

**VERDESIS references**  
**Siloxanes filter**

### 1. Introduction

Verdesis has developed a unique expertise in the field of bad quality biogas

- Siloxane elimination
- H<sub>2</sub>S elimination
- Methane enrichment

**The added value from Verdesis is in the development of turnkey project and the follow up of the process to give a guaranty on the efficiency of the biogas treatment.** The philosophy of Verdesis is not to bring the biogas in the specification of the engine manufacturer, which leads to keep highest maintenance cost and severe loss of revenues because of the high frequency of service.

The commitment of Verdesis for a similar cost to other biogas treatment is to bring the biogas to a quality similar to natural gas, which leads to the minimum possible of maintenance cost with very little down time during the year.

In this context, Verdesis ensure to the customer higher revenues with a higher reliability due to less frequent oil change or major overhaul.

### 2. Site description: Biffa – Braine le Château - Belgique

- |                          |   |
|--------------------------|---|
| - Electrical power       | = 3200kW (Deutz engine)                         |
| - Methane level          | = [44% : 48%]                                   |
| - CH <sub>4</sub> flow   | = 2500m <sup>3</sup> /h                         |
| - biogas pressure        | = [200mb – 350mb]                               |
| - Max temperature biogaz | = 60°C  |
| - Total V.O.C.           | = 1100mg/m <sup>3</sup> – 1200mg/m <sup>3</sup> |
| - H <sub>2</sub> S       | = 60 mg/m <sup>3</sup>                          |
| - Siloxanes + silanol    | = 42 mg/m <sup>3</sup>                          |

### 3. Installed equipment

- Water chiller to get biogaz temperature below 5°C
- Water demister
- Automatic condensats drain
- Passive biogas reheat system
- Skid with two inox vessels

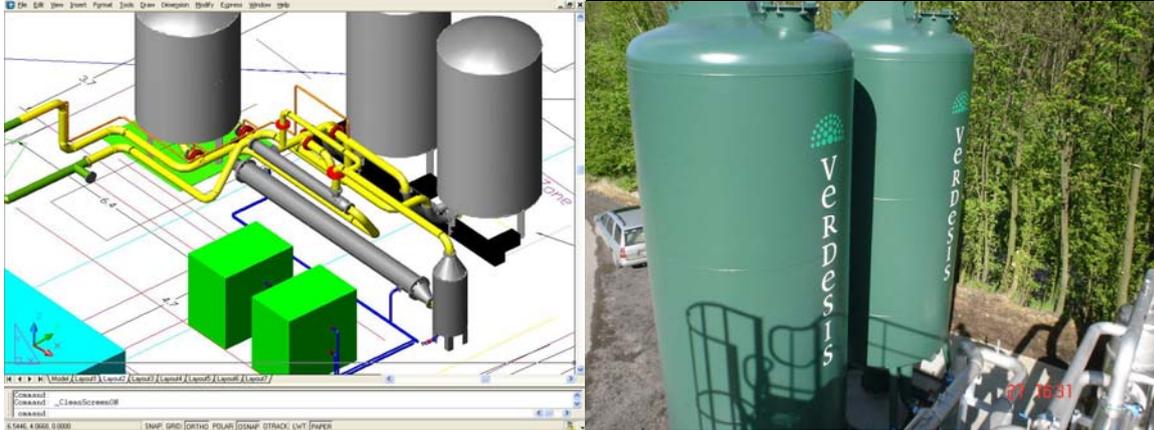
**Verdesis is distributor of AFT in Europe of Activated Graphite SAG™, which allows filtering the biogas with very different results.** The best activated carbon allows reducing the silanol and disiloxanes, which are present in high quantity whenever there is siloxane on landfill biogas. Activated Graphite can remove completely (below 0.005mg/m<sup>3</sup>) any siloxanes during the complete cycle. In addition, the activated carbon has an effect to remove any V.O.C. except a few like the freon which are no threat for the engines.

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Measurement achieved on the site on activated carbon and activated graphite have shown the excellent quality of activated graphite SAG™. These results have proved the higher loading rate for the activated graphite as well as the unique filtration capability. These results highlight the results achieved in USA where the engine such as Waukesha, Deutz, Jenbacher or Caterpillar are using Activated Graphite **SAG™** and the maintenance program went very similar to natural gas.



#### 4. Results & measurements

During the pilot phase: the siloxanes are analyzed each week

<b>Analyses</b>	<b>Biogas brut</b>	<b>Activated carbon</b>	<b>Activated Graphite</b>
	<i>Conc.</i> <i>µg/m3</i>	<i>Conc.</i> <i>µg/m3</i>	<i>Conc.</i> <i>µg/m3</i>
	130 V.O.C. components	80 V.O.C. components	15 V.O.C. components
SILANOL, TRIMETHYL	12,000	660	< 5,0
DISILOXANE, HEXAMETHYL	6,000	450	< 5,0
TRISILOXANE, OCTAMETHYL	170	< 5,0	< 5,0
CYCLOTRISILOXANE, HEXAMETHYL	1,100	< 5,0	< 5,0
CYCLOTETRASILOXANE, OCTAMETHYL	21,000	< 5,0	< 5,0
CYCLOPENTASILOXANE, DECAMETHYL	1,600	< 5,0	< 5,0
TETRASILOXANE, DECAMETHYL	< 5,0	< 5,0	< 5,0
PENTASILOXANE, DODECAMETHYL	< 5,0	< 5,0	< 5,0
SILANE, TETRAMETHYL	< 5,0	< 5,0	< 5,0

#### 5. Verdesis responsibility in the project.

Feasibility study	X
Equipment design	X
Equipment manufacturing	X
Equipment owned by Verdesis	X
Equipment commissioning – June 2003	X
Biogaz measurements	
Vessels change management	X
Post treatment management	X