



Submission to the

Environmental Protection Agency

On

**Municipal Solid Waste Pre-treatment & Residuals Management
An EPA Technical Guidance Document**

From:

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1. Introduction

This submission examines the stability standard for stabilised biowaste when it is landfilled. This submission will examine the following:

- Stability standards in other EU Countries,
- Different stability requirements of MBT & source separated compost,
- The background to the environmental side effects of landfilling,
- Estimation of diversion of SRW based on biodegradability,
- Stability methods & sampling,
- Creating incentives for landfill diversion.

1.1 Definitions

The term 'biowaste' is commonly used in reference to source separated biodegradable materials and also in residual organic waste management as 'stabilised biowaste'. Cré recommends that in residual organic waste management that the stabilised biowaste definition be changed to 'Stabilised Residual Waste' or abbreviated as SRW. For this document Cré is using the abbreviation – SRW.

1.2 Stability Standards in Other EU Countries

The stability standard in Germany is an AT₄ limit of 5mg O₂/g dry matter (d.m). In Austria the standard is an AT₄ limit of 7mg O₂/g d.m. In Italy the stability method used is the Dynamic Respiration Index (DRI) with a limit of 1,000 mg O₂/kg VS/h.

The DRI has a significant advantage over the AT₄ method as it uses samples as big as 80 litres while the AT₄ uses only a few litres. The sample size taken should be large. This is to ensure that a relatively high degree of sampling is conducted to account for variability in the waste stream.

In the UK two tests used are the Dynamic Respiration and the Biochemical Methane Potential. The dynamic respiration (DR4) test is an aerobic method of determining organic waste biodegradability based on the standard methods (ASTM D5975-96, ISO 14855:1999). Typically the test takes four days to run.

The Biochemical Methane Potential (BM100) test is an anaerobic method of determining the biogas (landfill gas) production from the organic matter content of the sample. The biological test takes place under anaerobic conditions and therefore more closely resembles the conditions within a landfill. However, this test typically takes 100 days to run. It is recommended that the Irish EPA should consider this test method to determine the potential greenhouse gas production from MBT SRW.

1.3 Stability Standards in the EPA Technical Document

The Irish EPA discussion document (Municipal Solid Waste Pre-treatment & Residuals Management An EPA Technical Guidance Document) recommends the AT₄ limit of 10mg O₂/g d.m. or the Dynamic Respiration Index limit of 1,000 mg O₂/kg VS/h. The AT₄ limit is based on the draft biowaste directive. Cré in communication with experts in Europe has learnt that the AT₄ limit of 10 mg O₂/g d.m. was 'picked from the air' and was just based on a debate between individual consultants back in 2001. It is recommended that the EPA use an AT₄ limit value that is used by other countries such as Germany & Austria. A DRI test was included as a method in the second draft of the EU biowaste directive. However, it is very expensive and complicated to conduct. It is recommended that this test method is not used in Ireland.

1.4 Different Stability Requirements of MBT & Source Separated Compost

There are clear distinctions on the stability requirement for compost manufactured from source separated materials and the stability requirement of MBT SRW used in a landfill.

Source separated compost is a 'living material' that provides benefits for soil such as nutrients, organic matter, microbial bioiota and disease resistant properties. The compost has to have a

certain level of stability and maturity and does not need to be biologically inert. If it were biological inert many of the attributes associated with source separated compost would be lost.

The purpose of using MBT SRW in a landfill is to ensure that there is no fermentability/greenhouse gas production under anaerobic conditions within a landfill. As such the MBT SRW has to be biologically inert. This means that the level of stability has to be much stricter than the level of stability required of source separated compost.

1.5 Estimation of Diversion of SRW based on Biodegradability

The aim of the stability requirements of landfilled SRW is to ensure that the material should be biologically inert so that there is no fermentability/greenhouse gas production potential while disposed of in a landfill.

An AT₄ reading of 5mg O₂/g d.m according to Table 1 has a reduced biodegradability of 80-90%. The percentage of the MBT input BMW that has been diverted from landfill should be determined by estimating the percentage reduction in biogas production between MBT input and the MBT SRW landfilled. For example if 1000kg of MBT SRW has a reduced biodegradability of 80%, then 800 kg is counted as diversion. The other 200kg would be counted as disposal and not recovered.

2. Environmental Side-Effects of Landfilling

For some time, studies on the environmental side-effects of landfilling have focused on the importance of cutting the maximum possible extent of the fermentability of the waste to be disposed of. As fermentable waste undergoes anaerobic conditions, it produces biogas, mainly composed of methane (which is a powerful greenhouse gas, and cannot be fully captured by drainage systems); this in turn increases the chemical "strength" of leachate, causes settlements in the shape of the landfill. All this results in a long-term threat to groundwater and air quality, and further produces a constraint for site reclamation¹.

Waste which is destined for landfill should be treated to a high standard in order to achieve the maximum possible reduction of the negative side effects of landfilling.

The first noteworthy attempt to define acceptance – with reference to "stability" – was made by Germany, which in the T.A.Si. (Technische Anleitungen – Siedlungsabfälle, Technical Guidelines on Household Waste) set a threshold at 5% volatile solids for the waste to be landfilled. This was factually mandating incineration as the only possible pre-treatment.

This approach was disputed by researchers, waste managers and some local authorities, since "volatile solids" include also non-biogenic materials such as plastics, and also biogenic ones not so easily degradable (wood, textiles); such materials of course do not increase fermentability of the landfilled waste, its capability to produce biogas and leachate. Hence, this approach was distorting the goals of proper treatment and related treatment options. Under the general standpoint of losing fermentability/achieving stability of the waste to be landfilled, research has shown the excellent performances of mechanical-biological treatment (MBT) – the so called "cold" pre-treatment, be it aerobic or anaerobic – in order to cut fermentability. The Landfill Directive itself lists "Biological Treatment" among suitable options for pre-treatment.

Points of main concern when it comes to landfilling, such as the potential for production of biogas and the chemical "strength" of leachate, may be properly tackled through MBT. The following Table 1 shows achievable values.

Table1. Effects of Biological Pre-treatment

Feature	Final Effect [source]	% reduction (as compared to initial)
Respiration rate	AT ₄ = 5 mg O ₂ /g d.m. (96h) DRI = about 1000 mg o ₂ /kg VS.h	[1] 80-90% [2]
Gas Production Potential	20 L/kg d.m. 40 L/kg d.m.	[1] 80-90% [2]
Volume	Final density (compacted): 1.2-1.4 t/m ³ Mass loss (due to mineralisation): 20-40%	[1] up to 60% [2]

[1] Leikam K., Stegmann R., 1997 *Landfill behaviour of mechanical-biological pretreated waste*. ISWA Times, 3/97, pp.23-27.

[2] ADANI F., 2001 Personal Communication (University of Milan) in Favoino, Enzo. *Drivers, trends, strategies and experiences for proper management of biowaste and the role of MBT*. Working Group on Composting and Integrated Waste Management Scuola Agraria del Parco di Monza, Italy.

Building on this scientific evidence, Germany in January 2001 issued new regulations (Ablagerungsverordnung, Ordinance on Disposal) whereby biological treatment was considered suitable for pre-treatment, in as much as it shows to be "equivalent" to the effects of reducing fermentability as required by T.A.Si. According to provisions set out by the new regulation, residual fermentability may be tested, for waste which has been treated biologically, through respirometry (Atmungsaktivität, with adoption of the AT₄ index, i.e. the oxygen uptake in 4 days) and the potential biogas production.

¹ Source: Favoino, Enzo. *Drivers, trends, strategies and experiences for proper management of biowaste and the role of MBT*. Working Group on Composting and Integrated Waste Management Scuola Agraria del Parco di Monza, Italy.

A similar, concurrent evolution may be described in the case of Austria, where the Deponieverordnung (Landfill Ordinance) at the start set in place the restriction that "No material may be landfilled if it has higher organic carbon content than 5%". This exemption was explicitly designed for waste originating from mechanical-biological pre-treatment, whose performances, in terms of reduced fermentability, have to be tested through respirometry.

Other countries are now set to take a similar approach, with particular reference to definitions of suitable test methods to test fermentability and define acceptance at landfill sites, in order to fulfil requirements of the Landfill Directive. Italy has tackled the subject in the frame of a decree on biological treatment and the destination of waste thereby treated; guidance has already been issued by the Committee of Regions, which endorses the concept of "assessing fermentability by means of respirometry" in order to determine whether MBT treated waste is still to be considered "biodegradable" (when a DRI <1000 is met, the waste is not considered "biodegradable" any more); many local regulations issued by regions, e.g. Veneto, Tuscany, Lombardy, have already enforced such approach.

The issue is being tackled also by the UK in the context of the Landfill Allowances Trading Scheme (LATS) that equally bases the assessment of residual "biodegradability" of MBT-treated waste on determination of respirometry and the biogas potential production.

3. Sampling

3.1 Sample Size

It is widely recognised that SRW is not a homogeneous material. As such a large sample size needs to be taken to ensure that the analysis on stability is somewhat representative.

3.2 Frequency

Each SRW batch should be tested when used in a landfill. The Environment Agency in the UK conducted research² and determined that a relatively high degree of sampling was needed to account for variability in the MBT waste stream.

3.3 Sample Taker

To ensure a level of confidence in the system, officers of the EPA Office of Environment Enforcement should act as independent sample takers. The cost of this should be borne by the organisation that generated the SRW. If independent sample takers are not used, what is to prevent unscrupulous operators from pawning off samples of high quality compost as SRW for laboratory analysis?

3.4 Standard Methods for Sample Taking

Standard procedures for sample SRW should be developed. The number of samples of SRW taken must be statically representative of the size of the SRW batch.

3.5 Sample Failure

If the SRW batch fails the laboratory method for stability analysis, the tonnes of MBT material landfilled should not be counted as diversion for meeting the EU Landfill Directive but should instead be treated as tonnes for disposal. The normal landfill disposal and landfill levy should apply to every single tonne in the SRW failed batch.

² Guidance on monitoring MBT and other pre-treatment processes for the landfill allowances scheme (England and Wales). Environment Agency, August 2005

4. Creating the Incentive for Landfill Diversion

At the end of the day, Ireland has significant ground to make up to divert biodegradable municipal waste (BMW) from landfills. At the moment a suite of initiatives are going to be used such as: increasing the landfill levy, a statutory instrument for commercial premises to segregated food waste, circular WPPR 17/08 to Local Authority City & County Managers on "National Strategy on Biodegradable Waste Implementation of Segregated Brown Bin Collection for Biowaste and Home Composting" and the EPA consultation document on the pre-treatment of organic waste before landfilling.

Everyone in the industry agrees that there needs to be strong incentives for the diversion of BMW from landfills. Cré is proposing the following incentive for creating landfill diversion based on different stability limits on MBT SRW in each local authority district:

1. The stability limit should be the same as to what is already current practice in another EU country and not based on a now defunct 2nd draft of the biowaste directive. It is proposed that the German stability standard of AT₄ limit of 5 mg O₂/g d.m as the baseline requirement across all of Ireland to landfill stabilised MBT SRW.
2. In a local authority region where there has been a significant emphasis on source separation and has achieved the actual Landfill Directive diversion targets already, a more relaxed MBT SRW stability limit of AT₄ 7 mg O₂/g d.m should apply. This standard of AT₄ 7 mg O₂/g d.m. is the actual limit used in Austria and is not based on a now defunct 2nd draft of the biowaste directive.

Local authorities which have met the Landfill Directive diversion targets with source separate collection systems should be rewarded in that the remaining residual organic waste does not need to meet the more stringent stability limit of 5 mg O₂/g d.m but 7 mg O₂/g d.m. This would create an economic incentive for source separation. This would mean that they would not have to invest in additional requirements to stabilise the MBT SRW. It is extremely important that this proposal be examined in detail to ensure there are no potential loopholes in which the figure calculated for diversion by source separation cannot be manipulated.

This may become an economic driver to improve performances for separate collection, in so much that local authorities doing well may be subject to more lenient provisions for pre-treatment, or just be exempted altogether - pursuant to article 6(a) of the Landfill Directive, that reads:

"Only waste pretreated is landfilled. This provision may not apply to (...) any waste for which treatment does not contribute to the objectives of this Directive (...) by reducing the quantity of the waste or the hazards to human health or the environment"

Those local authorities already sorting out 75-80% of BMW by means of separate collection, have already minimised risks of landfilling, hence the possible exemption. There are examples of this exemption in Italy of <10% organics in residual waste in Veneto, Italy, and <25% BMW (including paper, food, fines) in residual waste in Piedmont, Italy.

5. Recommendations of this Submission

The following are some recommendations for the EPA to examine:

- The term 'biowaste' is commonly used in reference to source separated biodegradable materials and also in residual organic waste management as 'stabilised biowaste'. Cré recommends that in residual organic waste management that the stabilised biowaste definition be changed to 'Stabilised Residual Waste' or abbreviation as SRW.
- Cré is proposing the following incentive for creating landfill diversion based on different stability limits on MBT SRW in each local authority region:

(1) The stability limit should be the same as what is already current practice in other EU countries and not based on a now defunct 2nd draft of the biowaste directive. It is proposed that the German stability standard of AT₄ limit of 5 mg O₂/g d.m be adopted as the baseline requirement across all of Ireland to landfill stabilised MBT SRW.

(2) In a local authority region where there has been a significant emphasis on source separation and has achieved the actual Landfill Directive diversion targets already, a more relaxed MBT SRW stability limit of AT₄ 7 mg O₂/g d.m should apply. This standard of AT₄ 7 mg O₂/g d.m. is the actual limit used in Austria and is not based on a now defunct 2nd draft of the biowaste directive.

Local authorities which have met the Landfill Directive diversion targets with source separate collection systems should be rewarded in that the remaining residual organic waste does not need to meet the more stringent stability limit of 5 mg O₂/g d.m but 7 mg O₂/g d.m. This would create an economic incentive for source separation. This would mean that they would not have to invest in additional requirements to stabilise the MBT SRW. It is extremely important that this proposal be examined in detail to ensure there are no potential loopholes in which the figure calculated for diversion by source separation cannot be manipulated.

This may be an economic driver to improve performances for separate collection, in that local authorities doing well may be subject to more lenient provisions for pre-treatment, or just be exempted altogether - pursuant to article 6(a) of the Landfill Directive, that reads:

"Only waste pre-treated is landfilled. This provision may not apply to (...) any waste for which treatment does not contribute to the objectives of this Directive (...) by reducing the quantity of the waste or the hazards to human health or the environment".

- An AT₄ reading of 5mg O₂/g d.m according Table 1 has a reduced biodegradability of 80-90%. The percentage of the MBT input BMW that has been diverted from landfill should be determined by estimating the percentage reduction in biogas production between MBT input and the MBT SRW landfilled. For example an AT₄ limit of 5 mg O₂/g d. is met, if 1000kg of MBT SRW has a reduced biodegradability of 80%, then 800 kg is counted as diversion. The other 200kg would be counted as disposal and not recovered.
- It is recommended that the EPA use an AT₄ limit value that is used by another country such as Germany or Austria.
- A DRI test was included as a method in the second draft of the EU biowaste directive. However, it is very expensive and complicated to conduct. It is recommended that this test method is not used in Ireland.
- Assessment of residual "biodegradability" of MBT-treated waste should be determined on respirometry and the biogas potential production (e.g. BMI100 method).
- Sampling of MBT SRW should be conducted on each batch.
- The sample size taken should be large. This is to ensure that a relatively high degree of sampling is conducted to account for variability in the MBT waste stream.
- To ensure a level of confidence in the system, officers of the EPA Office of Environment Enforcement should act as independent sample takers of MBT SRW for stability analysis.
- If the SRW batch fails the laboratory method for stability analysis, the tonnes of MBT material landfilled should not be counted as diversion for meeting the EU Landfill Directive but should instead be treated as tonnes for disposal. The normal landfill disposal and landfill levy should apply to every single tonne in the SRW failed batch.