

Enterprise Environmental
(registered trading name of McNamee Environmental Ltd)
Unit 1D
M4 Interchange Park
Celbridge
Co Kildare
Business Registration No. 527906

*Enterprise
Environmental*

"a specialist environmental monitoring service"

Contact: Ph/Fax: (01) 6279935, Mob: 087 6488690, Email: joemcnee1@gmail.com Web: www.enterpriseenvironmental.com

Sheet no. 1 of 7 sheets

LABORATORY REPORT

This report relates only to the sample(s) tested as reported herein.

Client:

**Bimeda Animal Health Ltd
2, 3 & 4 Airton Close
Airton Road
Tallaght
Dublin 24, D24 FH9V**

Title:

**Respirometry Test - Inhibition of
oxygen consumption by activated
sludge.
(IPPC Licence Reg. No P0357-01)**

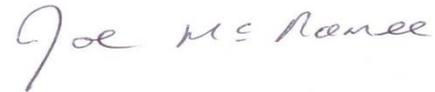
Attention of: Declan Dempsey, Plant Manager

Job Ref. T015

Report by: Joe McNamee, MSc

Issue No: 1

Date Sample Received: 8th March 2023



Purchase Order No.: (Declan Dempsey)

Copies to:

Date Reported: 14th March 2023

Client work - terms and conditions of acceptance

1. Reports shall not be used, either in whole or in part, for the purposes of advertising, publicity, or litigation without the prior written consent of Enterprise Environmental.
 2. All reports shall only be reproduced in full.
 3. All samples received for testing or laboratory work are considered perishable and of no commercial value and shall be disposed of or returned to the client one week after the "Date Reported" on the final report unless instructions to the contrary have been notified, in writing to Enterprise Environmental by the client before the end of the said one week period.
 4. Payment for work carried out shall be in accordance with the terms and conditions stated on Enterprise Environmental Invoices (unless otherwise agreed with Enterprise Environmental).
 5. No action or legal proceeding shall be taken (except in the case of wilful neglect or default) against Enterprise Environmental by reason of or arising out of the carrying out of any research, investigation, test or analysis or the publication of the results thereof in the name of Enterprise Environmental.
 6. Enterprise Environmental will not release any information received from or provided to the client in relation to this report except as may be required by law or as specified in writing by the client.
 7. The laws of Ireland shall apply.
-

Enterprise Environmental is a registered trading name of McNamee Environmental Ltd.
McNamee Environmental Ltd is a private company limited by shares (registered in Dublin) with an address at Unit 1D,
M4 Interchange Park, Celbridge, Co Kildare. CRO Reg. No. 540825. Director: J McNamee. Secretary: A McNamee

Introduction

Bimeda Animal Health Ltd, Airton Close, Tallaght, Dublin 24 has been issued with an Integrated Pollution Prevention & Control (IPPC) Licence, Register No. P0357-01, by the Environmental Protection Agency for the “*manufacture of pesticides, pharmaceutical or veterinary products and their intermediates*”.

The products formulated at the facility fall into four categories:

Drenches: for oral administration to animals to control internal parasites.

Dairy Hygiene: for dairy parlour cleaning/hygiene products.

Nutritionals: these are vitamin/mineral type supplements for horses and cattle.

Ectoparasiticides: used for the control of skin parasites on sheep and cattle and are presented as Dips and Pour-on.

The IPPC licence permits the discharge of the trade effluent arising from the manufacturing operation to the Local Authority (Irish Water) foul sewer. The sewer discharges to Ringsend Municipal Wastewater Treatment Plant (MWwTP) which provides full biological treatment of the trade effluent in admixture with municipal sewage using an activated sludge process before discharge to Dublin Bay. A condition of the Licence requires the company to have “toxicity” testing of the trade effluent carried out on a quarterly basis. In the past the company had Microtox (*vibrio fischeri*) analysis carried out for several years but had been unable to make a meaningful interpretation of the results. Consequently, the company had discussions with the EPA to prepare a proposal for a more specific and useful toxicity testing proposal to comply with the licence condition.

The company now has an agreement with the EPA to have twice yearly Respirometry testing carried out to determine the acute toxicity/biological inhibition of the trade effluent to the microbes in the receiving treatment plant in Ringsend MWwTP. Enterprise Environmental was contracted by Bimeda Animal Health Ltd to carry out this twice yearly Respirometry testing. This report presents the results of the 1st Respirometry test for the Year 2023.

Respirometry is a recognised and widely used technique for carrying out Direct Toxicity Assessment of trade effluents being discharged for biological treatment. The technique is typically used as a screening process to assess trade effluent samples, specific waste streams, mother liquors etc., to provide an assessment of the likely acute biological impacts to the activated sludge in a receiving biological wastewater treatment plant.

A composite sample of trade effluent was collected by Enterprise Environmental on the 8th of March 2023 and tested using a Respirometry test based on an International Organisation for Standardisation test method (EN ISO 8192:2007). This ISO test specifies a method for assessing the inhibitory effect of a test material or wastewater on the oxygen consumption (respiration rate) of activated sludge micro-organisms. It provides information on inhibitory or stimulatory effects after short term exposure (up to 180 minutes) of the test sample on the activated sludge micro-organisms. The test is designed to represent conditions in a biological wastewater treatment plant and was carried out on the sample using activated sludge (flocculent) from Ringsend MWwTP.

Test Principle

In the presence of easily biodegradable substances, activated sludge consumes oxygen at a higher rate than in their absence, depending on, among other factors, the concentration of micro-organisms present. The addition of a toxic concentration of a test material will result in a decrease in the oxygen consumption rate. The test uses a volumetric Respirometer to continually measure and record the oxygen consumption rate (respiration rate) of the activated sludge at a fixed mixed liquor suspended solids concentration. The sludge is fed with a non-toxic, biodegradable substrate (control) and the oxygen consumption rate is compared to sludge fed with the control substrate **plus the test sample**. In the event that the oxygen consumption rate of the test is lower than the control this indicates biological inhibition/toxicity. The percent inhibition of the oxygen consumption is calculated after a stipulated time (180 minutes) by comparing the oxygen consumption rate of the **control** sample (OECD synthetic sewage)⁽¹⁾ with the oxygen consumption rate of the sample containing **test** material. This test is repeated for a range of test sample concentrations to enable an inhibition curve to be calculated.

The sensitivity of the activated sludge can be checked using a reference substance, 3,5-dichlorophenol. This substance has an EC₅₀ toxicity value in the range of **2 to 25 mg/kg** when tested against a nitrifying municipal activated sludge and a value of **5 to 40 mg/kg** when tested against a non-nitrifying sludge. When the same sludge source is regularly used its sensitivity only needs to be checked intermittently and when a different source is used its sensitivity should be checked for each series of tests where possible. Ringsend activated sludge is regularly used for Respirometry testing by Enterprise Environmental.

⁽¹⁾ **OECD synthetic sewage:** Standard synthetic sewage as defined by the Organisation for Economic Co-Operation and Development made up at 100-fold strength. Its composition is:

<i>Peptone</i>	<i>16g</i>
<i>Meat extract</i>	<i>11 g</i>
<i>Urea</i>	<i>3 g</i>
<i>Sodium chloride</i>	<i>0.7 g</i>
<i>Calcium chloride dihydrate</i>	<i>0.4 g</i>
<i>Magnesium sulphate heptahydrate</i>	<i>0.2 g</i>
<i>Dipotassium hydrogen phosphate</i>	<i>2.8 g</i>
<i>Water</i>	<i>to 1000 ml</i>

Test Method

The test was carried out in accordance with EN ISO 8192:2007. A purpose designed, fully automated Arthur volumetric Respirometer was used to continually measure and record the oxygen consumption rate instead of a one-off reading using a dissolved oxygen meter. This 6-place instrument utilises a 1 litre sample chamber and an air uplift column to provide continuous aeration and mixing which simulates the aeration basin in a full scale activated sludge treatment plant.

Test Conditions

Test Sample:	Bimeda Animal Health Ltd, Trade effluent composite sample at SE-1, taken from 11.00h on the 7 th until 11.00h on the 8 th of March 2023. (collected by Enterprise Environmental at 11.30h on the 8 th March 2023)
Activated Sludge Source:	Ringsend sludge (flocculent) collected on the 7 th of March 2023
Pre-treatment of sludge:	Allowed settle for approximately 30 minutes and the supernatant decanted to increase the MLSS concentration. Aerated at 22 °C and fed with synthetic sewage to maintain the health of the sludge until used in the test. The sludge was screened for nitrification and nitrification was detected.
pH of Sludge:	7.5
pH of test sample:	7.6
Suspended Solids concentration of Activated Sludge in test chamber:	1,500 mg/kg
Test Duration:	180 minutes
Test Temperature:	22 °C
Test Date:	7 th to 8 th of March 2023

Definitions

EC₅₀ The effective concentration (0 to 100 % w/w or mg/kg) of the test sample giving a calculated or interpolated inhibition of oxygen consumption of 50 % as compared to a blank control.

Toxic Unit. An alternative means of expressing effluent toxicity (0 to 100 % w/w) as a function of the undiluted sample. This is known as the Toxic Unit and is defined as 100/EC₅₀.

Inhibition Threshold. The effective concentration (0 to 100 % w/w or mg/kg) of the test sample giving a calculated or interpolated inhibition of oxygen consumption of zero as compared to a blank control.

Results

Sludge Sensitivity Reference Test (Ringsend activated sludge (flocculent) of the 7th of March 2023)

This test assesses the suitability of the activated sludge for the EN ISO8192:2007 test. The 180 min EC₅₀ toxicity value of 3,5-dichlorophenol should be within the range of 2 to 25 mg/kg (nitrifying sludge).

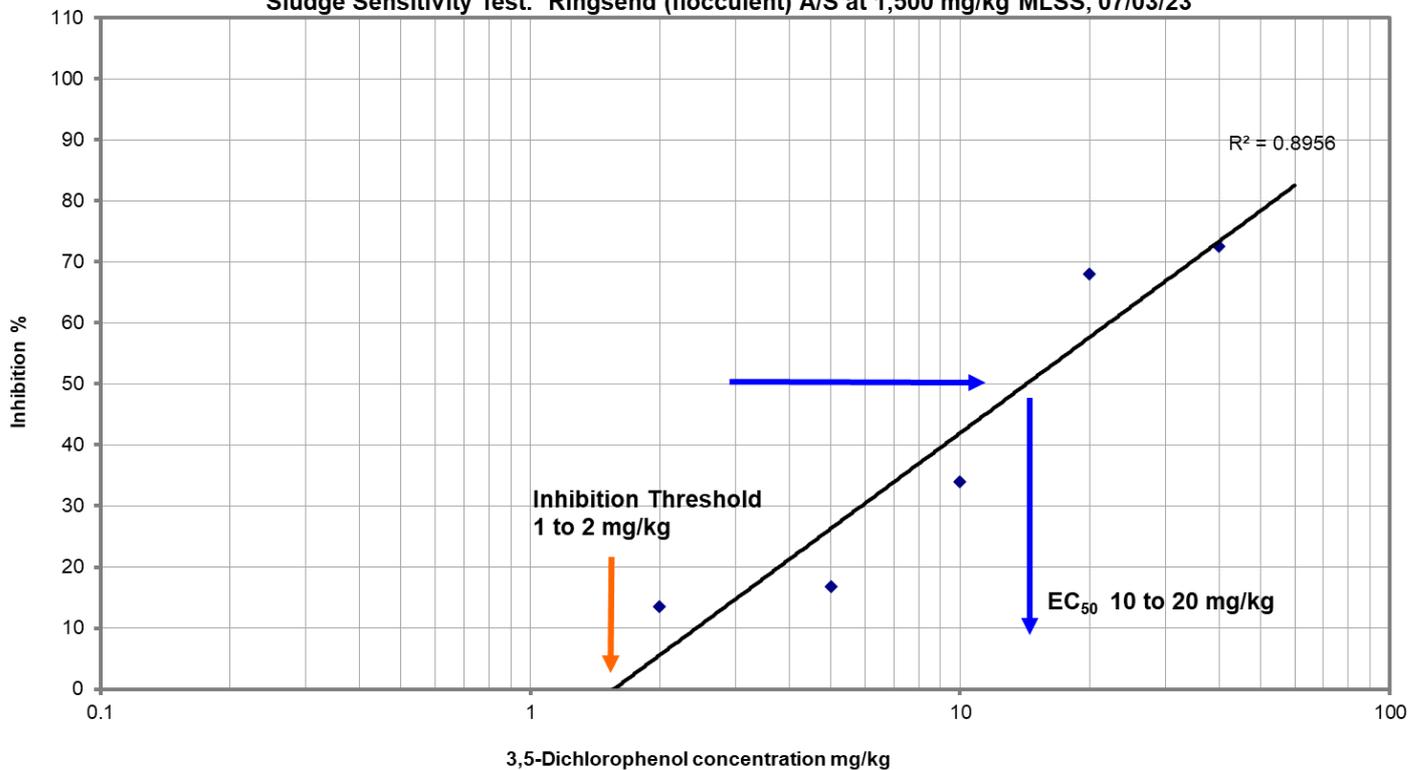
Reference Substance Used: 3,5-dichlorophenol.

Result of Sludge Sensitivity Test:

180 min EC₅₀ toxicity value: 10 to 20 mg/kg (see inhibition Chart No. 1)

As this value was within the normal range (2 to 25 mg/kg) for nitrifying municipal activated sludge the sludge was suitable for testing purposes

Chart 1. Test for Inhibition of Oxygen Consumption by Activated Sludge
 Test Method Reference: EN ISO 8192:2007, 180 minute test.
 Sludge Sensitivity Test: Ringsend (flocculent) A/S at 1,500 mg/kg MLSS, 07/03/23



Sample Test

(Bimeda Animal Health Ltd, Trade effluent composite sample at SE-1, taken from 11.00h on the 7th until 11.00h on the 8th of March 2023)

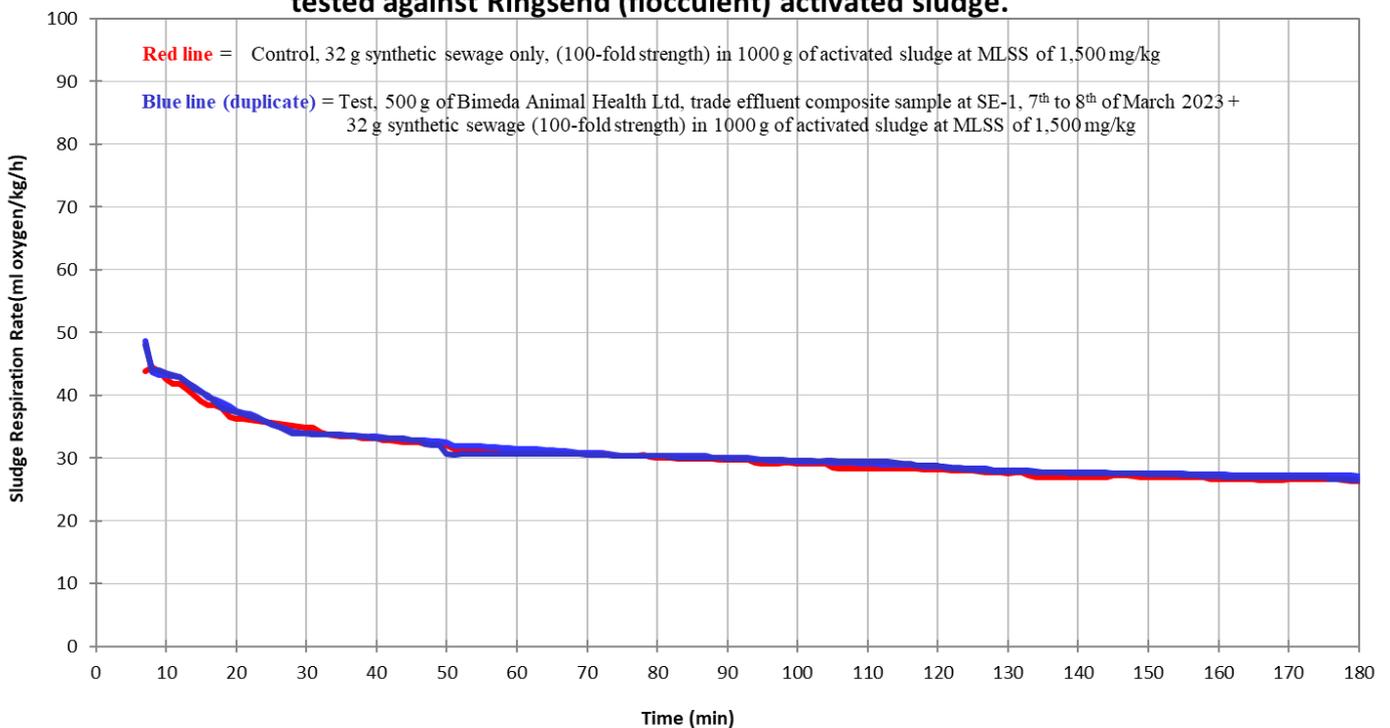
The sample was tested in duplicate at a sample concentration of 50 % w/w (500 g of test sample made up to 1 kg with activated sludge). **No toxicity/inhibition was detected after 180 minutes.**

The results are presented in the table below and the Respiration chart for the **control** and the **test sample** is presented in Chart 2. The Chart shows the respiration rate of the test sample to be very similar to the Control indicating no evidence of acute inhibition/toxicity to the microbes in the activated sludge.

Result of Sample Test:

EC₅₀ toxicity value (180 minute):	Greater than 50 % concentration w/w
Toxic Unit value (180 minute):	Less than 2 TU
Inhibition Threshold (180 minute):	Greater than 50% concentration w/w

Chart 2 Respirometry Chart, Bimeda Animal Health Ltd, Trade Effluent, composite sample at SE-1, 7th to 8th March 2023 tested against Ringsend (flocculent) activated sludge.



Results Summary.

The results indicate that the Bimeda Animal Health Ltd, trade effluent sample analysed exhibited no acute biological inhibition/toxicity to a mixed microbial population of heterotrophic and nitrifying microorganisms, from Ringsend activated sludge at up to 50 % w/w concentration in the sludge.

This sample had an **EC₅₀ value of “greater than 50 % concentration” w/w (less than 2 TU)** and an **Inhibition Threshold of “greater than 50 % w/w concentration”**. The results indicate that the Bimeda Animal Health Ltd trade effluent sample tested would not cause acute inhibition/toxicity to the activated sludge in the treatment plant at up to **50 % concentration w/w** of the flow in the sewer.