Final Report

ECO CHAIN LUBE: Assessment of the Ready Biodegradability with the Manometric Respirometry Test

Guideline

OECD Guideline No. 301 F

Study Director

André Dabrunz

Date

11 Feb 2016

Testing Facility	Sponsor
Eurofins Agroscience Services EcoChem GmbH / Eurofins Agroscience Services Ecotox GmbH Eutinger Str. 24 D-75223 Niefern-Öschelbronn Germany	AddX 430 Upper Newtownards Road, Belfast, Antrim BT4 3GY, Northern Ireland

Study Identification Code

Test item:	ECO CHAIN LUBE
Study code:	S15-05806
Trial/Lab Phase code:	S15-05806-L1_ABMR

Statement of Confidentiality

This report contains confidential and proprietary information of the sponsor which must not be disclosed to anyone except the employees of this company or to persons authorised by law or judicial judgement without the expressed and written approval of the sponsor.

Statement of Compliance with the Principles of Good Laboratory Practice

The study described in this report was conducted in compliance with the most recent edition of:

- The Principles of Good Laboratory Practice (GLP), (Chemicals Act, Annex 1, Federal Republic of Germany)
- The OECD Principles of Good Laboratory Practice

The German requirements are based on the OECD Principles of Good Laboratory Practice which are accepted by regulatory authorities throughout the European Community, the United States of America (FDA and EPA) and Japan (MHW, MAFF and METI) on the basis of intergovernmental agreements.

The determination of the chemical oxygen demand (COD) was performed under non-GLP conditions.

The name of the test facility changed from "Eurofins Agroscience Services EcoChem GmbH" to "Eurofins Agroscience Services EcoChem GmbH / Eurofins Agroscience Services Ecotox GmbH" on 10 December 2015.

Head of testing facility
(Dr. Marco Candolfi/Dr. Susanne Timmermann)

23 Feb 16 S. Timmermann
Date / Signature

Study director
(André Dabrunz)

11 Feb 2016 A. Dabrunz
Date / Signature

Statement of Quality Assurance Unit

Study code: S15-05806

Study title: ECO CHAIN LUBE: Assessment of the Ready Biodegradability with the Manometric Respirometry Test

This study has been audited by the relevant Quality Assurance Unit(s) in accordance with the OECD principles of Good Laboratory Practice and respective national regulations. Dates of inspection and reporting are listed in this section. Documents were audited as draft versions. Facilities and/or processes and systems are monitored as part of a regular program.

	Date of Audit	Date of Report to Principal Investigator	Date of Report to Study Director[1)]	Date of Report to Management[2)]
Study Plan	09 Oct 2015	-	09 Oct 2015	09 Oct 2015
Experimental Phase Weighing: Test Item Application	16 Oct 2015	-	16 Oct 2015	16 Oct 2015
Final Report	26 Nov 2015	-	26 Nov 2015	26 Nov 2015

1) including Lead QA and test facility management if audit reported to Principal Investigator
2) test site management if audit reported to Principal Investigator, otherwise test facility management
- not applicable

According to the inspections detailed above, and the QA Statements provided by the test sites it can be confirmed that the methods, procedures, and observations described in this final report are a full and accurate account of the raw data.

Quality assurance
(Dr. Ulrich Schwarz)

23 Feb 2016 U. Schwarz
Date / Signature

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1 Summary

Report:	DABRUNZ, A. (2016): ECO CHAIN LUBE: Assessment of the Ready Biodegradability with the Manometric Respirometry Test
Source:	Eurofins Agroscience Services EcoChem GmbH / Eurofins Agroscience Services Ecotox GmbH, Eutinger Str. 24, 75223 Niefern-Öschelbronn, Germany; unpublished report no.: S15-05608 Issued 11 Feb 2016.
Guidelines:	OECD Guideline 301 F, Ready Biodegradability, Manometric Respirometry Test
Deviations:	None.
GLP:	Yes, certified laboratory
Objective:	The aim of the study was the ready biodegradability assessment of the test item in a 28-day biodegradation test according to OECD guideline 301 F.
Materials and methods:	Test item: Eco Chain Lube, Batch No.: 1506238.3. Test system: Manometric Respirometer, glass bottles filled with 250 mL test medium. The degradability and toxicity of the test item at a concentration of 100 mg/L was estimated in a mineral medium which was inoculated with microorganisms from a municipal wastewater treatment plant. In order to check the procedure sodium benzoate was used as a readily degradable reference item at a concentration of 100 mg/L, along with a toxicity control with 100 mg/L test item and 100 mg/L sodium benzoate. The system consisted of reaction vessels containing a CO_2 absorbing agent, an electro-chemical oxygen generator and a switching manometer. The amount of produced oxygen required to maintain constant gas volume was determined via coulometry. The test over 28 days was performed in a climate controlled chamber. The temperature ranged from 22.28 – 22.98 °C with mean temperature of 22.59°C. Percent degradation was determined as the ratio of the amount of oxygen taken up by the microbial population during biodegradation and the COD/ThOD (Chemical/ Theoretical Oxygen Demand) for the test or reference item.
Dates of work	16 Oct 2015 – 17 Nov 2015

Findings:

	10 % level of ThOD	10 % level of ThOD passed	60 % level of ThOD	60 % level of ThOD passed	Degradation day 28
	[mg/L]	[days]	[mg/L]	[days]	[%]
Test Item	17.7	1	106	8	84.6
Procedure Control	16.7	2	100	4	91.6

Conclusions: The ready biodegradability of the test item was assessed with the Manometric Respirometry Test according to OECD Guideline 301 F. The test item was tested at a nominal concentration of 100 mg/L.

The following biodegradation was determined at the end of the 28-d period:

- Eco Chain Lube (100 mg/L): 84.6 %
- Sodium benzoate (100 mg/L): 91.6 %

Since the pass value of > 60 % was reached within 28 days the test item is considered to be readily biodegradable according to OECD guideline 301 F.

The test item had no inhibitory effect on activated sludge microorganisms at the tested concentration of 100 mg/L.

2 Time Schedule

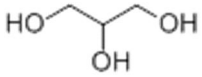
Study initiation date:	15 Oct 2015
Start of the experimental phase:	16 Oct 2015
End of the experimental phase:	17 Nov 2015
Draft report:	19 Nov 2015
Study completion date:	11 Feb 2016

3 Study Objective

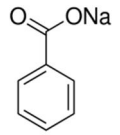
The purpose of the test was the assessment of the ready biodegradability of Eco Chain Lube in an aerobic aqueous medium at a nominal test concentration of 100 mg/L. The degradation was expressed as the biochemical oxygen demand (BOD) within 28 days as a percentage of the test item´s chemical oxygen demand (COD).

4 Materials and Methods

4.1 Test and Reference Item(s)

Test Item			
Test item name	ECO CHAIN LUBE	Batch number	1506238.3
EAS Test item code	M-00000825	Appearance / colour	liquid / yellow
Formulation type	not available	Intended use	not available
Active ingredient 1	glycerol	Content of a.i. nominal	83 %
CAS number	56-81-5	Content of a.i. analysed	not available
Chemical structure		Molecular weight	92.1 g/mol
Active ingredient 2	flowtac 2000	Content of a.i. nominal	2 %
CAS number	not available	Content of a.i. analysed	not available
Chemical structure	not available	Molecular weight	not available
Relative density nominal	1.063	Risk symbol(s)	not available
Issue date of certificate	not available	Expiry date	30 Sep 2016 *
Chemical Oxygen Demand (COD)	1.767 mg/mg	Storage conditions	ambient (≤ +30°C), dark, dry

* not given by sponsor but assumed to be one year after first receipt

Reference Item			
Test item name	Sodium benzoate	Batch number	15D280007
EAS Test item code	M-00000974	Appearance / colour	solid / white
Chemical name	benzoic acid sodium salt		
CAS number	532-32-1	Purity analysed	99.8 % w/w
Chemical structure		Molecular weight	144.1 g/mol
Density	not applicable	Signal words	none
Issue date of certificate	Apr 2015	Expiry date	31 Oct 2019
Theoretical Oxygen demand (ThOD)	1.67 mg/mg	Storage conditions	ambient (≤ +30 °C), dark, dry

All specifications given on the certificate of analysis, provided by the sponsor/supplier are essential for correct identification of the test item for use under GLP. They have not been verified by the test facility and no claim of GLP compliance will be made for these data except where this is explicitly

claimed on the certificate of analysis. Additional specifications for test item characterisation may originate from (non-GLP) sources other than the sponsor/supplier.

4.2 Principle of the Test

The test was performed in accordance with OECD Guideline 301 F.

The mineral medium was inoculated with a defined amount of activated sludge from a municipal waste water treatment plant. 500 mL brown glass bottles served as reaction vessels. These were filled with 250 mL permanently stirred test media, into which the respective chemicals (see 4.6) were added. For CO_2 absorbance, the reaction vessels also contained a separate vessel filled with soda lime (see Figure 1).

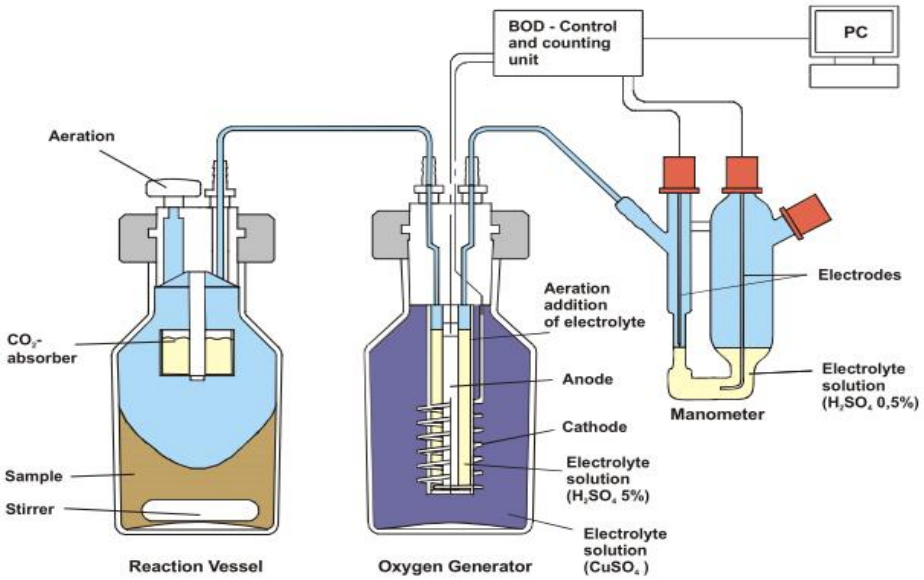


Figure 1: BSBdigi Measuring Principle

All reaction vessels were stored in an Incubator BSB-Digi device (Selutec GmbH, 72379 Hechingen, Germany) at a temperature between 22.28-22.98 °C with a mean temperature of 22.59 °C. The samples were permanently stirred during the test period. The amount of produced oxygen required to maintain constant gas volume was determined via coulometry over the test period of 28 days. Degradation was determined for the test item, an inoculum control, a procedure control, an abiotic control and a toxicity control (see 4.6).

4.3 Inoculum

As inoculum, activated sludge collected from the aeration tank of the municipal sewage treatment plant of Pforzheim/Germany was used. This sewage treatment plant predominantly processes domestic sewage. The activated

sludge was washed in mineral medium for three times by centrifugation at 3000 rpm for 10 minutes and was afterwards kept under aerobic conditions for 1 day prior to application.

4.4 Mineral Medium

The mineral medium was prepared from four stock solutions using ultrapure grade water. The final composition was as described in Table 1.

Table 1: Composition of the mineral medium

Prepared from	Compound	Concentration mineral medium [mg/L]
Stock solution 1	KH_2PO_4 K_2HPO_4 Na_2HPO_4 NH_4Cl	85.0 217.5 266.5 5.00
Stock solution 2	$CaCl_2 \cdot 2\ H_2O$	36.4
Stock solution 3	$MgSO_4\ 7\ H_2O$	22.5
Stock solution 4	$FeCl_3\ 6\ H_2O$	0.25

All chemicals used were of analytical grade.

4.5 Test Medium

The pH of the test medium was 7.4 ± 0.2 and 250 mL were used for the abiotic control. Test medium for all other treatment groups was prepared by addition of activated sludge to the mineral medium. The concentration of activated sludge was adjusted to 30 mg/L.

4.6 Treatment Groups

1. Test item group (test item and inoculum)
2. Procedure control group (reference item and inoculum)
3. Inoculum control group (inoculum)
4. Toxicity control group (test item, reference item and inoculum)

For treatment groups 1 - 3 two replicates and for treatment group 4 one replicate were used.

4.7 Performance of the Test

Respective amounts of test item were prepared on glass cover slips of 21*26 mm and given into the respective test vessels (treatment groups 1and 4). For all test assays 250 mL of the respective medium were transferred into the test vessels by using volumetric flasks. The preparation of the individual treatments is summarised in Table 2. Test vessels were put into the test

chamber, and were allowed to acclimatise for about one hour at slightly opened manometer and test vessel lids. Prior to the test start lids were closed tightly and simultaneously.

The pH was measured in the mineral medium and one additional test item replicate prior to the test start and in all treatment groups after 28 days.

The oxygen uptake for each test vessel was measured continuously and recorded at 6 hour intervals (daily values are given in appendix A 1).

Table 2: Preparation of the test assays

Test item (TG1)	Reference item (TG2)	Inoculum control (TG3)	Toxicity control (TG4)
100 mg/L	100 mg/L	-	100 mg/L test item 100 mg/L ref. item

4.8 Evaluation of the Degradability

The BOD determined at each time was calculated by subtracting the oxygen depletion (mg O_2/L) of the inoculum control from that exhibited by the test item. This corrected depletion was divided by the concentration (mg/L) of the test item, to obtain the specific BOD as mg oxygen per mg test item. The percentage biodegradation was calculated by dividing the specific BOD by the ThOD of the test item, the reference item or a mixture of both:

$$BOD = \frac{\text{mg } O_2\text{/L (uptake test item)} - \text{mg } O_2\text{/L(uptake blank)}}{\text{mg test item/L}} = \text{mg } O_2\text{/mg test item}$$

$$\% \text{ Degradation} = \frac{BOD}{ThOD} \cdot 100$$

The ThOD for the reference item was calculated from the elemental composition ($C_cH_hCl_{cl}N_nNa_{na}O_oP_pS_s$).

$$ThOD = \frac{16\left[2c + 1/2(h - cl - 3n) + 3s + 5/2p + 1/2na - o\right]}{MW} \text{ mg } O_2\text{/mg}$$

Where MW = molecular weight

The ThOD of the reference item sodium benzoate was calculated to be 1.67 mg O_2/mg.

The COD for the test item was determined to be 1.767 mg O_2/mg.

The ThOD of the toxicity control was calculated to be

$$ThOD_{toxCont} = \frac{ThOD_{Ref} + \left(COD_{Ti} * \frac{mg\ Test\ item}{mg\ Ref\ item} \right)}{1 + \left(\frac{mg\ Test\ item}{mg\ Ref\ item} \right)}\ mg\ O_2/mg$$

Hence it was determined to be 1.719 mg O_2/mg

5 Deviations from the Study Plan

The study was performed according to the study plan dated 15 Oct 2015 without any deviation. This report reflects the conduct of the study.

6 Results

The O_2 concentrations in the test vessels were measured at time intervals of 6 h from t = 0 days to t = 28 days. All treatment groups were corrected by the mean value of the inoculum controls. Afterwards, the biochemical oxygen demand (BOD mg O_2/mg test item) was calculated as described in section 4.8. The percent degradation was derived from the BOD, divided by the theoretical oxygen demand ($ThOD_{Ref}$, $COD_{Test\ Item}$ or the sum of both). The test item showed a degradation of 84.6 % while the reference item amounted to a degradation of 91.6 % after 28 days. A summary for the respective pass levels is given in Table 3.

To exclude an overestimation of oxygen consumption, photometric nitrate and nitrite measurements were performed for each replicate of TG 1, TG 3 and TG 4 at t = 28 days and nitrification could be excluded as impairing factor.

Table 3: Pass levels and overall degradation.

	10 % level of ThOD	10 % level of ThOD passed	60 % level of ThOD	60 % level of ThOD passed	Degradation day 28
	[mg/L]	[days]	[mg/L]	[days]	[%]
Test Item	17.7	1	106	8	84.6
Procedure Control	16.7	2	100	4	91.6

In the toxicity control, biodegradation amounted to 79.1 % within 14 days. Thus, according to the test guidelines, the test item had no inhibitory effect on activated sludge microorganisms at the tested concentration of 100 mg/L due to a biodegradation > 25 %.

Measured pH values are shown in Table 4.

The daily % degradation values are given in appendix A 2. For a graphical summary of the absolute oxygen demand and percent degradation see Figure 1 and Figure 2.

Table 4: pH-values

Treatment group	Replicate	
	1	2
Mineral Medium (day 0)	7.22	
Test Item (day 0)*	7.20	
Test Item (day 28)	7.58	7.70
Procedure Control (day 28)	7.91	7.92
Inoculum Control (day 28)	7.35	7.36
Toxicity Control (day 28)	8.35	

*measured in one additional replicate

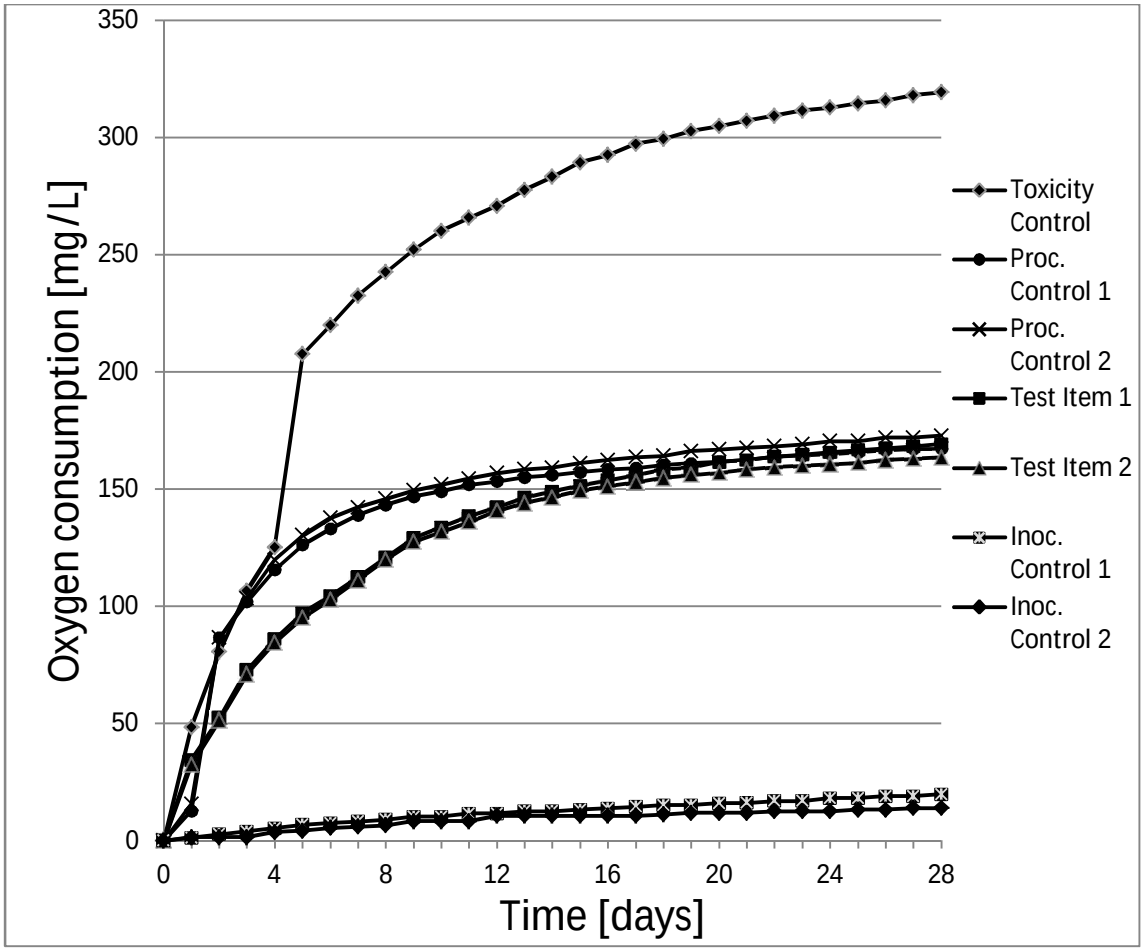


Figure 2: Absolute Oxygen Demand of all Treatment Groups over 28 Days

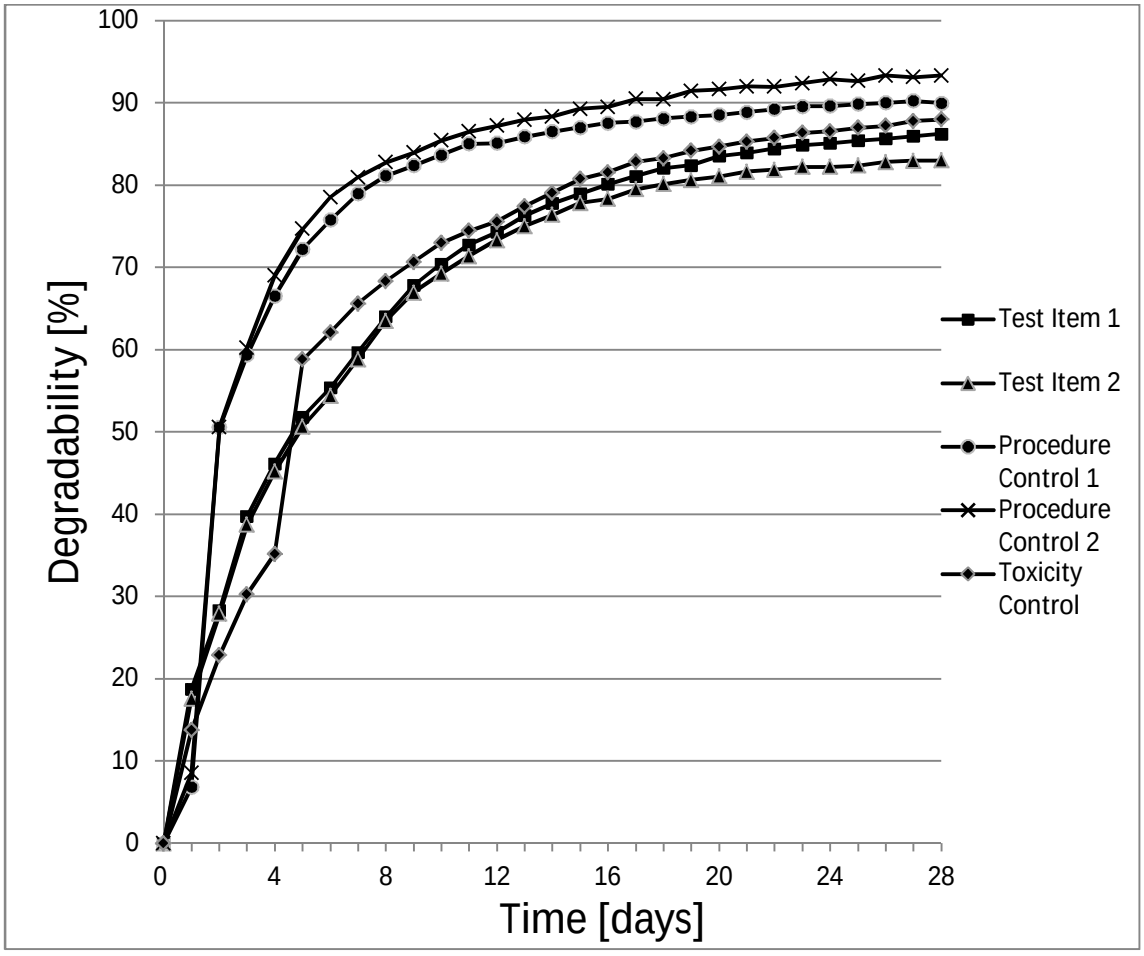


Figure 3: Percent Degradation over 28 Days

7 Validity of the Test

The results of the test can be regarded as valid as

- The differences of extremes for replicate values of the removal of the test chemical at the plateau, at the end of the 28 day test or at the end of the 10-d window, were lower than 20 %.
- The percent degradation of the reference item reached respective pass level (60 %) by day 3.
- The degradation of the toxicity control was > 25 % (79.1 %) after 14 days (calculated for the mixture of sodium benzoate 100 mg/L + test item 100 mg/L). Toxic effects of the test item therefore can be excluded.
- The mean O_2 consumption of inoculum controls did not exceed 60 mg/L after 28 days (maximal consumption 19.8 mg/L).
- pH in all Treatment groups (degradation ≤ 60%) was within the range of 6 – 8.5.

8 Conclusions

Conclusions: The ready biodegradability of the test item was assessed with the Manometric Respirometry Test according to OECD Guideline 301 F. The test item was tested at a nominal concentration of 100 mg/L.

The following biodegradation was determined at the end of the 28-d period:

- Eco Chain Lube (100 mg/L): 84.6 %
- Sodium benzoate (100 mg/L): 91.6 %

Since the pass value of > 60 % was reached within 28 days the test item is considered to be readily biodegradable according to OECD guideline 301 F.

The test item had no inhibitory effect on activated sludge microorganisms at the tested concentration of 100 mg/L.

9 Archiving

All data and study documents will be archived in accordance with the SOP's of the Test Facility / Test Site.

Archived data and documents will be retained for a period from the issue of the final report, in accordance with the local national regulatory requirements (determined by the country of origin of the Study Director).

Study specific documents will be stored in the GLP Archives listed below.

Facility-based records and documentation of QA of the involved test sites will be stored in the respective GLP Archives according to the applicable national regulations.

A sample of the test item will be stored in the dedicated archive at the test facility.

At least the following documents will be archived:

Document or material	**Location of GLP Archive**	**Original/Copy**
Study plan and amendments	Test Facility	Original
Raw data	Test Facility	Original
Final report (and report amendments)	Test Facility	Original

At the end of the archiving period study-specific data or material will **NOT** be disposed of without the prior written consent of the Sponsor.

10 References

OECD (1998): OECD Principles on Good Laboratory Practice (as revised in 1997). OECD Series on Principles of Good Laboratory Practice and Compliance Monitoring. ENV/MC/CHEM(98)17.

OECD 301 F (1992): OECD Guidelines for Testing of Chemicals No. 301 F. Ready Biodegradability: Manometric Respirometry Test. Adopted: 17 July 1992.

Appendix

A 1 Individual Daily Values for Cumulative Oxygen Consumption

Time	Test Item 1	Test Item 2	Procedure Control 1	Procedure Control 2	Inoculum Control 1	Inoculum Control 2	Toxicity Control
[days]	[mg/L]						
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	34.4	32.4	12.7	15.6	1.2	1.5	48.5
2	52.1	51.4	86.5	86.6	2.7	1.5	80.6
3	72.9	71.1	101.8	103.3	3.9	1.5	106.6
4	86.0	84.3	115.5	119.7	5.3	3.6	125.2
5	97.1	95.0	126.1	130.2	6.8	4.2	207.6
6	104.3	102.6	133.0	137.6	7.5	5.4	219.9
7	112.5	111.0	138.9	142.2	8.1	6.0	232.6
8	120.8	119.9	143.2	145.9	8.9	6.5	242.6
9	129.1	127.5	146.8	149.4	10.2	8.3	252.1
10	133.7	131.6	149.0	151.9	10.2	8.3	260.1
11	138.5	136.0	151.9	154.4	11.5	8.3	265.8
12	142.3	140.6	153.2	156.7	11.5	10.6	270.8
13	146.4	144.1	155.0	158.4	12.5	10.6	277.7
14	149.0	146.5	156.0	159.1	12.5	10.6	283.3
15	151.4	149.4	157.2	161.0	13.2	10.6	289.4
16	153.8	151.2	158.4	162.4	13.8	10.6	292.5
17	155.8	153.0	159.0	163.6	14.4	10.6	297.3
18	158.2	154.7	160.3	164.2	15.1	11.2	299.4
19	159.1	155.9	161.0	166.2	15.1	11.8	302.8
20	161.5	157.1	161.7	166.9	15.9	11.8	304.9
21	162.3	158.2	162.4	167.6	16.1	11.8	307.1
22	163.9	159.4	163.7	168.3	16.9	12.5	309.4
23	164.7	160.0	164.3	169.0	16.9	12.5	311.5
24	165.7	160.6	165.0	170.4	18.1	12.5	312.7
25	166.6	161.2	165.7	170.4	18.1	13.2	314.6
26	167.4	162.4	166.4	171.9	18.9	13.2	315.8
27	168.3	163.0	167.1	171.9	18.9	13.9	318.1
28	169.2	163.5	167.1	172.7	19.8	13.9	319.3

A 2 Percentage Degradation

Degradation[1] [%]					
	Test Item		Procedure Control		Toxicity Control
[days]	Replicate 1	Replicate 2	Replicate 1	Replicate 2	-
0	0.0	0.0	0.0	0.0	0.0
1	18.7	17.6	6.8	8.5	13.7
2	28.3	27.9	50.5	50.6	22.8
3	39.7	38.7	59.3	60.2	30.2
4	46.2	45.2	66.5	69.0	35.1
5	51.8	50.7	72.2	74.7	58.8
6	55.4	54.4	75.8	78.5	62.1
7	59.7	58.8	79.0	80.9	65.6
8	64.0	63.5	81.1	82.8	68.3
9	67.8	66.9	82.4	83.9	70.7
10	70.4	69.2	83.7	85.4	73.0
11	72.8	71.4	85.0	86.5	74.5
12	74.3	73.3	85.1	87.2	75.6
13	76.3	75.0	85.9	87.9	77.4
14	77.8	76.4	86.5	88.4	79.1
15	78.9	77.8	87.0	89.3	80.7
16	80.1	78.3	87.5	89.5	81.6
17	81.1	79.5	87.7	90.5	82.9
18	82.1	80.1	88.1	90.4	83.3
19	82.4	80.6	88.4	91.5	84.2
20	83.6	81.1	88.5	91.6	84.7
21	84.0	81.6	88.9	92.0	85.3
22	84.4	81.9	89.2	92.0	85.7
23	84.9	82.2	89.6	92.4	86.4
24	85.1	82.2	89.6	92.9	86.5
25	85.4	82.4	89.9	92.7	87.0
26	85.7	82.8	90.0	93.3	87.2
27	86.0	83.0	90.2	93.1	87.8
28	86.2	83.0	90.0	93.3	88.0
Mean	84.6		91.6		-

[1] Corrected for the mean oxygen uptake of the inoculum controls

A 3 GLP Certificate

Baden-Württemberg

LANDESANSTALT FÜR UMWELT, MESSUNGEN UND NATURSCHUTZ BADEN-WÜRTTEMBERG

Gute Laborpraxis / Good Laboratory Practice

GLP-Bescheinigung / Statement of GLP Compliance

(gemäß / according to § 19 b Chemikaliengesetz)

Eine GLP-Inspektion zur Überwachung der Einhaltung der GLP-Grundsätze gemäß Chemikaliengesetz bzw. Richtlinie 2004/9/EG wurde durchgeführt in:

Assessment of conformity with GLP according to Chemikaliengesetz and Directive 2004/9/EC at:

☒ Prüfeinrichtung / Test facility ☐ Prüfstandort / Test site

Eurofins Agroscience Services EcoChem GmbH / Eurofins Agroscience Services Ecotox GmbH

Eutinger Straße 24

75223 Niefern-Öschelbronn

(Unverwechselbare Bezeichnung und Adresse / Unequivocal name and adress)

Prüfungen nach Kategorien / Areas of Expertise

(gemäß / according ChemVwV-GLP Nr. 5.3 / OECD guidance)

1	**Prüfungen zur Bestimmung der physikalisch-chemischen Eigenschaften**	**Physical-chemical testing**
4	**Ökotoxikologische Prüfungen zur Bestimmung der Auswirkungen auf aquatische und terrestrische Organismen**	**Environmental toxicity studies on aquatic and terrestrial organisms**
5	**Prüfungen zum Verhalten im Boden, im Wasser und in der Luft; Prüfungen zur Bioakkumulation und zur Metabolisierung**	**Studies on behavior in water, soil and air; bioaccumulation**
6	**Prüfungen zur Bestimmung von Rückständen**	**Residue studies**
7	**Prüfungen zur Bestimmung der Auswirkungen auf Mesokosmen und natürliche Ökosysteme**	**Studies on effects on mesocosms and natural ecosystems**
8	**Analytische Prüfungen an biologischen Materialien**	**Analytical and clinical chemistry testing**

Datum der Inspektion / Date of Inspection

(Tag.Monat.Jahr / day.month.year)

10.10.2013

Die/Der genannte Prüfeinrichtung/Prüfstandort befindet sich im nationalen GLP-Überwachungsverfahren und wird regelmäßig auf Einhaltung der GLP-Grundsätze überwacht.
Auf der Grundlage des Inspektionsberichtes wird hiermit bestätigt, dass in dieser Prüfeinrichtung/diesem Prüfstandort die oben genannten Prüfungen unter Einhaltung der GLP-Grundsätze durchgeführt werden können.

The above mentioned test facility/test site is included in the national GLP Compliance Programme and is inspected on a regular basis.

Based on the inspection report it can be confirmed, that this test facility/test site is able to conduct the aforementioned studies in compliance with the Principles of GLP.

Unterschrift, Datum / Signature, Date

Dr. Volker Giraud
Leiter der Abteilung Technischer Umweltschutz

Karlsruhe, 10.12.2015

(Name und Funktion der verantwortlichen Person / Name and function of responsible person)

LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg
Postfach 10 01 63, 76231 Karlsruhe

(Name und Adresse der GLP-Überwachungsbehörde / Name and address of GLP Monitoring Authority)

Figure 4: GLP Certificate of the Testing Facility