

ASTM D5338 - Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions - 1101170129B

To: BiologiQ, Inc.

Report Number: 1101170129B

Date: November 1, 2017

From: Thomas Poth - Eden Research Laboratory

Eden Research Laboratory

Report

Regarding: ASTM D5338 - 88 weeks Study of BiologiQ Samples - ERL #1345 & 1346

RESULTS

Thermophilic testing for aerobic biodegradation, over 88 week period, of plastic samples resulted in MBR 15121706 Sample (ERL #1345) — 88.2% and MBR 16011801 Sample (ERL #1346) — 93.3% biodegradation.

METHOD

The degree and rate of aerobic 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. When 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 aerobic disposal situation. ASTM method D5338 determines the degree of aerobic biodegradation of plastic materials in high-solids aerobic conditions. The test sample is exposed to inoculum cultivated from a municipal compost facility. Aerobic decomposition, in this case, employs a high solids environment. The aerobic composting takes place in an environment where temperature, aeration and humidity are closely monitored and controlled.

This test method is a ratio of percent converted sample carbon to background carbon found in municipal and industrial high-solids aerobic compost treatment facilities. This method is applicable to all plastic materials that are not toxic to microorganisms present in aerobic composting piles which generally do NOT operate strictly on household waste.

ASTM Method D5338 determines the rate and degree of aerobic biodegradation by measuring the volume of carbon dioxide (CO₂) as a function of time (weeks) of exposure to aerobic compost. This method is considered an accelerated representation with respect to municipal and industrial aerobic composting environments. A city composting facility is a prime example of this environment.

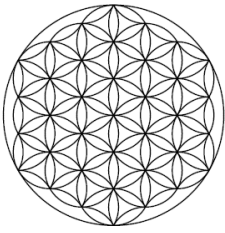
Procedure modifications include adjustment of operational temperature to 58±2°C as per section 11.3.1 because the incubation systems that we frequently employ operate at this temperature. The Ba(OH)₂ carbon dioxide scrubbing system has been replaced by gas columns and a gas chromatograph as per section 6.4 because the number of samples being tested would require a large volume of caustic base and might be a safety issue.

INOCULUM

1. Inoculum Characteristics and Preparation
 1. Sludge from Organic Compost – Bernalillo Municipal Compost Facility & Albuquerque Municipal Wastewater Facility
 1. 15 day hold period observed @ 30 ± 2°C
 2. Compost is turned daily
 3. Solid Content - 47.7%
 4. pH - 7.7 - 8.0
 5. Volatile Fatty Acids - 28.5%
 6. TKN - 2.54%

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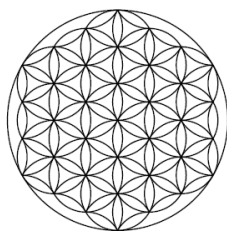
SAMPLES THEORETICAL CARBON CONTENT (PERCENT OF SAMPLE)

Sample	Percent Resin	Percent Carbon	Percent Additive	Percent Carbon	Total
1345	72.5	85.7	27.5	46.7	75.0
1346	56.0	85.7	44.0	46.8	68.6

WEEKLY GAS VOLUMES @ STP CONTROL SET (ml)

Week Beginning	IA	IB	IC	NA	NB	NC	PA	PB	PC
25-Feb-16	1078.2	1203.1	971.7	555.3	772.8	1022.6	4053.5	3956.3	3674.1
03-Mar-16	328.5	397.9	314.7	333.2	203.6	273.0	2429.3	2114.7	3216.0
10-Mar-16	166.6	231.4	148.1	226.7	27.8	162.0	2137.8	1041.1	2702.3
17-Mar-16	69.4	342.4	97.2	111.1	83.3	69.4	791.3	106.4	157.3
24-Mar-16	-152.7	328.5	37.0	92.5	485.9	46.3	425.7	111.1	78.7
31-Mar-16	-64.8	175.8	50.9	18.5	374.8	-9.3	226.7	46.3	46.3
07-Apr-16	-9.3	37.0	60.2	120.3	-4.6	101.8	212.9	78.7	60.2
14-Apr-16	-4.6	37.0	69.4	485.9	-9.3	485.9	485.9	64.8	83.3
21-Apr-16	55.5	32.4	55.5	374.8	37.0	374.8	374.8	134.2	120.3
28-Apr-16	-32.4	55.5	41.6	240.6	-23.1	240.6	240.6	92.5	13.9
05-May-16	-0.0	32.4	37.0	166.6	-9.3	166.6	166.6	78.7	41.6
12-May-16	-9.3	41.6	50.9	64.8	13.9	83.3	152.7	69.4	23.1
19-May-16	27.8	55.5	41.6	37.0	13.9	9.3	101.8	55.5	9.3
26-May-16	-13.9	46.3	32.4	-4.6	23.1	-18.5	55.5	50.9	-9.3
02-Jun-16	46.3	55.5	46.3	46.3	13.9	18.5	106.4	69.4	55.5
09-Jun-16	13.9	46.3	46.3	9.3	-4.6	-0.0	18.5	-18.5	0.0
16-Jun-16	865.3	60.2	60.2	32.4	4.6	-4.6	157.3	87.9	18.5
23-Jun-16	573.8	60.2	69.4	23.1	-4.6	-4.6	18.5	18.5	-9.3
30-Jun-16	18.5	37.0	18.5	18.5	-9.3	-4.6	4.6	27.8	0.0
07-Jul-16	4.6	60.2	27.8	13.9	4.6	4.6	27.8	32.4	13.9
14-Jul-16	-4.6	37.0	55.5	13.9	-9.3	-13.9	32.4	9.3	-9.3
21-Jul-16	64.8	27.8	46.3	37.0	18.5	9.3	50.9	13.9	27.8
28-Jul-16	4.6	78.7	60.2	9.3	4.6	-9.3	-9.3	13.9	-4.6
04-Aug-16	46.3	60.2	32.4	41.6	277.6	347.0	231.4	263.8	222.1
11-Aug-16	46.3	46.3	55.5	0.0	-23.1	-69.4	-46.3	-32.4	13.9
18-Aug-16	92.5	64.8	46.3	27.8	-41.6	-27.8	-4.6	55.5	27.8
25-Aug-16	0.0	41.6	37.0	9.3	18.5	4.6	-18.5	-9.3	-4.6
01-Sep-16	23.1	41.6	46.3	23.1	13.9	9.3	4.6	18.5	18.5
08-Sep-16	0.0	-32.4	60.2	9.3	-18.5	-32.4	-23.1	0.0	-13.9
15-Sep-16	50.9	0.0	64.8	13.9	9.3	27.8	27.8	37.0	9.3
22-Sep-16	13.9	0.0	282.3	9.3	-23.1	-0.0	-0.0	994.9	4.6
29-Sep-16	27.8	23.1	23.1	46.3	-4.6	41.6	9.3	55.5	-9.3
06-Oct-16	4.6	0.0	0.0	0.0	46.3	0.0	-18.5	273.0	-4.6
13-Oct-16	333.2	0.0	4.6	46.3	-46.3	46.3	23.1	27.8	0.0
20-Oct-16	-291.5	0.0	-9.3	32.4	37.0	27.8	41.6	50.9	69.4
27-Oct-16	27.8	69.4	-9.3	9.3	13.9	23.1	18.5	18.5	18.5

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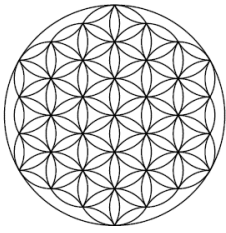
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Week Beginning	IA	IB	IC	NA	NB	NC	PA	PB	PC
03-Nov-16	-9.3	0.0	-32.4	18.5	27.8	23.1	18.5	32.4	32.4
10-Nov-16	0.0	0.0	23.1	32.4	18.5	9.3	23.1	23.1	23.1
17-Nov-16	-13.9	23.1	-23.1	13.9	23.1	23.1	18.5	9.3	27.8
24-Nov-16	0.0	0.0	32.4	27.8	18.5	13.9	23.1	13.9	27.8
01-Dec-16	18.5	46.3	18.5	23.1	18.5	23.1	23.1	23.1	23.1
08-Dec-16	-4.6	9.3	-4.6	18.5	23.1	18.5	13.9	23.1	18.5
15-Dec-16	9.3	18.5	-23.1	13.9	23.1	13.9	18.5	23.1	23.1
22-Dec-16	23.1	55.5	-4.6	27.8	27.8	27.8	9.3	13.9	23.1
04-Jan-17	0.0	0.0	-4.6	0.0	4.6	4.6	0.0	4.6	4.6
11-Jan-17	0.0	0.0	0.0	0.0	0.0	0.0	4.6	4.6	0.0
18-Jan-17	18.5	13.9	9.3	4.6	4.6	4.6	4.6	0.0	0.0
25-Jan-17	9.3	9.3	4.6	0.0	4.6	4.6	4.6	4.6	4.6
01-Feb-17	9.3	4.6	4.6	4.6	4.6	4.6	0.0	0.0	4.6
08-Feb-17	0.0	0.0	0.0	4.6	4.6	4.6	0.0	0.0	4.6
15-Feb-17	55.5	50.9	0.0	0.0	4.6	4.6	4.6	0.0	4.6
22-Feb-17	0.0	0.0	0.0	4.6	4.6	4.6	0.0	4.6	4.6
01-Mar-17	13.9	27.8	18.5	4.6	0.0	4.6	4.6	0.0	0.0
08-Mar-17	4.6	0.0	4.6	4.6	0.0	0.0	0.0	4.6	4.6
15-Mar-17	4.6	0.0	4.6	0.0	4.6	4.6	4.6	4.6	4.6
22-Mar-17	0.0	0.0	0.0	4.6	0.0	0.0	4.6	4.6	4.6
29-Mar-17	0.0	0.0	4.6	0.0	0.0	0.0	0.0	4.6	4.6
05-Apr-17	4.6	4.6	4.6	0.0	4.6	4.6	0.0	0.0	4.6
12-Apr-17	0.0	4.6	0.0	4.6	4.6	4.6	4.6	4.6	4.6
19-Apr-17	0.0	4.6	4.6	0.0	0.0	0.0	4.6	4.6	4.6
26-Apr-17	4.6	4.6	4.6	4.6	0.0	0.0	4.6	0.0	0.0
03-May-17	4.6	0.0	4.6	4.6	4.6	0.0	4.6	4.6	4.6
10-May-17	4.6	4.6	4.6	4.6	4.6	0.0	0.0	4.6	0.0
17-May-17	0.0	4.6	0.0	4.6	4.6	4.6	4.6	4.6	0.0
24-May-17	4.6	4.6	0.0	0.0	4.6	4.6	4.6	4.6	0.0
31-May-17	0.0	4.6	4.6	4.6	4.6	4.6	0.0	0.0	4.6
07-Jun-17	0.0	4.6	4.6	0.0	4.6	4.6	4.6	4.6	4.6
14-Jun-17	0.0	0.0	4.6	4.6	0.0	0.0	0.0	0.0	0.0
21-Jun-17	0.0	0.0	4.6	4.6	4.6	0.0	4.6	0.0	0.0
28-Jun-17	4.6	0.0	0.0	4.6	4.6	0.0	0.0	4.6	0.0
05-Jul-17	0.0	4.6	0.0	4.6	4.6	0.0	4.6	0.0	0.0
12-Jul-17	0.0	4.6	0.0	4.6	4.6	4.6	0.0	0.0	0.0
19-Jul-17	4.6	0.0	4.6	0.0	0.0	4.6	0.0	0.0	4.6
26-Jul-17	4.6	4.6	4.6	4.6	4.6	4.6	4.6	0.0	0.0
02-Aug-17	4.6	0.0	4.6	4.6	4.6	4.6	4.6	4.6	4.6
09-Aug-17	0.0	4.6	4.6	4.6	0.0	4.6	4.6	4.6	4.6
16-Aug-17	4.6	4.6	0.0	4.6	0.0	4.6	0.0	4.6	4.6
23-Aug-17	4.6	0.0	0.0	4.6	4.6	4.6	4.6	4.6	4.6
30-Aug-17	4.6	0.0	0.0	4.6	4.6	0.0	0.0	4.6	4.6
06-Sep-17	0.0	4.6	0.0	4.6	4.6	0.0	0.0	0.0	4.6



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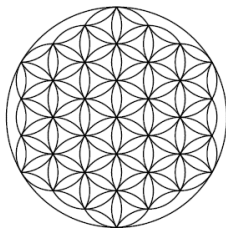
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Week Beginning	IA	IB	IC	NA	NB	NC	PA	PB	PC
13-Sep-17	0.0	4.6	4.6	4.6	4.6	4.6	0.0	0.0	4.6
20-Sep-17	4.6	0.0	4.6	4.6	4.6	4.6	0.0	0.0	4.6
27-Sep-17	0.0	0.0	4.6	4.6	4.6	4.6	4.6	0.0	4.6
04-Oct-17	0.0	0.0	0.0	0.0	4.6	4.6	4.6	0.0	4.6
11-Oct-17	4.6	0.0	4.6	0.0	4.6	4.6	4.6	0.0	4.6
18-Oct-17	0.0	4.6	4.6	0.0	0.0	0.0	4.6	0.0	0.0
25-Oct-17	0.0	4.6	4.6	4.6	0.0	4.6	4.6	0.0	4.6

SAMPLE SET (ml)

Week Beginning	1345A	1345B	1345C	1346A	1346B	1346C
25-Feb-16	1958.7	1211.4	1219.3	3728.7	3052.2	841.7
03-Mar-16	1628.3	1337.3	983.3	298.9	660.8	833.8
10-Mar-16	3390.4	550.6	448.4	267.5	1250.8	731.6
17-Mar-16	1864.3	15.7	267.5	503.5	794.5	495.6
24-Mar-16	479.9	-86.5	-47.2	354.0	196.7	440.5
31-Mar-16	409.1	275.3	236.0	346.1	298.9	888.9
07-Apr-16	519.2	291.1	597.8	464.1	118.0	833.8
14-Apr-16	448.4	928.2	590.0	354.0	243.9	676.5
21-Apr-16	354.0	841.7	715.8	731.6	275.3	173.1
28-Apr-16	133.7	401.2	574.2	1172.1	377.6	-23.6
05-May-16	7.9	251.7	409.1	912.5	1250.8	236.0
12-May-16	125.9	165.2	715.8	503.5	912.5	236.0
19-May-16	110.1	165.2	1400.2	786.6	613.6	763.0
26-May-16	519.2	212.4	865.3	1172.1	597.8	346.1
02-Jun-16	1950.9	1109.2	472.0	912.5	1250.8	204.5
09-Jun-16	865.3	715.8	0.0	503.5	912.5	180.9
16-Jun-16	102.3	78.7	78.7	574.2	613.6	794.5
23-Jun-16	896.8	39.3	1620.5	1943.0	597.8	715.8
30-Jun-16	527.1	55.1	920.4	228.1	1250.8	55.1
07-Jul-16	212.4	70.8	527.1	133.7	912.5	78.7
14-Jul-16	188.8	94.4	1455.3	1014.8	621.4	78.7
21-Jul-16	692.2	102.3	1014.8	920.4	590.0	78.7
28-Jul-16	912.5	731.6	566.4	928.2	1250.8	55.1
04-Aug-16	1471.0	1022.6	1282.2	369.7	912.5	70.8
11-Aug-16	865.3	944.0	1140.6	464.1	621.4	94.4
18-Aug-16	472.0	432.7	637.2	228.1	527.1	86.5
25-Aug-16	369.7	503.5	1046.2	86.5	1038.4	62.9
01-Sep-16	472.0	2454.3	920.4	165.2	306.8	86.5
08-Sep-16	550.6	157.3	928.2	228.1	-39.3	86.5
15-Sep-16	464.1	590.0	369.7	212.4	39.3	31.5
22-Sep-16	283.2	550.6	1156.4	180.9	-70.8	86.5
29-Sep-16	314.7	511.3	920.4	212.4	102.3	55.1
06-Oct-16	118.0	849.6	519.2	102.3	-15.7	86.5
13-Oct-16	472.0	519.2	236.0	1014.8	31.5	86.5

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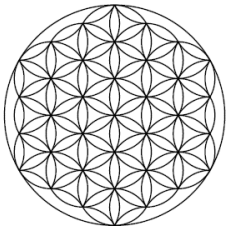
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Week Beginning	1345A	1345B	1345C	1346A	1346B	1346C
20-Oct-16	849.6	912.5	188.8	542.8	967.6	102.3
27-Oct-16	385.5	708.0	125.9	448.4	566.4	86.5
03-Nov-16	78.7	1534.0	55.1	86.5	448.4	62.9
10-Nov-16	94.4	306.8	118.0	149.5	1014.8	86.5
17-Nov-16	94.4	39.3	-62.9	39.3	542.8	78.7
24-Nov-16	94.4	204.5	102.3	125.9	668.6	47.2
01-Dec-16	78.7	2879.1	849.6	23.6	0.0	78.7
08-Dec-16	70.8	629.3	401.2	70.8	31.5	102.3
15-Dec-16	70.8	283.2	94.4	86.5	967.6	62.9
22-Dec-16	78.7	0.0	86.5	23.6	566.4	267.5
04-Jan-17	39.3	0.0	23.6	149.5	62.9	133.7
11-Jan-17	236.0	0.0	15.7	70.8	47.2	70.8
18-Jan-17	157.3	0.0	15.7	70.8	86.5	62.9
25-Jan-17	204.5	0.0	15.7	62.9	78.7	196.7
01-Feb-17	102.3	0.0	23.6	7.9	39.3	133.7
08-Feb-17	102.3	0.0	23.6	47.2	31.5	23.6
15-Feb-17	125.9	0.0	7.9	62.9	78.7	78.7
22-Feb-17	86.5	0.0	23.6	31.5	196.7	102.3
01-Mar-17	70.8	0.0	15.7	401.2	7.9	818.1
08-Mar-17	94.4	0.0	23.6	0.0	39.3	149.5
15-Mar-17	125.9	0.0	15.7	330.4	7.9	133.7
22-Mar-17	62.9	0.0	15.7	110.1	15.7	94.4
29-Mar-17	62.9	0.0	23.6	86.5	39.3	165.2
05-Apr-17	62.9	0.0	0.0	39.3	-15.7	78.7
12-Apr-17	62.9	0.0	7.9	267.5	149.5	188.8
19-Apr-17	47.2	0.0	15.7	133.7	-23.6	118.0
26-Apr-17	86.5	0.0	23.6	1510.4	0.0	55.1
03-May-17	180.9	0.0	0.0	259.6	47.2	86.5
10-May-17	86.5	0.0	0.0	157.3	-23.6	55.1
17-May-17	86.5	0.0	23.6	39.3	157.3	283.2
24-May-17	118.0	0.0	0.0	7.9	47.2	1927.3
31-May-17	125.9	0.0	15.7	7.9	31.5	1140.6
07-Jun-17	102.3	0.0	7.9	47.2	0.0	763.0
14-Jun-17	31.5	0.0	23.6	78.7	0.0	527.1
21-Jun-17	39.3	0.0	15.7	55.1	15.7	354.0
28-Jun-17	15.7	0.0	7.9	70.8	7.9	393.3
05-Jul-17	31.5	0.0	39.3	39.3	-7.9	637.2
12-Jul-17	23.6	0.0	23.6	55.1	23.6	456.3
19-Jul-17	7.9	0.0	7.9	7.9	-7.9	393.3
26-Jul-17	23.6	0.0	15.7	7.9	-7.9	472.0
02-Aug-17	15.7	0.0	78.7	39.3	23.6	904.6
09-Aug-17	7.9	0.0	94.4	55.1	31.5	637.2
16-Aug-17	23.6	0.0	86.5	0.0	-23.6	487.7
23-Aug-17	15.7	0.0	70.8	39.3	0.0	330.4



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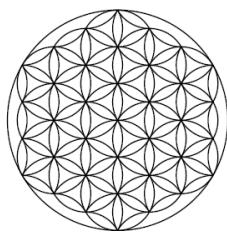
Week Beginning	1345A	1345B	1345C	1346A	1346B	1346C
30-Aug-17	0.0	0.0	110.1	39.3	94.4	0.0
06-Sep-17	7.9	0.0	102.3	39.3	-70.8	0.0
13-Sep-17	7.9	0.0	149.5	47.2	39.3	0.0
20-Sep-17	15.7	0.0	133.7	23.6	31.5	0.0
27-Sep-17	7.9	0.0	94.4	-118.0	7.9	0.0
04-Oct-17	7.9	94.4	86.5	125.9	-39.3	0.0
11-Oct-17	0.0	0.0	86.5	0.0	39.3	0.0
18-Oct-17	7.9	7.9	173.1	149.5	165.2	0.0
25-Oct-17	7.9	-7.9	110.1	23.6	31.5	0.0

WEEKLY AVERAGE GAS QUALITY CARBON DIOXIDE CONTROL SET (%)

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Week Beginning	IA	IB	IC	NA	NB	NC	PA	PB	PC
25-Feb-16	670.6	798.9	461.6	239.9	401.8	489.8	3295.5	3141.3	2961.3
03-Mar-16	241.5	296.9	245.4	273.5	149.6	205.9	1945.9	1691.7	2180.4
10-Mar-16	130.4	190.4	113.6	183.7	20.8	125.8	1703.8	865.2	1861.9
17-Mar-16	58.9	300.3	85.5	99.5	75.6	64.3	750.1	98.8	142.1
24-Mar-16	-126.9	289.4	34.6	87.0	448.5	43.3	390.8	100.9	68.4
31-Mar-16	-53.6	155.6	47.9	17.1	350.4	-8.6	207.7	43.5	39.9
07-Apr-16	-7.7	33.4	57.3	107.3	-4.3	91.2	199.2	71.3	52.8
14-Apr-16	-4.0	33.2	61.3	465.9	-8.5	461.6	457.7	60.4	74.0
21-Apr-16	46.2	30.2	52.0	342.2	35.7	345.2	341.8	125.1	102.9
28-Apr-16	-26.3	48.4	38.1	221.6	-21.3	222.8	221.4	88.9	12.6
05-May-16	-0.0	29.0	33.4	148.4	-8.6	151.9	156.8	73.6	36.8
12-May-16	-7.8	38.9	45.8	60.2	12.7	78.5	138.8	65.6	20.7
19-May-16	22.8	49.8	39.0	35.6	13.1	8.6	91.2	52.6	7.9
26-May-16	-11.8	41.0	30.3	-4.3	22.4	-17.1	53.3	46.8	-8.0
02-Jun-16	38.3	49.0	44.1	42.8	12.8	17.5	98.1	65.5	50.6
09-Jun-16	11.6	42.5	45.3	8.7	-4.2	-0.0	17.8	-17.2	0.0
16-Jun-16	700.9	54.6	54.8	29.6	4.2	-4.2	145.5	81.5	16.7
23-Jun-16	480.3	53.8	64.0	21.9	-4.2	-4.2	17.6	17.2	-8.1
30-Jun-16	15.9	33.8	17.1	17.5	-8.6	-4.3	4.3	25.6	0.0
07-Jul-16	3.9	55.6	24.9	13.3	4.2	4.3	25.8	31.2	12.3
14-Jul-16	-3.7	32.8	50.1	13.4	-8.4	-12.6	29.0	8.6	-8.4
21-Jul-16	53.4	25.7	41.8	35.6	17.1	8.6	45.9	12.8	25.7
28-Jul-16	3.8	67.9	55.3	8.7	4.3	-8.4	-8.5	13.1	-4.1
04-Aug-16	40.1	54.7	30.8	39.9	257.4	322.8	220.0	245.0	198.8
11-Aug-16	38.3	41.3	52.0	0.0	-21.1	-66.4	-41.7	-30.4	12.2
18-Aug-16	79.9	57.1	42.6	26.5	-37.8	-25.0	-4.2	51.5	23.6
25-Aug-16	0.0	36.4	33.2	9.1	17.1	4.2	-17.1	-8.7	-4.0
01-Sep-16	20.0	39.7	41.3	21.7	12.9	8.6	4.3	16.2	15.7
08-Sep-16	0.0	-30.4	56.4	8.6	-17.0	-29.2	-21.5	0.0	-12.1
15-Sep-16	43.7	0.0	57.0	12.9	8.5	25.9	26.4	35.2	8.4
22-Sep-16	11.5	0.0	266.7	8.3	-21.3	-0.0	-0.0	946.1	4.0

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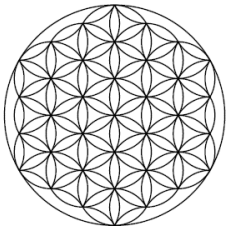
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Week Beginning	IA	IB	IC	NA	NB	NC	PA	PB	PC
29-Sep-16	23.9	20.8	21.4	44.4	-4.3	39.9	8.7	53.8	-8.1
06-Oct-16	3.9	0.0	0.0	0.0	42.6	0.0	-16.5	252.5	-4.2
13-Oct-16	266.2	0.0	4.3	43.5	-43.1	43.5	21.0	25.9	0.0
20-Oct-16	-241.7	0.0	-8.8	30.1	34.5	25.5	38.2	47.5	62.1
27-Oct-16	24.7	63.2	-8.2	8.8	12.3	21.8	17.2	17.1	16.4
03-Nov-16	-7.8	0.0	-30.2	17.1	26.0	21.8	16.8	30.0	29.6
10-Nov-16	0.0	0.0	21.2	30.6	16.6	8.8	21.6	22.0	19.5
17-Nov-16	-11.2	21.2	-21.2	13.2	22.0	21.6	16.8	8.7	24.1
24-Nov-16	0.0	0.0	30.2	26.9	16.8	12.8	20.9	13.0	25.2
01-Dec-16	15.2	43.2	16.9	21.7	17.4	21.7	21.3	21.2	20.2
08-Dec-16	-3.9	8.3	-4.3	17.2	20.8	17.2	12.9	20.8	16.1
15-Dec-16	7.9	16.4	-21.8	12.8	20.9	12.8	17.0	22.0	20.0
22-Dec-16	19.9	50.6	-4.2	25.9	24.9	26.0	8.5	13.4	20.4
04-Jan-17	0.0	0.0	-4.4	0.0	4.4	4.4	0.0	4.4	4.1
11-Jan-17	0.0	0.0	0.0	0.0	0.0	0.0	4.2	4.4	0.0
18-Jan-17	15.4	12.6	8.3	4.4	4.4	4.4	4.4	0.0	0.0
25-Jan-17	7.5	8.4	4.3	0.0	4.5	4.5	4.3	4.2	4.0
01-Feb-17	7.4	4.2	4.4	4.3	4.3	4.3	0.0	0.0	4.0
08-Feb-17	0.0	0.0	0.0	4.4	4.2	4.5	0.0	0.0	4.1
15-Feb-17	47.4	46.4	0.0	0.0	4.2	4.3	4.3	0.0	4.0
22-Feb-17	0.0	0.0	0.0	4.3	4.3	4.2	0.0	4.1	3.9
01-Mar-17	12.1	24.7	17.8	4.3	0.0	4.2	4.3	0.0	0.0
08-Mar-17	3.9	4.1	0.0	4.3	0.0	0.0	0.0	4.5	4.1
15-Mar-17	0.0	0.0	0.0	0.0	4.2	4.4	4.3	4.3	4.0
22-Mar-17	0.0	4.2	0.0	4.5	0.0	0.0	4.2	4.4	4.1
29-Mar-17	0.0	4.2	0.0	0.0	0.0	0.0	0.0	4.4	4.0
05-Apr-17	0.0	0.0	0.0	0.0	4.1	4.3	0.0	0.0	4.2
12-Apr-17	0.0	0.0	0.0	4.4	4.2	4.3	4.2	4.4	4.1
19-Apr-17	4.0	0.0	4.1	0.0	0.0	0.0	4.1	4.3	4.1
26-Apr-17	4.0	0.0	0.0	4.4	0.0	0.0	4.2	0.0	0.0
03-May-17	0.0	4.1	4.2	4.4	4.2	0.0	4.3	4.3	4.1
10-May-17	0.0	4.2	4.2	4.4	4.2	0.0	0.0	4.3	0.0
17-May-17	4.0	0.0	4.2	4.5	4.1	4.3	4.2	4.4	0.0
24-May-17	0.0	0.0	0.0	0.0	4.1	4.3	4.3	4.3	0.0
31-May-17	0.0	0.0	0.0	4.4	4.2	4.3	0.0	0.0	4.1
07-Jun-17	0.0	4.2	4.2	0.0	4.2	4.4	4.3	4.4	4.2
14-Jun-17	0.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0
21-Jun-17	4.0	4.2	4.2	4.4	4.1	0.0	4.3	0.0	0.0
28-Jun-17	0.0	4.2	0.0	4.5	4.2	0.0	0.0	4.4	0.0
05-Jul-17	0.0	4.2	4.2	4.5	4.1	0.0	4.2	0.0	0.0
12-Jul-17	0.0	4.2	4.2	4.5	4.2	4.3	0.0	0.0	0.0
19-Jul-17	0.0	0.0	4.2	0.0	0.0	4.3	0.0	0.0	4.1
26-Jul-17	4.0	4.2	4.2	4.5	4.1	4.3	4.2	0.0	0.0
02-Aug-17	4.0	0.0	0.0	4.4	4.1	4.4	4.2	4.3	4.1



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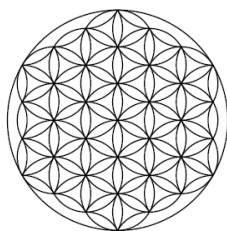
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Week Beginning	IA	IB	IC	NA	NB	NC	PA	PB	PC
09-Aug-17	4.0	4.3	4.2	4.5	0.0	4.3	4.2	4.4	4.1
16-Aug-17	0.0	4.2	4.2	4.4	0.0	4.4	0.0	4.4	4.1
23-Aug-17	4.0	0.0	0.0	4.4	4.2	4.3	4.1	4.4	4.2
30-Aug-17	0.0	4.2	0.0	4.5	4.1	0.0	0.0	4.4	4.2
06-Sep-17	4.0	0.0	4.2	4.5	4.1	0.0	0.0	0.0	4.2
13-Sep-17	0.0	4.2	4.2	4.5	4.1	4.4	0.0	0.0	4.2
20-Sep-17	4.0	4.3	0.0	4.4	4.2	4.4	0.0	0.0	4.1
27-Sep-17	0.0	0.0	0.0	4.4	4.1	4.3	4.2	0.0	4.2
04-Oct-17	0.0	0.0	4.2	0.0	4.2	4.4	4.1	0.0	4.1
11-Oct-17	0.0	4.3	0.0	0.0	4.1	4.3	4.2	0.0	4.1
18-Oct-17	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0
25-Oct-17	0.0	0.0	0.0	4.4	0.0	4.4	4.2	0.0	4.1

CARBON DIOXIDE SAMPLE SET

Week Beginning	1345A	1345B	1345C	1346A	1346B	1346C
25-Feb-16	826.6	510.0	558.4	1968.7	1346.0	468.0
03-Mar-16	954.2	837.1	592.9	203.6	471.1	567.8
10-Mar-16	2444.5	380.5	361.4	205.9	980.6	655.5
17-Mar-16	1096.2	10.3	180.8	306.1	559.3	325.1
24-Mar-16	348.9	-71.6	-40.7	334.9	190.8	450.2
31-Mar-16	329.7	239.3	212.6	320.5	298.3	886.2
07-Apr-16	437.2	260.5	554.8	421.0	120.0	863.9
14-Apr-16	403.5	875.3	569.9	330.6	240.0	687.3
21-Apr-16	337.4	847.6	724.4	685.5	275.0	178.6
28-Apr-16	124.5	385.5	603.0	1087.7	372.3	-25.3
05-May-16	7.2	260.3	433.6	849.5	1178.2	244.5
12-May-16	113.3	162.6	760.2	466.2	895.2	241.2
19-May-16	102.6	162.1	1440.8	729.2	620.3	798.9
26-May-16	480.2	211.3	881.7	1086.5	604.4	365.5
02-Jun-16	1792.9	1070.3	488.0	852.3	1239.5	205.8
09-Jun-16	796.9	703.0	0.0	464.7	876.9	186.7
16-Jun-16	96.7	75.8	83.2	530.0	584.1	820.7
23-Jun-16	829.5	60.2	1712.9	1746.8	593.1	768.1
30-Jun-16	495.4	99.6	936.9	202.8	1280.8	55.8
07-Jul-16	198.8	91.8	553.9	123.7	928.9	82.2
14-Jul-16	179.0	87.3	1484.4	959.0	611.5	82.0
21-Jul-16	637.6	68.7	1078.7	843.1	595.3	81.2
28-Jul-16	860.5	693.3	582.2	858.6	1254.5	57.9
04-Aug-16	1406.3	989.9	1305.3	346.1	897.0	73.9
11-Aug-16	816.8	920.4	1128.1	423.3	630.8	97.7
18-Aug-16	440.8	422.3	683.7	211.5	526.5	88.8
25-Aug-16	350.1	507.5	1089.1	80.8	1006.2	66.8
01-Sep-16	439.9	2331.6	938.8	154.0	312.6	89.9
08-Sep-16	502.2	155.6	981.1	201.2	-38.7	88.3

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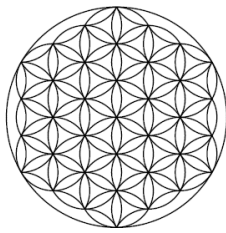
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Week Beginning	1345A	1345B	1345C	1346A	1346B	1346C
15-Sep-16	445.1	595.3	373.4	192.6	39.3	32.4
22-Sep-16	270.2	530.8	1196.8	176.6	-72.6	89.3
29-Sep-16	290.7	491.4	959.0	193.9	100.7	56.8
06-Oct-16	110.2	847.9	521.3	96.0	-15.5	86.5
13-Oct-16	442.3	517.6	252.0	918.4	31.8	86.4
20-Oct-16	796.9	876.9	195.8	499.4	929.8	104.4
27-Oct-16	366.6	707.3	129.4	417.0	553.4	89.5
03-Nov-16	72.1	1526.3	57.4	78.9	430.9	63.6
10-Nov-16	88.5	310.5	117.4	138.7	988.4	92.4
17-Nov-16	87.7	39.7	-64.9	37.5	541.7	81.3
24-Nov-16	91.3	196.8	104.0	117.4	674.7	48.8
01-Dec-16	69.5	2933.8	887.8	22.3	0.0	80.6
08-Dec-16	65.8	598.5	412.0	66.1	30.9	104.8
15-Dec-16	68.4	268.7	98.9	76.8	990.8	63.6
22-Dec-16	71.2	0.0	88.4	22.8	557.3	275.7
04-Jan-17	36.6	0.0	23.6	141.8	60.5	136.3
11-Jan-17	224.4	0.0	16.6	67.1	45.9	74.3
18-Jan-17	149.9	0.0	16.0	65.4	86.3	65.3
25-Jan-17	190.0	0.0	16.1	61.1	78.7	204.5
01-Feb-17	98.0	0.0	24.3	7.3	38.3	136.8
08-Feb-17	91.8	0.0	24.5	44.3	31.7	24.0
15-Feb-17	119.7	0.0	8.2	57.5	77.8	82.6
22-Feb-17	80.6	0.0	24.6	28.7	190.0	103.6
01-Mar-17	64.4	0.0	16.5	379.1	7.7	848.4
08-Mar-17	90.6	0.0	23.8	0.0	39.3	159.0
15-Mar-17	105.5	0.0	14.7	289.8	7.0	123.8
22-Mar-17	52.0	0.0	14.6	96.4	14.0	88.5
29-Mar-17	51.9	0.0	21.6	73.9	34.5	155.1
05-Apr-17	51.5	0.0	0.0	33.6	-13.7	74.8
12-Apr-17	51.1	0.0	7.3	231.4	131.2	175.8
19-Apr-17	39.4	0.0	14.6	115.0	-20.7	110.3
26-Apr-17	71.7	0.0	21.8	1315.5	0.0	51.7
03-May-17	152.2	0.0	0.0	222.5	41.6	81.3
10-May-17	71.2	0.0	0.0	137.3	-20.6	51.4
17-May-17	71.5	0.0	22.2	34.0	137.8	263.7
24-May-17	98.1	0.0	0.0	6.7	41.2	1805.9
31-May-17	104.0	0.0	14.5	6.9	27.9	1076.8
07-Jun-17	84.1	0.0	7.2	40.7	0.0	725.7
14-Jun-17	25.8	0.0	21.9	67.7	0.0	501.8
21-Jun-17	33.1	0.0	14.5	47.7	13.8	328.1
28-Jun-17	13.3	0.0	7.3	62.2	6.9	368.9
05-Jul-17	26.3	0.0	35.9	33.8	-7.0	606.0
12-Jul-17	19.5	0.0	21.5	47.6	20.8	432.1
19-Jul-17	6.6	0.0	7.2	7.0	-6.9	367.0



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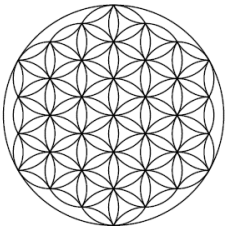
Week Beginning	1345A	1345B	1345C	1346A	1346B	1346C
26-Jul-17	19.2	0.0	14.4	6.8	-6.8	444.6
02-Aug-17	13.0	0.0	71.7	34.3	20.6	853.1
09-Aug-17	6.7	0.0	87.2	47.2	27.6	595.1
16-Aug-17	19.6	0.0	79.4	0.0	-20.7	455.5
23-Aug-17	12.9	0.0	64.6	34.2	0.0	305.9
30-Aug-17	0.0	0.0	101.5	33.9	83.7	0.0
06-Sep-17	6.6	0.0	94.9	34.1	-62.7	0.0
13-Sep-17	6.6	0.0	138.4	40.8	34.9	0.0
20-Sep-17	12.9	0.0	124.8	20.4	27.7	0.0
27-Sep-17	6.5	0.0	86.5	-103.8	6.9	0.0
04-Oct-17	6.5	82.3	79.6	109.8	-34.3	0.0
11-Oct-17	0.0	0.0	78.3	0.0	34.3	0.0
18-Oct-17	6.5	6.9	162.0	129.7	144.5	0.0
25-Oct-17	6.5	-6.8	101.5	20.4	28.2	0.0

DATA ANALYSIS

	Inoculum	Negative	Positive	1345 - MBR 15121706 1.0 MIL	1346 - MBR 16011801 1.0 MIL
Cumulative Gas Volume (mL)	3624.7	3291.6	11344.6	27700.3	27199.5
Percent CO ₂ (%)	74.8	86.7	81.6	98.9	97.8
Volume CO ₂ (mL)	2709.6	2852.5	9262.2	27396.5	26608.9
Mass CO ₂ (g)	5.32	5.60	18.19	53.81	52.27
Sample Mass (g)	1,000	10	10	20.0	20.0
Theoretical Sample Mass (g)	0.0	8.6	4.2	15.0	13.7
Biodegraded Mass (g)	1.45	1.53	4.96	14.68	14.25
Percent Biodegraded (%)		0.9	83.2	88.2	93.3

CONCLUSION

Upon consideration of gas production, it becomes obvious that aerobic biodegradation has occurred in the both BiologiQ samples. It appears that relatively linear lines have maintained for the latter period of active composting time. It seems that the samples are approaching an asymptotic line.



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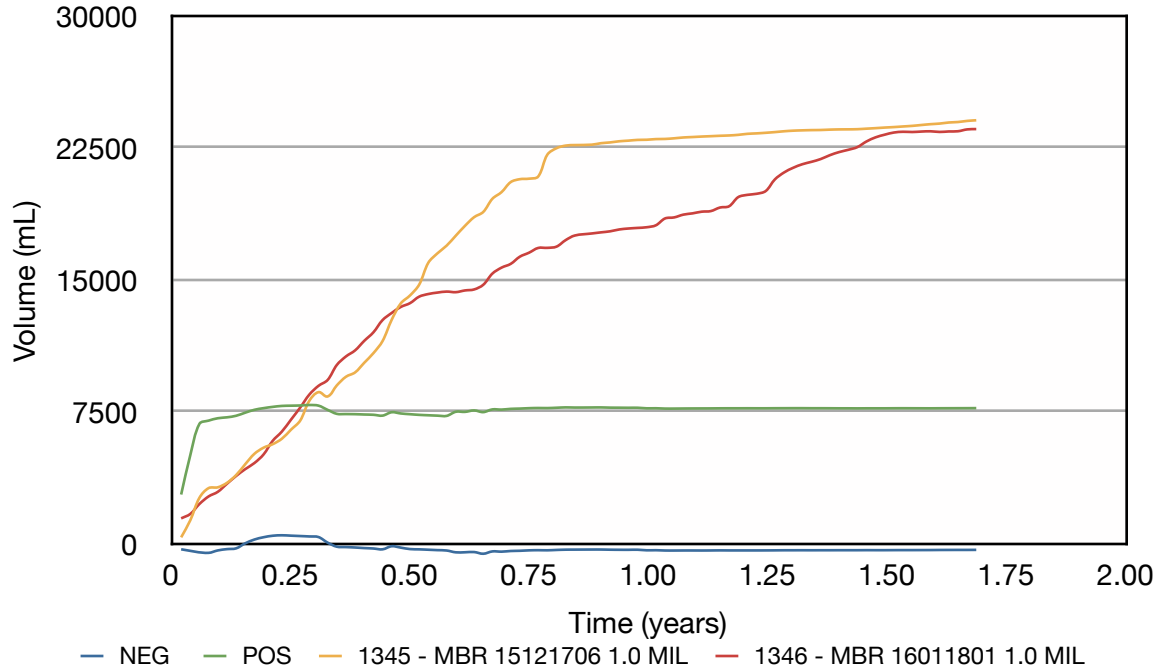
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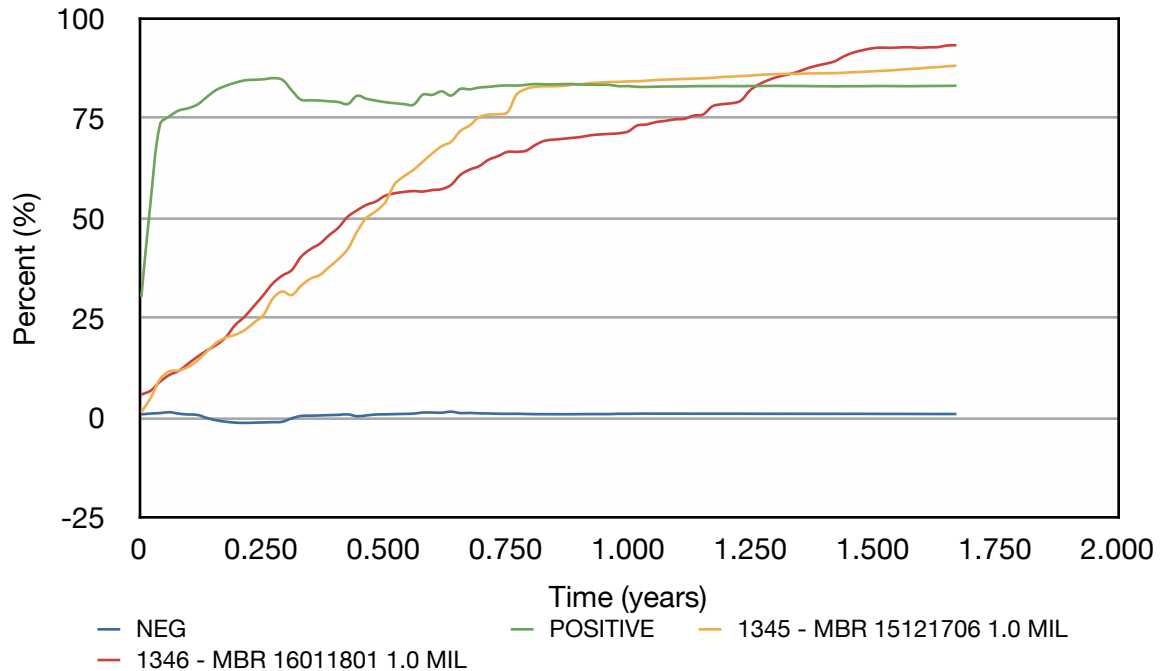
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ASTM D5338 - Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions - 1101170129B

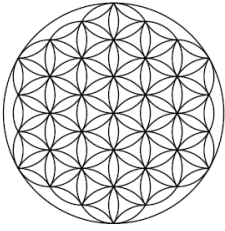
Cumulative Gas Volume (Background Corrected)



Biodegradation



Over a 88 week period the BiologiQ samples indicate about 88% and 93% aerobic biodegradation respectively. The treated sample appears to have surmounted the let down rate of the bio-additive. The rate of aerobic biodegradation of the sample is good.



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The positive control has achieved nearly 85% aerobic biodegradation. This sample will go through many biological cycles as it composts. It seems the syntrophic effect of the microbes has been fulfilled for all samples.

In this test, temperature and moisture are optimized and these conditions may not be present in all compost facilities. In such cases composting might not be as accelerated.

Thomas Poth
Laboratory Director
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