Symphony Environmental Ltd
6 Elstree Gate, Elstree Way
Borehamwood
Hertfordshire WD6 1JD
England

+44 (0)20 8207 5900 Telephone
+44 (0)20 8207 7632 Facsimile
www.d2w.net
technical@d2w.net

**Date:** 29 January 2014

# PRODUCT EVALUATION REPORT:

## Mateiciuc HDPE Ventilation Pipes

## Antibacterial, Antifungal and Antialgal Performance

FM 37939
9001: 2008
14001: 2004

**SYMPHONY ENVIRONMENTAL LTD**

## 1. Introduction and Samples

Symphony Environmental Technologies were provided with samples of HDPE ventilation pipes produced by Mateiciuc. The samples were sent to a microbiological laboratory to determine the efficacy of the samples containing $d_2p$ 97100 against bacterial, fungal and algal growth.

The following supplies were tested:

- HDPE Ventilation Pipes without additive (control)
- HDPE Ventilation Pipes with 1% $d_2p$ 97100
- HDPE Ventilation Pipes with 2% $d_2p$ 97100

## 2. Conclusions

It has been demonstrated that the HDPE ventilation pipes containing $d_2p$ additive 97100 exhibit excellent resistance to fungal, bacterial and algal growth. The control samples without additive demonstrated no resistance to microbial growth.

# 3. Testing

## 3.1 ISO 22196:2011 - Antibacterial Efficacy

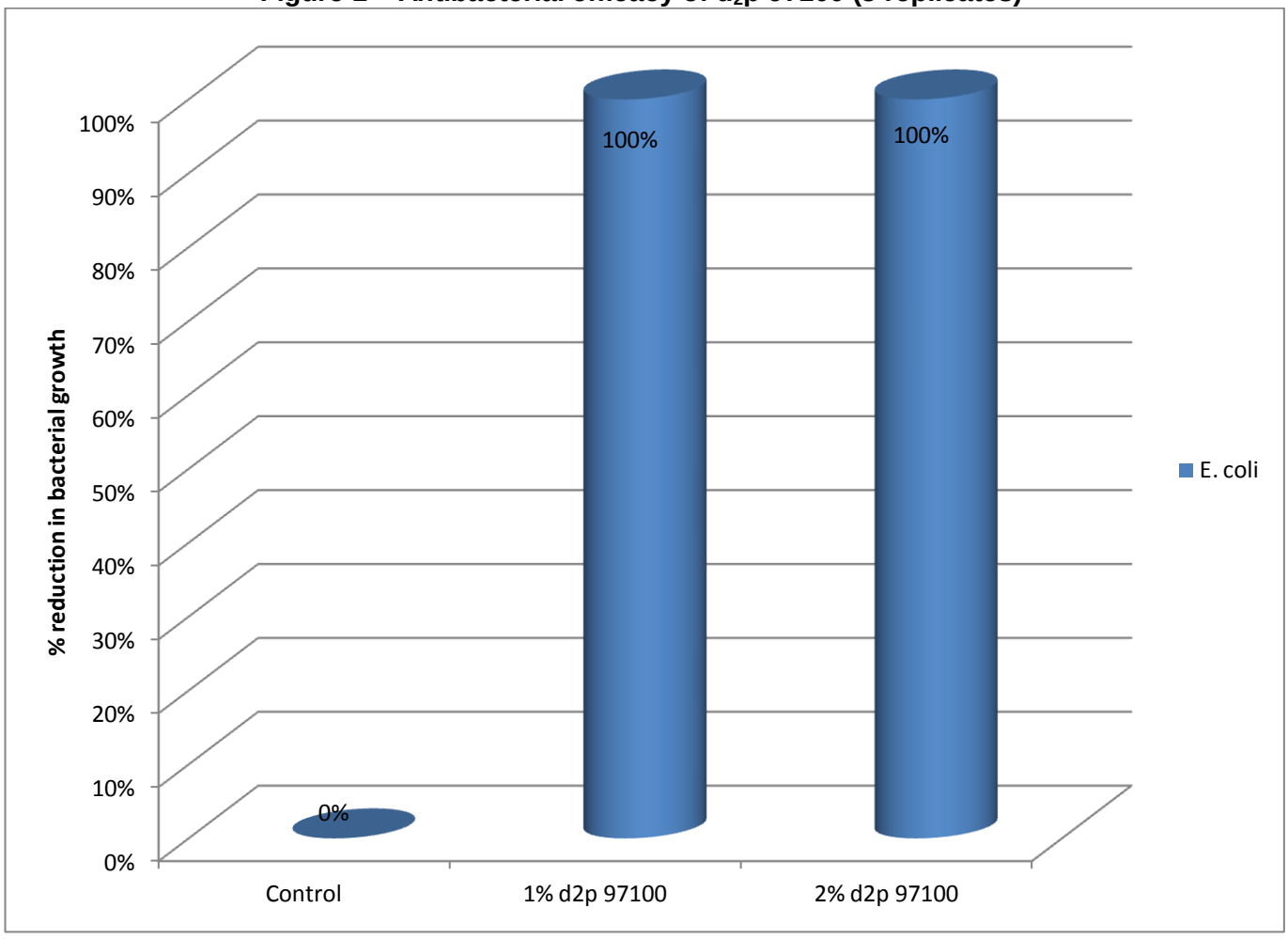
### 3.1.1 Method

A nutritive broth containing *Escherichia coli* was applied to 3 control samples, 3 samples containing 1% $d_2p$ additive 97100, and 3 samples containing 2% $d_2p$ 97100. Each sample was incubated at 35°C (with a humidity level >95%) for 24 hours. After the 24 hour period the microbial concentrations on each sample were determined. The reduction of microorganisms relative to the initial concentration applied was calculated for each sample.

### 3.1.2 Results

The results are shown in figure 1. The presence of $d_2p$ 97100 in the pipe samples showed excellent efficacy in reducing the number of colony forming units present, when compared to the control samples.

**Figure 1 – Antibacterial efficacy of $d_2p$ 97100 (3 replicates)**



### 3.2 ASTM E 2180 – Antifungal Efficacy

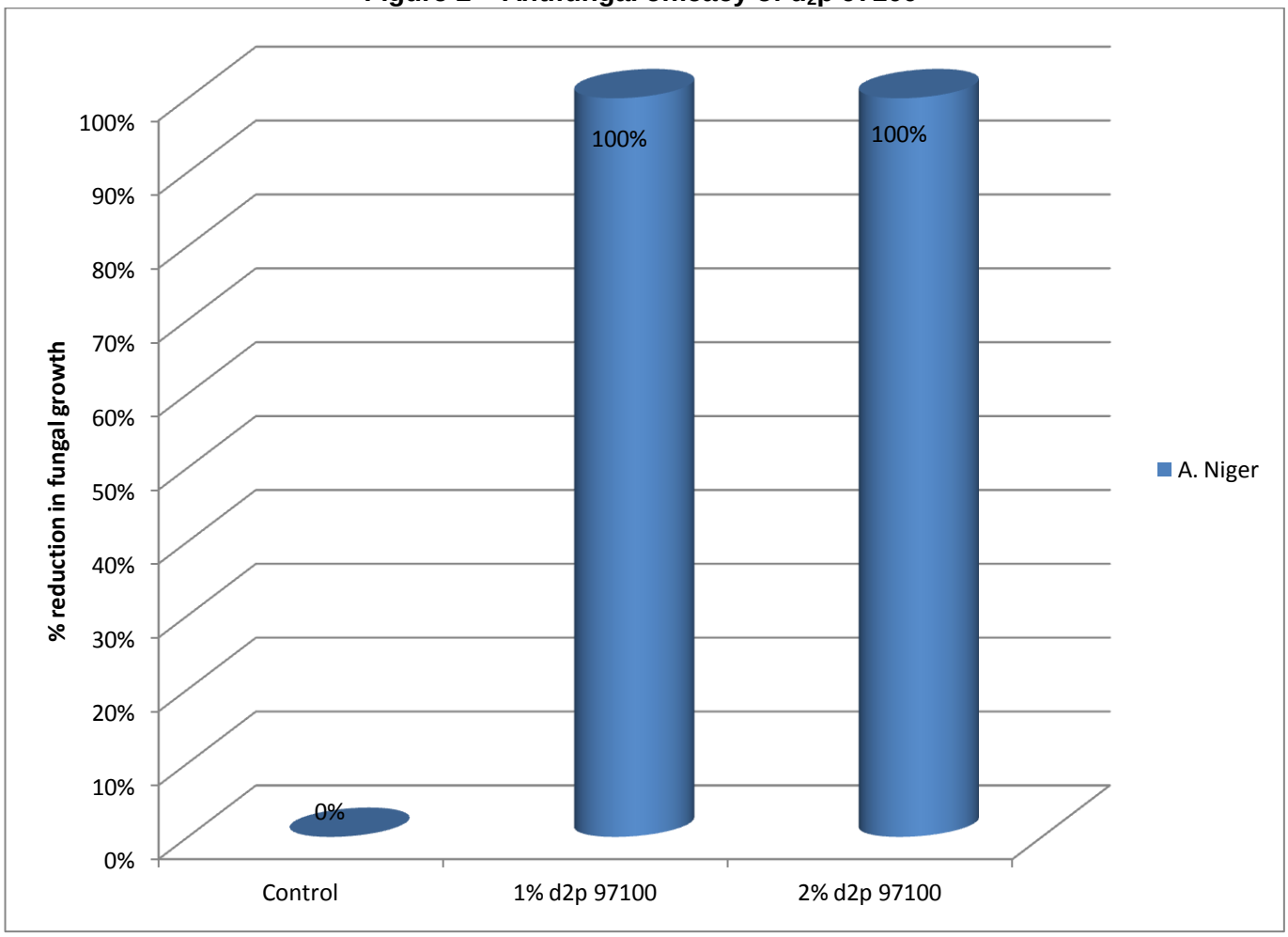
#### 3.2.1 Method

An agar slurry inoculums containing *Aspergillus Niger* was applied to the surface if 3 control samples, 3 samples containing 1% $d_2p$ additive 97100, and 3 samples containing 2% $d_2p$ 97100. Each sample was incubated at 45°C (with a humidity level >75%) for 48 hours. After 48 hours the inoculums was removed and the amount of fungal organisms remaining measured.

#### 3.2.2 Results

The results are shown in figure 2. The presence of $d_2p$ 97100 in the pipe samples showed excellent efficacy in reducing the number of fungal organisms present, when compared to the control sample.

**Figure 2 – Antifungal efficacy of $d_2p$ 97100**



### 3.3 Modified ISO 22916 – Antialgal Efficacy

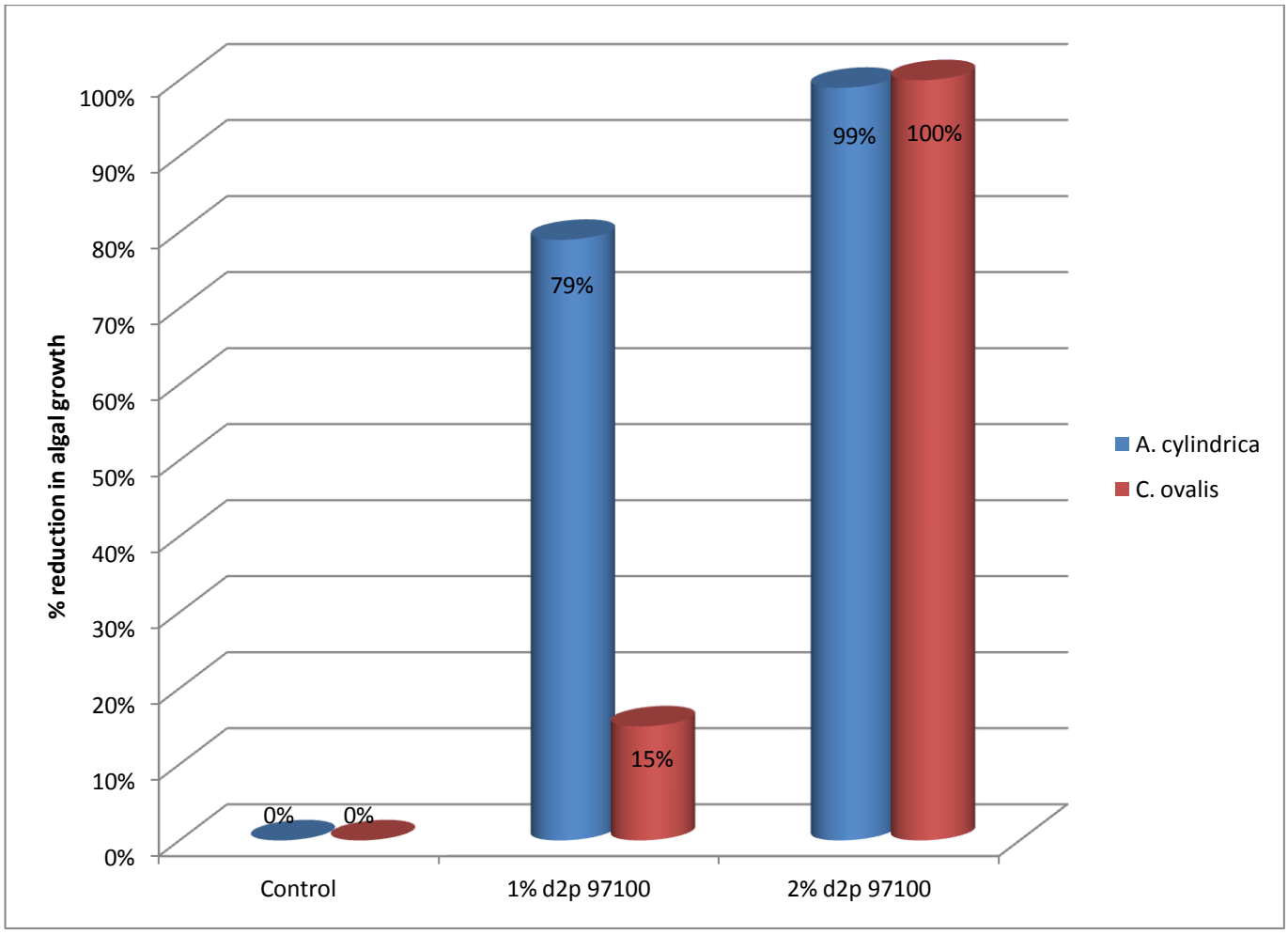
#### 3.3.1 Method

A nutritive broth containing the two test species (*A. cylindrical* and *C. ovalis*) was applied to 3 control samples, 3 samples containing 1% $d_2p$ additive 97100, and 3 samples containing 2% $d_2p$ 97100. Each sample was incubated at 35°C (with a humidity level >95%) for 72 hours. After the 72 hour period the microbial concentrations on each sample were determined. The reduction of microorganisms relative to the initial concentration applied was calculated for each sample.

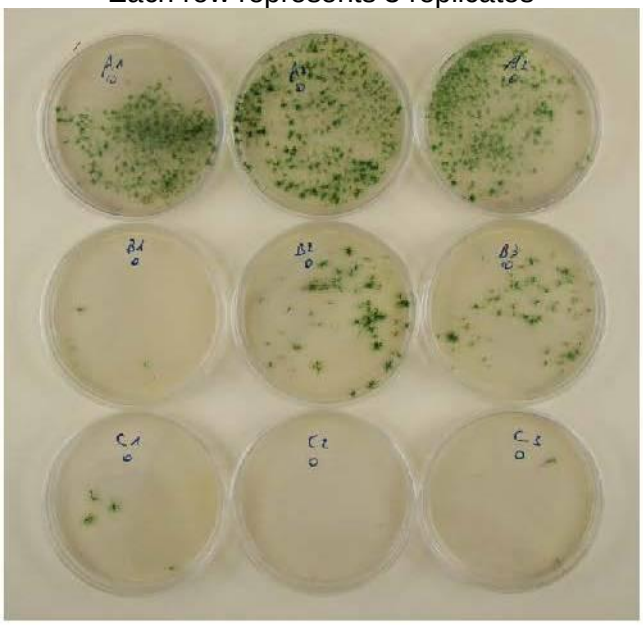
#### 3.3.2 Results

The results are shown in figure 3. The presence of $d_2p$ 97100 at 2% shows excellent efficacy in reducing the number of organisms present, the presence of $d_2p$ 97100 at 1% shows efficacy in reducing the number of organisms present.

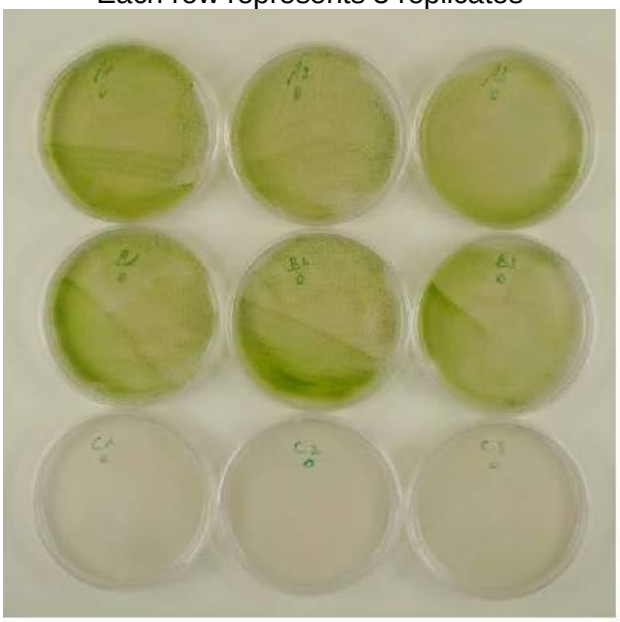
**Figure 3 – Antialgal efficacy of $d_2p$ 97100**



**Growth of *A. cylindrica* -** Top row: Control, Middle Row: 1% $d_2p$ 97100, Bottom row: 2% $d_2p$ 97100
Each row represents 3 replicates



**Growth of C. ovalis -** Top row: Control, Middle Row: 1% $d_2p$ 97100, Bottom row: 2% $d_2p$ 97100
Each row represents 3 replicates



Author:

Digitally signed by James White
DN: cn=James White, o=Symphony Environmental, ou=Technical Assistant, email=james.white@d2w.net, c=GB
Date: 2014.01.29 16:45:28 Z

James White
Technical Assistant

The information presented in this report is based on the material actually tested externally. Performance of finished product depends on conditions to which the product is exposed.