A look at sorting and separating urban organic waste streams

Stepping up to the plate

Municipalities, businesses and residents increasingly choose to divert their organics from landfill-bound waste streams. It's the circular economy at its finest: what was waste becomes a resource. These organic materials, or feedstocks, then trundle down an evolving path: one that is shape-shifting each year as the relevant components to facilitate a closed loop of energy and nutrients – permits, capital to build and operate, operations to process the materials, and outbound markets to return the resulting products back into the grid and landscape – get aligned. Since feedstocks have such a large influence on the rest of this proverbial and literal food chain, Harvest wanted to dive deeper into characteristics that shape feedstock generation and collection and provide best practices for sorting with success.

This article focuses on urban organic waste streams. It assumes that all upstream efforts have been made to follow the US Environmental Protection Agency's organic waste hierarchy by reducing organic waste at the source and directing any remaining edible food towards human consumption. Also relevant is a general understanding of downstream processing technologies. Anaerobic digestion has two primary flavours: "high solids" which accommodates "stackable" feedstocks (think yard trimmings laced with pasta), and "low solids" digestion which accommodates "pumpable" feedstocks (think slurries of food scraps mixed with fats, oils and grease (FOG), wastewater treatment plants, or manures). Composting, the notable aerobic cousin of digestion, converts a range of yard trimmings and food scraps into nutrient-rich soil products.

Harvest's energy garden in Florida anaerobically digests organic feedstocks from a well-known theme park and area hotels, restaurants and businesses

> [Feedstocks are the tip of the spear that directly influence the rest of the organic waste processing pathway]

Fork it over: know thy audience

Wherever there are people, there is organic waste. When thinking about the flow of these wastes, it's helpful to define the waste generator and characterise the waste composition. Waste generators are typically grouped as follows:

- **Residential:** Homes and properties generating yard trimmings and kitchen scraps.
- **Commercial:** Grocery stores, restaurants, hotels and other business generating larger volumes of pre- and post-consumer food scraps as well as FOG.
- **Institutional, commercial, and industrial (ICI):** Concentrated populations such as schools, prisons, campuses, and hospitals; or food-related industries such as food processors, breweries, and dairies, all generating large volumes of organic waste.
- **Other:** Multi-family dwellings (housing with four or more units) and events (festivals, conferences) have their own unique characteristics.

In terms of the composition of wastes generated, not all rinds are created – or collected – equally. The following four drivers shape local policies and practices.

- **Energetic densities of food waste.** The same foods that make humans fat help anaerobic bacteria fart and burp. Those farts and burps, known as biogas, can make electricity, pipeline grade natural gas, or vehicle fuel. If you want to optimise biogas generation, be sure to get the donuts to digestion and leave the leafy greens for other technologies.
- **Volumes of food waste:** Large volumes of waste generated in a few locations are typically easier to manage than lots of smaller generators. But it's a balance: you don't necessarily want to get all of your eggs from one basket.

- **Geographic clusters:** Dovetailing with volumes, every hauler knows that a collection route in the same region is ideal because it efficiently shares the fixed collection costs associated with starting up a collection truck and driving it around town.
- **Capture rate versus contamination rate:** This can be tricky. The generator and the processor typically do a dance. The processor's ideal "clean" load of feedstock leads to lower processing costs (removing and disposing of contaminants), increased safety (associated with removing said contaminants from equipment), and optimal product quality (improved biogas yields and fertiliser products). However, the generator might value the ability to include contaminants. This balance is typically struck via acceptance specifications and tip fees.

Best practices for feedstock collection

Public-private partnerships help unlock organic diversion, bioenergy markets and soil fertility demands. Without this collaboration, development can get stuck in a chicken-and-egg situation: the public sector can't begin to collect organic waste without a local processor; private industry doesn't want to build (nor can it finance) a processing facility without a feedstock guarantee. A number of variables shape these partnerships, particularly around policies and permits. In regards to feedstock, the following practices support successful sorting:

1. **Get aligned.** Be clear about what materials the processor(s) can handle. Define these acceptance specifications early.
2. **Support upstream.** Give the upstream generators the tools they need to supply the desired feedstock. Best practices for sorting stations include:
   a. **Use pictures.** Images or even actual objects are more effective than text alone.
   b. **Point positive.** Use arrows to show where items should go.
   c. **Place your signs close.** Place your signs as close to the point of disposal as possible.
   d. **Colour coordinate.** Match sorting categories with recognisable colors.
   e. **Pair bins.** Create organics, recycling, and landfill bins together to maximise convenience.
3. **Start small.** It's easier to draw lines narrowly at first, then expand.

At its marquis anaerobic digester in Central Florida, Harvest Power took a hybrid approach to sourcing feedstock. A well-known theme park served as its first customer by guaranteeing fixed volumes of food scraps, biosolids and FOG. Harvest then built a facility with additional capacity and sourced the remaining feedstock from area hotels, restaurants and businesses that cater to the 50+ million visitors to Central Florida each year.

Looking Ahead

Organics recycling is appealing across North America. As an indicator, BioCycle's recently published data on residential food waste collection programs across the country estimates that the number of households with access to curbside food waste collection has doubled from 2014 to 2017 to over 5 million households.

California seems particularly ripe given its significant volumes of feedstocks and aggressive diversion policies. The American Biogas Council (ABC), which has assembled feedstock and policy summaries of all states, estimates that California generates 6.1 million US tons per year of food waste. The state is already on the path towards aggressive diversion: Assembly Bill 1826 requires all commercial producers of at least 200 tons of organic waste per year to arrange to have their waste composted or digested anaerobically. In addition, California's "75% Initiative" requires 75% of solid waste generated to be source reduced, recycled, or composted by the year 2020. Managing these volumes will take a significant uptick in processing capacity. Indeed, the ABC estimates that 96 new food waste biogas systems are needed to accompany the existing 5 in operation, and 101 new biogas systems at wastewater recycling could accompany the 151 ones already in operation. Additional composting sites will also be needed to meet those goals.

This is the food waste frontier. Developing it successfully will take collaboration and commitment through public private partnerships. Feedstocks are the tip of the spear that directly influence the rest of the organic waste processing pathway. Hopefully this article provided a framework for thinking about feedstocks: the players, parameters, and possibilities. ●

For more information:

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