SEPARATE

"Enabling market uptake of innovative separation and cleaning solutions for material recycling of all product groups contained in bio-wastes and MSW"

D.2.4

Analytical capabilities developed

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Executive summary

Experience so far has shown that the potential customers for the SEPARATE Waste System find the offer of this innovative set of technologies very appealing but refrain from buying because they want to know specifically what the SEPARATE technologies do to their own waste, in their country operating in their conditions.

They usually find it difficult to believe that the results from treating different waste in another context with the same technology will lead to similar results. Hence, they are particularly interested to understand more specifically what happens with the heavy metals, what is the potential biogas yield, the methane content, how dry is the dry fraction, etc. when treating their own waste.

The main aim of Work Package 2 "Long and short-term tests and analytical reports" is to address this major market barrier by carrying out test of "local" waste with a mobile test machine and by getting the incoming and outgoing waste streams analysed during a range of long-term and short-term tests on-site.

As a first step, Task 2.4 consists of the development of a range of analytical capabilities at the premises of db technologies BV for the most common tests in order to be able to quickly do own analyses for potential new customers in the future. db technologies BV has therefore set up its own laboratory and has bought a range of small equipment to carry out tests out analyses on dry matter, organic matter, ash and moisture.

This report presents the work that db technologies BV as a leader of Task 2.4 "Building up own analytical capabilities" has undertaken in the first twelve months of the project (September 2013 – August 2014).

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1. The principle

By doing local tests with the SEPARATE Waste System, potential customers can see with their own eyes what is happening with their different waste streams through the treatment. While optical results already give a good indication, they have to be confirmed with real figures and data.

To this end, a two-pronged approach has been chosen to get the relevant data:

- Development of a range of analytical capabilities for DB for the most common, basic parameters enabling DB to quickly do own analyses for potential new customers;
- Independent renowned scientific laboratories to carry out comprehensive analysis of the different waste streams covering a wide range of parameters (see Annex I) during the long-term tests of the SEPARATE project.

For each of the different waste streams, samples will be collected to be analysed at different stages of the treatment process. Samples will be taken from the original incoming waste to see how the situation was before treatment. After the separation by the press, samples will be collected from both the dry and wet fraction.

For the incoming waste, the dry and the wet fraction, different kind of parameters will be analysed as outlined in Annex I. These different parameters can be divided into more or less 'simple' basic parameters and more complex parameters. The basic parameters will be analysed by DB with the help of the new analytical equipment that has been bought. The more difficult and complex analysis will be carried out by an external certified laboratory.

2. Waste streams

In principle, DB can analyse all available waste streams according to basic parameters such as dry matter, organic matter, ashes and moisture content. During the SEPARATE tests, we are dealing with the following waste streams:

- Organic mono-streams
- Bio-waste
- MSW unsorted

Accordingly during test period of the project additional waste streams can show up which will be analysed as well with this equipment and on these basic parameters.

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3. Analysis and parameters

The new analytical equipment is enabling DB to immediately assess the test samples of waste from a specific client. The basic parameters comprise:

- Dry matter
- Organic matter
- Crude ash
- Moisture

With these basic parameters a mass balances can be established which customers need to run and adjust their equipment. Among other, it allows them to understand the moisture content, the viscosity and the amount of organic matter that can be fermented (or composted). For example, a low percentage of organics with high ash content would reveal that only a low gas yield can be achieved in the anaerobic digestion process.

By executing this basic analysis, potential clients can get directly a very good impression of how the separation will be according to the relevant waste stream.

To obtain more detailed data, the samples have to be sent to an external and certified laboratory which will undertake:

- Fermentation test (biogas yield, CH_4);
- Minerals + heavy metals;
- Caloric value for incoming waste and dry fraction;
- Contaminants like small pieces of glass, plastic and stones.

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4. Analytical equipment

To establish the analytical capabilities of DB for the most common parameters, the following equipment has been bought:

4.1 Small container unit laboratory

This small container unit is fully made of steel and has one door and one window which can be closed by a manual roller-screen. The measurements are about 3,0 x 2,4 x 2,5 meter (lxwxh). Inside the unit there are electricity connections, one small heater and the floor is covered with canvas which is easy for cleaning. On the walls a kind of laminate plates is fastened.

Figure 4-1: Pictures of the container unit

In the small container unit the equipment is installed like the furnace, incubator and scale. These equipment is needed to execute the basic analysis.

Figure 4-2: Pictures of the circulations furnace and incubator

4.2 Laboratory items

In addition to the above mentioned container unit and necessary equipment, the following smaller additional consumable articles have been purchased:

- buckets for sample material;
- porcelain crucibles;
- spatulas;
- gloves.

These are necessary and needed to get the work done.

Annex I: Test analysis criteria

1 INPUT WASTE

No.	Sample	Analysis / Parameter	Requirements	Test Method
1	**Incoming waste**	**Physico-chemical characteristics**		
		Total solids		
		Volatile solids		
		Ash		
		Moisture content, %		EN 13040
		Physical contaminants		
		Physical contaminants (glass, metal, plastic)		
		Stones + inert material		
		Caloric value (gross + nett)		
		Bulk density		
		Potentially toxic elements (on dry weight basis)		
		Arsenic (As), mg/kg	≤ 10	AOAC 975.03 (B) (b)
		Chromium (Cr), mg/kg	≤ 50	EN 13650
		Copper (Cu), mg/kg	≤ 200	EN 13650
		Lead (Pb), mg/kg	≤ 100	EN 13650
		Mercury (Hg), mg/kg	≤ 0.15	ISO 16772
		Nickel (Ni), mg/kg	≤ 50	EN 13650
		Zinc (Zn), mg/kg	≤ 300	EN 13650
		Cadmium (Cd), mg/kg	≤ 3	EN 13650

2 OUTPUT AFTER PRESS

2a	**Dry fraction**	**Physico-chemical characteristics**		
		Total solids		
		Volatile solids		
		Ash		
		Moisture content, %		EN 13040
		Physical contaminants		
		Physical contaminants (glass, metal, plastic)		
		Stones + inert material		
		Caloric value (gross + nett)		
		Bulk density		

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No.	Sample	Analysis / Parameter	Requirements	Test Method
2b	Wet fraction	**Physico-chemical characteristics**		
		Total solids		
		Volatile solids		
		Ash		
		Moisture content, %		EN 13040
		pH + EC		EN 13037
		COD		
		BOD5		
		Nitrogen (N)		EN 13654-2
		Phosphorous (P)		
		Potassium (K)		
		Calcium (Ca)		
		Magnesium (Mg)		
		Physical contaminants		
		Physical contaminants (glass, metal, plastic)		
		Stones + inert material		
		Fermentation / biogas test		
		Fermentation/biogas test incl. CH_4-ration (GB21)		
		Potentially toxic elements (on dry weight basis)		
		Arsenic (As), mg/kg	≤ 10	AOAC 975.03 (B) (b)
		Chromium (Cr), mg/kg	≤ 50	EN 13650
		Copper (Cu), mg/kg	≤ 200	EN 13650
		Lead (Pb), mg/kg	≤ 100	EN 13650
		Mercury (Hg), mg/kg	≤ 0.15	ISO 16772
		Nickel (Ni), mg/kg	≤ 50	EN 13650
		Zinc (Zn), mg/kg	≤ 300	EN 13650
		Cadmium (Cd), mg/kg	≤ 3	EN 13650

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