

# The Incubation Test - Development of a Test Method Describing the Biological Reactivity of Mechanically-Biologically Pretreated Waste

*Erwin BINNER, Alexander ZACH*

Universität für Bodenkultur Wien (University of Agricultural Sciences, Vienna)

IWGA, Department Waste Management

Nußdorfer Lände 29-31, A-1190 Vienna, Austria

Tel.: ++43-1/ 318 99 00

e-mail: Erwin Binner <h526a1@edv2.boku.ac.at>

## Abstract:

The Austrian Landfill Ordinance allows the disposal of mechanically-biologically pretreated wastes in a so-called „Massenabfalldeponie“, if their calorific value is less than 6,000 kJ/kg DM. The calorific value describes the potential energy gained in an incineration process but is not intended to describe the reactivity. In 1994 we started to develop an anaerobic test method (incubation test) describing the gas-generating potential of MBP-wastes. This test method allows to reproduce a majority of "natural conditions" in the laboratory. Large sample sizes (> 1 kg DM), robust test conditions and easy handling ensures good reproduction of results even for the purpose of self control in MBP-facilities.

Two research programs (1996 to 1999) sponsored by the Austrian Ministry of Environment showed, that the results of the **incubation test** (gas production **GS<sub>21</sub>**, test-duration 21 days) correlate significantly ( $r = 0.956$ , 27 samples of well pretreated wastes) to the whole gas-generating potential (gas production in 240 days) as well as to the **respiration activity** test (**AT<sub>4</sub>**, test-duration 4 days,  $r = 0.912$ , 27 samples).

For the incubation test a moist fresh sample sieved to  $\varnothing$  20 mm with approximately 1.5 kg dry matter is saturated to water-holding capacity and then incubated in a glass reactor under anaerobic conditions at 40°C (water bath). Gas generation is measured by a so-called "eudiometertube" and calculated to normal-conditions (0°C, 1013 mbar). Because of the big amount of sample only 2 repetitions are necessary. Even though gas generation is often not yet finished after 240 days, it is still possible to make an adequately accurate assessment after 21 days.

In contrast to the fermentation test (50 g moist fresh sample ground to  $\varnothing$  10 mm, diluted up to 300 ml) the incubation test does not need inoculation. Normally the anaerobic degradation process starts very soon, if waste is sufficiently pretreated. However, untreated or very shortly treated wastes often show long lag phases because of acidification, which may pretend low reactivity. Lag-phases and low reactivity can be recognized by different curves of cumulative gas-generation, by measuring pH-value and analyzing the methane content in the generated gas. Concave curves (Fig.1), pH-values lower than 6,5 and methane contents < 55 % are typical for lag-phases. Convex curves, pH-values > 7 and methane contents > 60 % characterize low reactive materials. If lag-phases occur, test duration must be extended.

The advantages of the incubation test are:

- no inoculum needed (no problems with preparation and storage of inoculum)

- good reproduction because of the large amount of sample (1.5 kg DM)
- for each sample only duplicate analysis is sufficient (2 test cells - in contrary to the fermentation test where 7 test cells are necessary)
- well pretreated materials still produce measurable amounts of gas – in contrary, in the fermentation test gas amounts are hardly detectable due to the low amount of sample

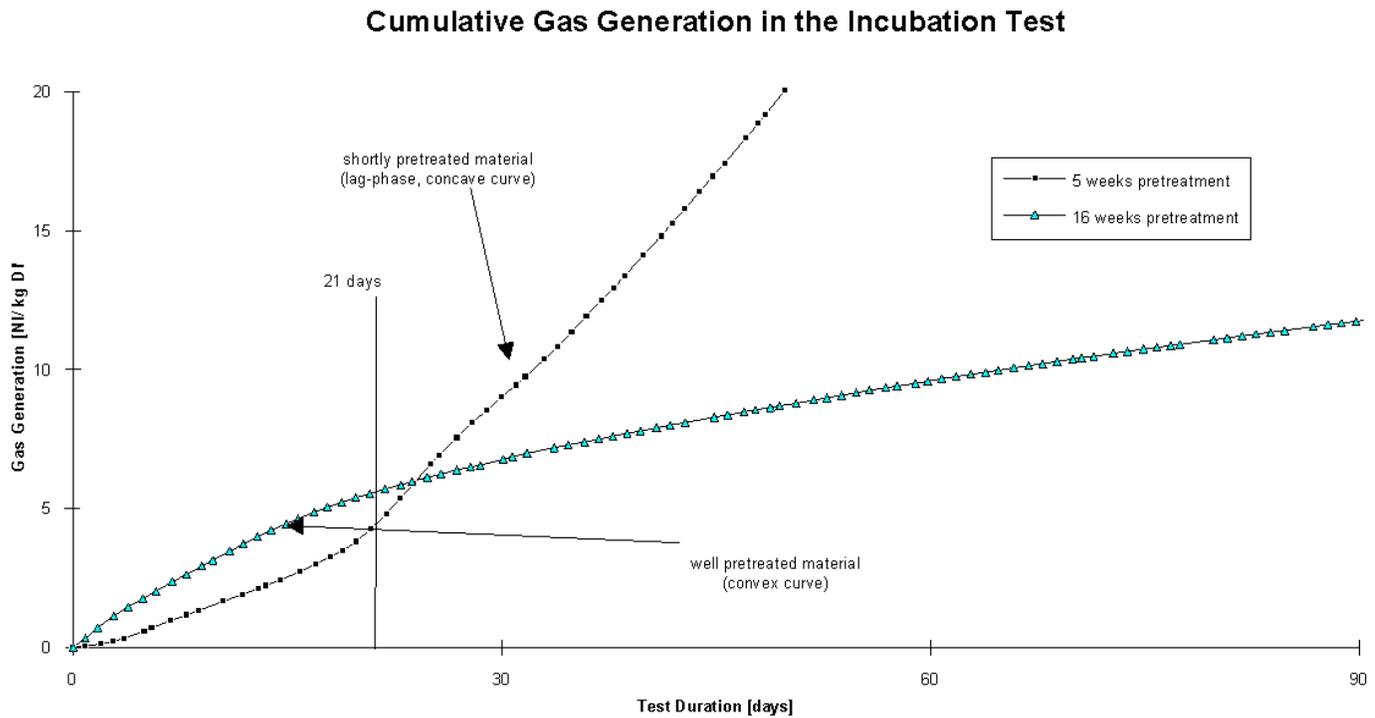


Fig. 1: Cumulated gas generation in the incubation test. The different types of the curves allow to recognize either lag-phases (concave curve) or low reactivity (convex curve).