

Biothane Toxicity Test Exsan Exsan 2012-V-V 52050034 August 2011

INTRODUCTION:

The Biothane laboratory received a sample of Exsan 2012-V-V from Exsan on August 5, 2011. Exsan 2012-V-V can be used as either a conveyor lubricant or cleaner. Tests were run in our laboratory to determine if the chemical had any acute adverse effect on the activity of Biothane anaerobic bacteria. Exsan provided Biothane with the typical dosage rate for Exsan 2012-V and this dosage rate was used in the test.

METHOD:

The toxicity testing is conducted using an anaerobic respirometer with eight - 500 milliliter cells. Each cell is started with 5 gVSS of biomass from an operating Biothane system. At the beginning of the test 3,500 ml of reference solution is made and used throughout the test. The reference solution is a pH adjusted solution consisting of propionic, butyric, and acetic acids, macronutrients and micronutrients. One hundred milliliters of the reference solution is added to each cell for each test run. The cells are diluted to a final volume of 500 milliliters with tap water. The final COD concentration of each cell is approximately 5,000 mg/L. The resulting F: M ratio in the tests is approximately 0.50 gCOD/gTSS/d. The cells are maintained at 35°C using a circulating water bath and are intermittently stirred.

Gas generated by the biomass flows from the test cells to a gas flow-measuring unit via a needle and tubing, building up pressure within the cell. At a preset pressure a valve opens and releases a known volume of gas. The measuring unit is connected to an interface module which transfers the information to a computer, converting the number of valve openings to cumulative flow volume. The computer stores the data for later processing.

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Four consecutive 24-hour runs are done on each cell. After each run the cell contents are allowed to settle and 350 milliliters of supernatant are decanted off. Fresh reference solution is then added to each cell to start the next run. The total COD fed to each cell is roughly the same. The pH of each cell is checked at the beginning of each run to ensure that it is in the optimal operating range. Four different chemical dosage rates are tested. One, two, four and eight times the average plant use rates are tested. The average test dosages are based on the expected dosage rates given to us by Exsan.

In Run 1 each cell is fed only the reference solution. The gas production in Run 1 determines the base activity of the biomass. In Runs 2 and 3 each cell is fed the reference solution along with the defined chemical dose. The gas production in Runs 2 and 3 determines the effects of the chemical on the biomass. In Run 4 each cell is fed only the reference solution. The gas production in Run 4 determines if the biomass can recover from any toxicity witnessed in Runs 2 and 3.

Table 1.1 lists the chemical and its average usage rate as defined by Exsan.

Table 1.1 Chemical Use of Exsan 2012-V

Chemical	Type	Use lpd	Spec. Grav. (kg/l)	1x Ave. Conc. in WW (ppm)
EXSAN 2012-V	Line Lubricant	485	1.030	100

*Wastewater Flow = 5,000 m3/d

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Table 1.2 lists the chemical dilution used and the dosing rate to each cell.

Table 1.2 Exsan 2012-V Toxicity Testing Schedule

Chemical	Chem. Dilution Factor	Use	1x Dose	2x Dose	4x Dose	8x Dose
Exsan 2012-V	10	ml	0.49	0.97	1.95	3.89
		ppm	100	200	400	800

Dose: (ml) is the amount of diluted sample to be used per cell; (ppm) is the chemical concentration per cell. (1X) = the design average use in the plant. (2X) = 2 times the average use rate, (4X) = 4 times the average use rate, and (8X) = 8 times the average use rate.

RESULTS:

The results are presented in two tables and two graphs. The total gas production and gas production rate of Run 1 are used as a Reference throughout the toxicity test. If, in Run 2 or 3, the total gas production or gas production rate of a cell decreases by more than 10% of its Reference, the chemical is said to be inhibitory to the anaerobic bacteria at the dosage of the effected cell if the gas production increases significantly with the removal of the chemical in Run 4. If the gas production of the effected cell does not significantly increase with the removal of the chemical in Run 4, the chemical is said to be toxic to the anaerobic bacteria at that dosage rate.

The results of the test are presented below in Tables 2.1 and 2.2.

1x dosage rate (Cell1): The gas productions and gas production rates did not decrease more than 10% of their references. Therefore, Exsan 2012-V is not toxic at the 1x tested dosage rate.

2x dosage rate (Cell 2): The gas productions and gas production rates did not decrease more than 10% of their references. Therefore, Exsan 2012-V is not toxic at the 2x tested dosage rate.

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4x dosage rate (Cell 3): The gas productions and gas production rates did not decrease more than 10% of their references. Therefore, Exsan 2012-V is not toxic at the 4x tested dosage rate.

8x dosage rate (Cell 4): The gas productions and gas production rates did not decrease more than 10% of their references. Therefore, Exsan 2012-V is not toxic at the 8x tested dosage rate.

Table 2.1 Total Gas Production (ml) For Exsan 2012-V

	Chemical Con.	Run 1 Run 1 Reference	Run 2 Run 2 Test Conc.	Run 3 Run 3 Test Conc.	Run 4 Run 4 Reference
Cell 1	1X Exsan 2012-V	755	770	797	782
Cell 2	2X Exsan 2012-V	727	752	775	764
Cell 3	4X Exsan 2012-V	714	756	772	737
Cell 4	8X Exsan 2012-V	723	862	822	724

Table 2.2 Maximum Gas Production Rate (ml/hr) For Exsan 2012-V

	Chemical Con.	Run 1 Run 1 Reference	Run 2 Run 2 Test Conc.	Run 3 Run 3 Test Conc.	Run 4 Run 4 Reference
Cell 1	1X Exsan 2012-V	63	72	80	80
Cell 2	2X Exsan 2012-V	61	69	78	77
Cell 3	4X Exsan 2012-V	59	68	61	61
Cell 4	8X Exsan 2012-V	58	70	62	55

CONCLUSIONS:

The above Tables and attached graphs indicate that Exsan 2012-V was not toxic or inhibitory to the anaerobic bacteria at the 1x – 8x tested dosage rates (100 – 800 ppm). A summary of the test results is given below in Table 3.1.

This test only measures the acute toxic effects of the chemical on the anaerobic bacteria. It does not measure the chronic effects of the chemical on the bacteria nor does it measure the potential toxicity of this compound when combined with other compounds that are or may be used in the facility.

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Table 3.1 Toxicity Test Summary

Exsan 2012-V	1x	2x	4x	8x
Chemical Conc.	100 ppm (485 L/d)	200 ppm (970 L/d)	400 ppm (1940 L/d)	800 ppm (3880 L/d)
Toxicity Finding	Not Toxic	Not Toxic	Not Toxic	Not Toxic

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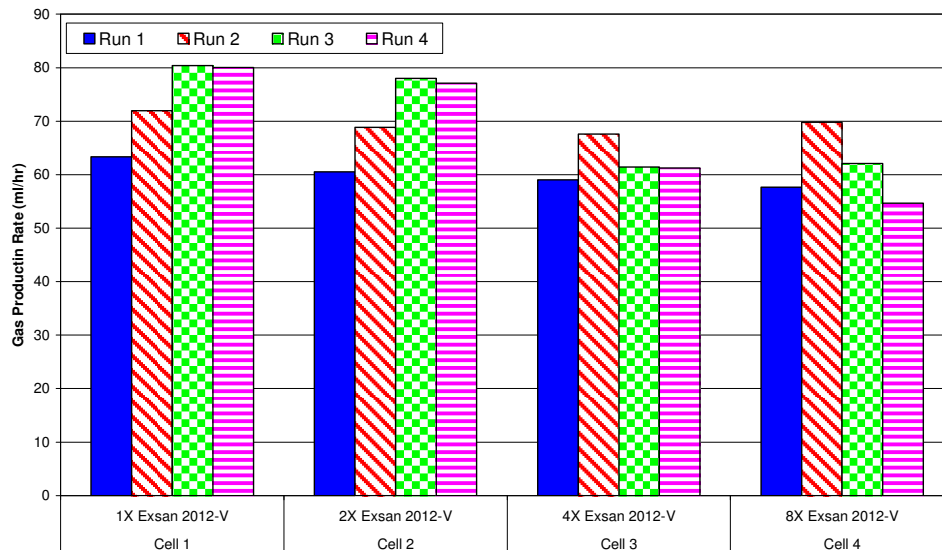
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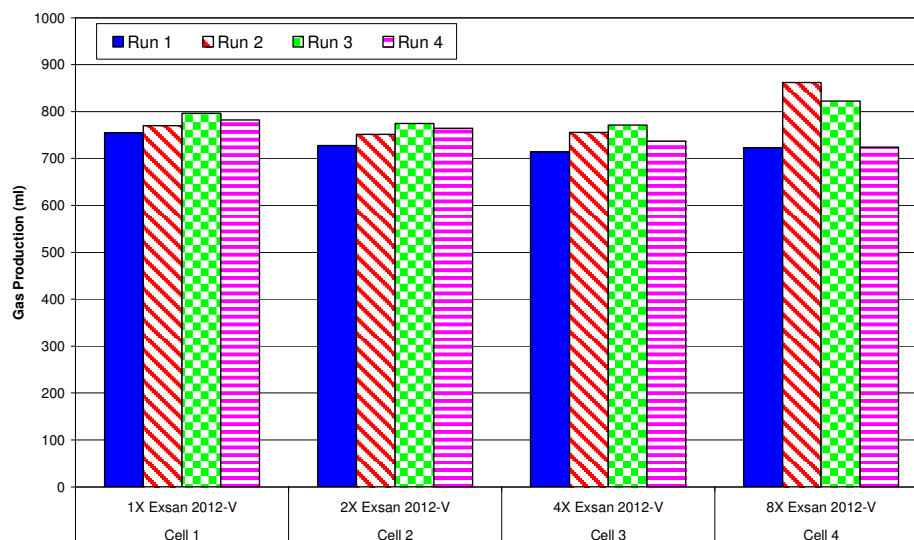


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**Exsan Toxicity Test (August 2011)
2012-V
Gas Production Rate**



**Exsan Toxicity Test (August 2011)
2012-V
Gas Production**



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