APPENDIX B

ADDITIONAL INFORMATION ON COMPOSTING AND ANAEROBIC DIGESTION FACILITIES

April 2019

Question: How does typical finished compost from a standard aerobic composting facility compare to the compost typically produced from composted anaerobic digestion digestate?

An anaerobic digestion (AD) facility is able to partially break down the organic waste during the AD process and extract renewable energy (in the form of methane gas) that would otherwise be lost if material went straight to aerobic composting. Digestate is therefore already partially digested, which speeds up the composting process compared to an aerobic composting process. In general, a skilled compost plant operator will be able to analyze the feedstock coming into the facility, whether it is digestate or SSO, apply best practices to optimize amendment, pre-processing and process parameters, and achieve a high quality compost for unrestricted use from either source of feedstock.

In BC, the Organic Matter Recycling Regulation requires compost from any source to meet the same standards for unrestricted use. This implies that compost from digestate and from directly composted SSO could technically achieve the same standards.

In a 2017 publication called *Quality assurance of compost and digestate - Experiences from Germany*, the German Environment Agency stated that quality requirements for compost and digestate in Germany are identical, thus pointing to the conclusion that both have to and can meet the same standards (i.e., there should be no substantive difference between compost from digestate and compost from composting facilities). [1]

According to guidelines developed by WRAP UK, titled *Digestate and compost use in agriculture* (February 2016)[2], food-derived anaerobic digestate will typically have a much higher readily available nitrogen than aerobic compost, but aerobic compost will have significantly higher quantities of phosphate, potash, magnesium, and sulphur.

WRAP UK completed an analysis where they compared the nutrient content of food-based digestate against aerobic compost, and converted it to a cost value. In summary, the total value (per hectare) for food-based digestate was £103, while the value for aerobic compost was £128.The nitrogen value for digestate was higher, but the phosphate and potash values were higher for compost, resulting in a total overall higher value for aerobic compost. It should be noted that the analysis calculated the total value based on average fertilizer prices and the financial comparison is therefore specific to the UK.

The nutrient content of compost from digestate and from directly composted SSO will depend on the input mixture of feedstock and how it is amended by the operator. It can be expected that each batch will vary in nutrient content, but overall have value as a soil amendment. In most cases, compost is blended with sand, humus and other materials to prepare a marketable product. The soil blender will utilize the tested nutrient of the compost and prepare his blend for the proposed market appropriately. Compost from digestate and from directly composted SSO is expected to be equally useful for this purpose.

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[1] *Quality assurance of compost and digestate. Experiences from Germany* Publisher: German Environment Agency Section III 2.4 Waste Technology, Waste Technology Transfer Section I 1.2 International Sustainability Strategies, Policy and Knowledge Transfer Wörlitzer Platz 1 D-06844 Dessau-Roßlau Tel: +49 340-2103-0 info@umweltbundesamt.de Internet: www.umweltbundesamt.de As at July 2017, ISSN 2363-832X

[2] http://www.wrap.org.uk/sites/files/wrap/Digestate_compost_good_practice_guide_reference_version.pdf

The output volume of compost after an AD process (20%-30% of input) will be lower than from direct composting of SSO (28%-45% of input) because some of the organic matter will be consumed in the production of biogas.

Compost markets generally compete with natural products, such as peat moss, and are subject to market forces of supply and demand. Overall, prices for compost fluctuate but remain relatively low; generally, one can expect compost from any source to be under about $50 per tonne, excluding transportation.

Question: What is the difference between liquid and solid digestion?

Anaerobic digestion (AD) facilities use either a solid (dry or high-solids) or liquid (wet) AD system to process organic waste. Wet AD is the more traditional process and has been used for decades to treat wastewater treatment sludges and agricultural manures. More recently, the desire to digest source-segregated organics (SSO) or food waste has led to the development of dry systems. The material left over at the end of the wet and dry AD process is called digestate.

When SSO was first considered for AD, the well-established wet AD process was applied, and SSO had to be specially prepared (pre-processed). SSO from curbside collection have a solids content between 20-30% and the composition and consistency can vary greatly. Wet AD systems typically operate with a solids content of 10-15%, so that considerable pre-processing is required for the SSO, including dilution with water and pulping, in order to get the SSO in the consistency of a thick soup. Wet AD systems also require a very clean feedstock and any contamination (i.e., plastic bags, stones, glass, etc.) must be removed before the slurry enters the AD process.

Yard and garden waste is generally not suitable for wet AD because the solids content of the incoming feedstock is 40% or greater. The process does not break down lignocellulosic materials well, which comprise a substantial part of yard and garden waste. Therefore, the gas yields from yard and garden waste are generally low.

Dry AD systems are designed to process organic feedstock with a solids content between 25% and 40%. Unlike wet digesters that process pumpable slurries, dry AD systems can process solid substrates with or without very little addition of water. Dry AD systems can also process yard and garden waste. Dry AD systems are gaining popularity in North America and Europe because they are more forgiving on the type of collection required (i.e., many municipalities like to collect yard and food waste combined) and dry AD systems are much more forgiving of contamination in the feedstock (i.e., plastic bags, stones, etc.).

Among the Request for Expressions of Interest submissions to the Capital Regional District, three of the seven AD submissions specified the use of wet AD. Dry AD was preferred by the balance of submissions.

The digestate from an AD process can be a solid, semi-solid, or liquid, depending on the type of AD system used. With proper authorizations from environmental regulators, liquid digestate can be applied to agricultural land. Solid and semi-solid digestate is usually composted. One of the RFEOI submissions proposed the production on a digestate cake fertilizer through the use of a dewatering centrifuge.

In summary, both wet AD and dry AD processes can be applied; however, dry AD is generally preferred for SSO mixed with yard and garden waste. With wet systems, contamination in the feedstock must be removed before the AD process and can generally not accept yard and garden waste. Dry processes are more forgiving and can process contaminated feedstock; however, the contamination will just pass through the process and impact the digestate resulting in a contaminated end product, such as compost.

Question: Describe the typical quality of compost produced from composted anaerobic digestion digestate?

Digestate is the solid or semi-solid material left over at the end of the AD process, once any liquid effluents or percolates have been drained off. Depending on the AD process, the digestate may need further processing to stabilize it and remove pathogens. The most common method of stabilizing digestate is through composting.

Digestate from wet AD systems is usually dewatered to approximately 50% moisture content and further treated and used in a variety of ways, including agricultural land spreading as fertilizer (where allowed), composting, or drying to 10 to 15% moisture (85 to 90% solids) and pelletizing for use as fertilizer (AgroEnergien, 2012). Digestates from a dry AD system are often composted immediately after removal from the digester without dewatering and can be land applied once the compost is mature.

The quality of compost produced from digestate will depend on the quality of the feedstock entering the AD system. If there is contamination entering a dry AD process, the contamination will remain in the compost end product and, in fact, be more concentrated, since volumes of organics will be reduced during the AD process but contaminants will pass through the process with no change. Wet AD systems are usually sensitive to contamination; therefore, extensive up-front processing is required to remove contaminants before the actual digestion process.

An AD system utilizing clean organic feedstock should produce a clean, high-quality compost. This assumes that the compost facility is operated according to best practice and composting process parameters are adapted by the operator to the type and composition of the digestate and the desired characteristics of the compost end product.

This discussion precludes digestate that comes from the digestion of biosolids, since the composition and contaminant levels could be different from digestate coming from SSO as a sole feedstock.

Existing Commercial Composting and Anaerobic Digestion Facilities

Table 1 presents a list of the composting and AD facilities that are currently operating within Vancouver Island and the lower mainland (as far as Abbotsford). The table includes the type of technology each facility is using and Morrison Hershfield's current understanding of the status of each facility (i.e., open/closed/suspended). These facilities receive food scraps and or leaf and yard waste. Composting facilities processing only biosolids are not included.

Table 1: Major Composting Facilities Operating in Metro Vancouver and Vancouver Island

Vancouver Island Facilities			
Facility/ Operator	Technology Used	Technology Details	Comments on Status
Comox Valley Waste Management Centre (CVWMC)	Composting	Covered aerated static pile (ASP) using Gore membrane.	Open. This as a small-scale organics composting pilot facility (<5,000 tpy). Comox Strathcona Waste Management has received grant funding to design and build a regional organics processing facility. The project is scheduled to be completed by the end of 2020. At this point in the planning stage, the CVRD is planning for a facility using aerobic composting technology with a capacity up to 16,500 tpy. Planning for this facility is ongoing.
Chemainus Compost Facility, Coast Environmental	Composting	Covered ASP using Gore membrane.	Open. Capacity of 18,500 tpy. North Cowichan appealed a decision by the province that allows Coast Environmental to increase its processing capacity at its Chemainus facility.[3]
Fisher Road Holdings, DL Bins owns Fisher Road Recycling	Composting	Enclosed aerated static container using Herhof Cells, followed by outside composting with forced air (positive aeration).	Open. Capacity of 36,000 tpy.
Nanaimo Organic Waste Ltd.	Composting	Upgrading to an enclosed (in-tunnel) aerobic static pile process.	Open. Capacity to process 25,000 tpy.
Salish Soils, Port Mellon, Sunshine Coast	Composting	A covered ASP compost facility using the Gore Cover System.	Open. Capacity of 12,000 tpy[4].

[3] https://www.lakecowichangazette.com/news/north-cowichan-appeals-new-permit-for-expansion-at-chemainus-composting-facility/
[4] http://gibsons.ca/wp-content/uploads/2017/12/SCRD-Organics-Diversion-Strategy.pdf

Lower Mainland Facilities			
Facility/ Operator	Technology Used	Technology Details	Comments on Status
Anaconda Systems Limited Vancouver	Composting	In-vessel, followed by static pile.	Open. Capacity of approximately 12,000 tpy[5].
Ecowaste Industries Ltd. Richmond	Composting	Turned Windrow.	Open. Accepts only yard waste and wood waste.
Enviro-Smart Organics, Green for Life Environmental Delta	Composting	Covered ASP system.	Open. The facility is permitted to process 150,000 tpy[6].
Harvest Power	Anaerobic Digestion	Covered ASP after anaerobic digestion.	The facility is no long receiving organic waste.
Net Zero Waste Abbotsford	Composting	Gore membrane system inside a building for first composting phase (i.e., double enclosed system). Curing outdoors. Biofilter for air from building.	Open. Current capacity is <5,000 tpy (dry), however permit submission has been submitted for an expansion.
Orgaworld Surrey	Anaerobic Digestion	Dry anaerobic digestion in tunnels, composting of digestate in tunnels. All operations, including curing indoors.	Open. Permitted to process 115,000 tpy.
Hop Compost Vancouver	Composting	In-vessel, followed by Covered Static Pile.	Open. Capacity of 2,000 tpy.

[5] Presentation by Anaconda at Waste Management Association of BC Conference, Surrey, Feb 21, 2019.
[6] Andrew Marr, Metro Vancouver, at National Zero Waste Council webinar on Organics Disposal Bans, Dec 7, 2017.