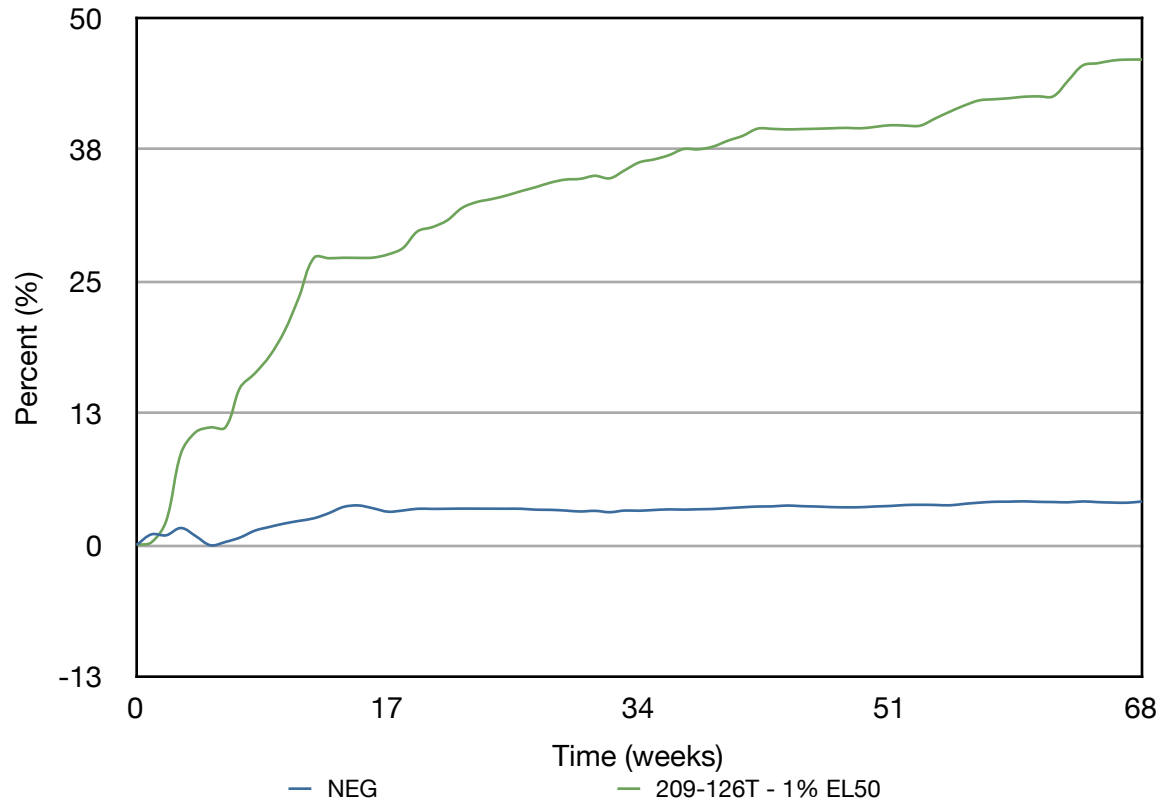
2111 Menaul NE, Suite A
Albuquerque, NM 87107
T 505.508.3994

thomas.poth@edenresearchlab.com

Reproduce report ONLY in FULL
Total pages 13

ASTM D5511-11 - Anaerobic High Solids Biodegradability Test - 072412A

Biodegradation



Prediction of time to total biodegradation is still difficult. It is unknown if the slope of biodegradation will remain a relatively linear model for the majority of the degradation cycle. Over a 68 week period the treated samples indicate about 46% biodegradation. The treated sample appears to have surmounted the let down rate of the bio-additive. The rate of biodegradation of the sample is good.

The positive control has achieved the required 70%+ biodegradation. This sample will go through many biological cycles as it biodegrades. It seems the syntrophic effect of the microbes has been fulfilled for the treated sample. It is not uncommon for this to take up to 90+ days before the microbial colonies reach a quorum.

These results are good. In this test, temperature and moisture are optimized and these conditions may not be present in all landfills. In such cases biodegradation would not be as accelerated. To determine an accurate time to total degradation additional testing would be required.

Thomas Poth
Laboratory Director
Eden Research Laboratory