MSW Digesters & Biochar

SOLVING AIR PERMITTING CHALLENGES FOR INNOVATIVE WASTE SOLUTIONS

Conference On The Environment – November 6, 2025

Agenda

01 // ORGANICS DIVERSION

02 // RNG/BIOCHAR PROCESS

03 // AIR PERMITTING CHALLENGES

04 // PROPOSED SOLUTIONS

Organics Diversion // Importance

- **Why Organics Diversion Matters in Minnesota**
  - **Extend Landfill Lifespan**
  - **Nearly 2/3** of what ends up in landfills or incinerators in Minnesota could have been reused, recycled or composted; this includes organics.

- **From MPCA's 2023 sustainable materials management report:**
  - Minnesota generates ~30 % organics in its MSW — a prime feedstock for RNG production through AD.
  - Statewide interest in anaerobic digestion is increasing; 59 digesters already operate in Minnesota (2022)
  - Minnesota invested $5 million in 2023 to expand organics infrastructure, including AD capacity.
  - AD captures methane for renewable energy instead of releasing it from landfills — key to Minnesota's Climate Action Framework.
  - Digestate from AD improves soil carbon and fertility when used as compost or biochar.
  - The MPCA highlights that AD digestate can be further processed into **biochar or compost**, which provides **soil-building and carbon-sequestration benefits**.

AMERICAN BIOGAS COUNCIL

Biogas State Profile: Minnesota

Minnesota ranks **#25** out of 50 states for its biogas production potential of **43.0 billion ft³/yr.**

Economic Benefits	Climate Benefits	Recycling Benefits
$29.8 billion in capital investment **79,848 construction jobs** to build the systems **3,395 long-term jobs** to operate the systems	Equivalent to the GHG emissions avoided by taking **32,647 cars off the road** Equivalent to the carbon sequestered by **140,054 acres of forest** Equivalent emission reductions to **989 U.S. football fields of solar panels** Equivalent to the GHG emissions avoided by running **42 U.S. wind turbines** (avg. size) for a year	**5,233,636 tons/yr** of dairy manure, which could produce **8.5 billion ft³** of biogas each year **15,070,511 tons/yr** of swine manure, which could produce **9.99 billion ft³** of biogas each year **55,927 tons/yr** of poultry manure, which could produce **2.6 billion ft³** of biogas each year **1,540,000 tons/yr** of food waste, which could produce **4.0 billion ft³** of biogas each year **273 million gallons/day** of wastewater, which could produce **1.5 billion ft³** of biogas each year

EPA's National Goals:

- **50% Reduction by 2030:** Set in 2015 by EPA and the U.S. Department of Agriculture (USDA) - national objective to reduce food loss and waste by 50% by the year 2030.

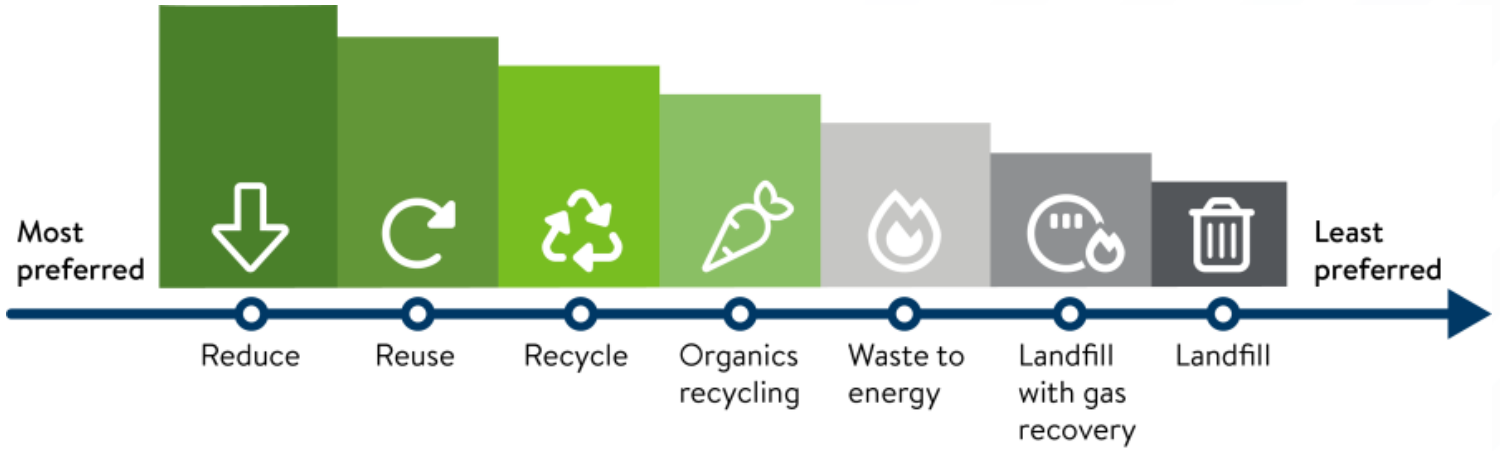
Minnesota's Goals:

- **50% Reduction in Food Waste Disposal by 2030 (from 2013 levels)**
- **By 2030:**
  - **15% waste reduction**
  - **75% recycling (metro)**
  - **35% recycling (non-metro)**
  - "recycling" explicitly includes composting of source-separated organics

Organics Diversion // Reducing impacts from organics disposal.

Ranked from most effective to least effective:

1. **Prevention & Source Reduction**
2. **Food Rescue & Redistribution**
3. **Animal Feed & Industrial Uses**
4. **Composting & Anaerobic Digestion (AD)**
    1. Residential collection & Transport: source separated organics (curbside/drop-off)
    2. Commercial & Institutional Collection: Dedicated organics waste haulers, FOG collection, food dehydration
    3. Food Manufacturers: off-specification, byproducts
    4. Agricultural & Industrial: manure/agricultural residue hauling, wastewater sludge
    5. Emerging technologies: On-site organics processing units, smart waste bins
5. **Landfill Gas Recovery & Waste-to-Energy (WTE) Systems**
6. **Landfill**



- System consists of an Anaerobic Digester (AD) followed by a High Temperature biochar process
- Equity partnership between Dem-Con and KVI

DEM-CON MATERIALS RECOVERY Kanadevia INOVA

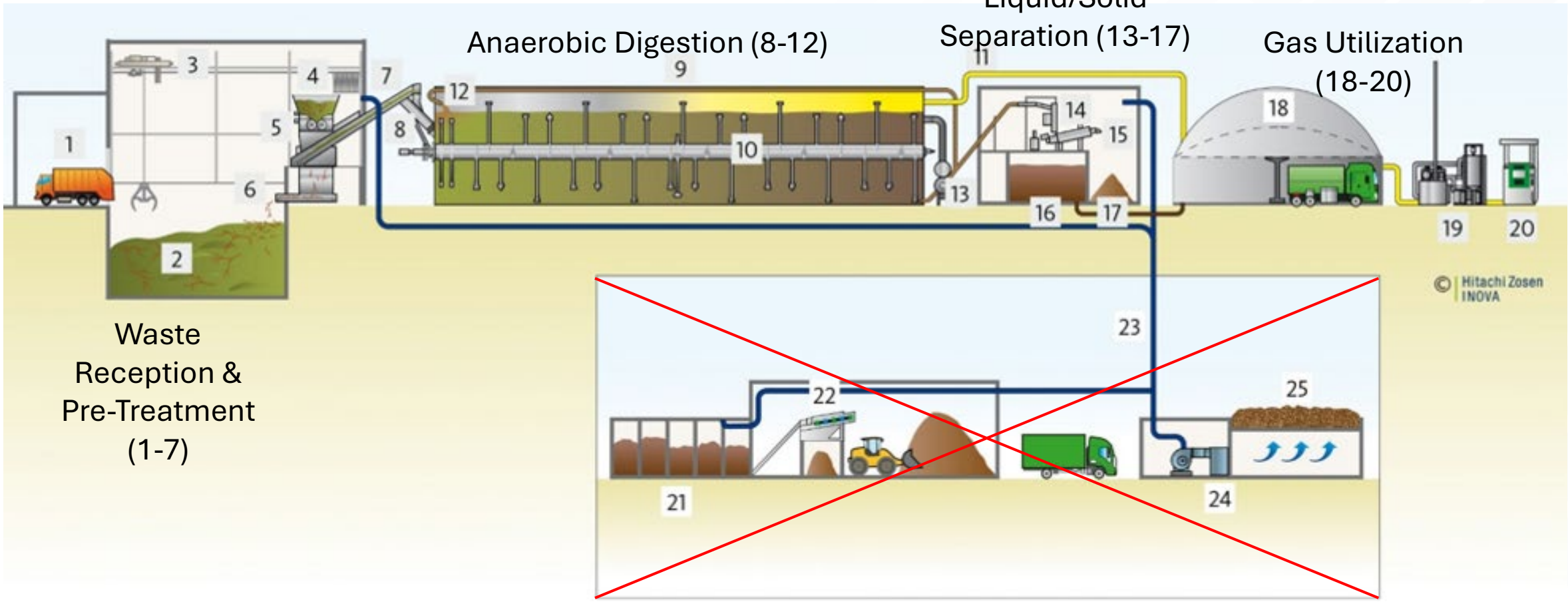
- Built to accommodate future capacity needs - modular construction expandable in 35,000-ton increments
- Inputs: 75,000 tons/year of organic materials
  - 30,000 tons/yr of source separated organics (SSO)
  - 20,000 tons/yr of Organic Rich Materials (ORM) ← Comingled with MSW
  - 15,000 tons/yr of organic materials from 3rd party + FOG
  - 10,000 tons/yr of yard waste (needed for structural content)

➢Outputs: AD Facility End Products

- ➢ Renewable Natural Gas: 175,000 MMBtu/year (~2,000 homes per year)
- ➢ Biochar: 10,000 tons/year

- **Renewable Natural Gas (RNG)** will be sent directly to utility pipeline, this project has been submitted by two of Minnesota's largest natural gas providers, in their Innovation Plan submittal to the Public Utility Commission (PUC)
- High-Temperature Biochar Process produces **Biochar** from digestate:
  - Similar to activated carbon but with much lower surface area
  - Soil amendment to increase nutrient and moisture retention
  - Soil remediation projects
  - Carbon sequestration
  - Emerging technology for PFAS reduction

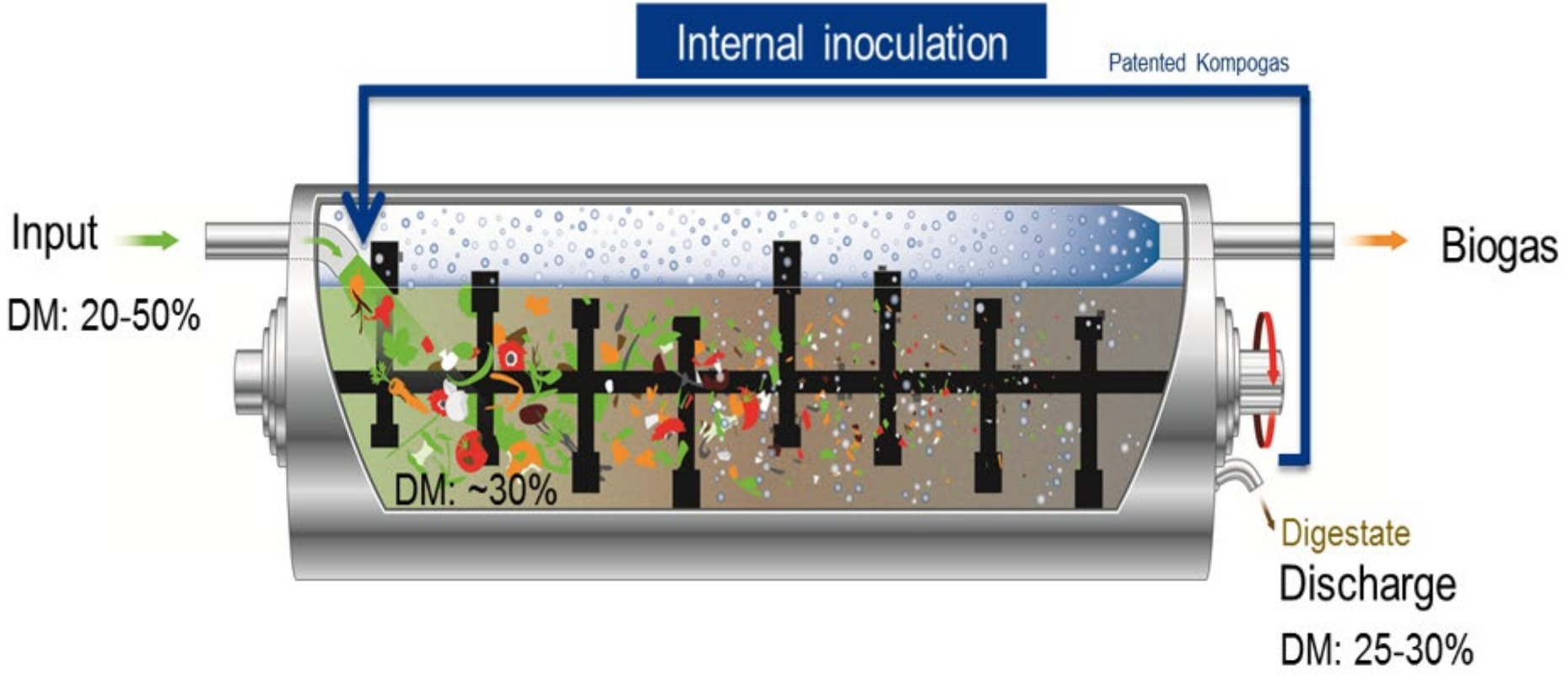
Digester to RNG/Biochar// Process



Waste Reception & Pre-Treatment (1-7)

Traditional Composting Process (21-25) is replaced by a Biochar Production Process

Digester to RNG/Biochar// Process



Horizontal plug flow
- Optimal digestion -

Thermophile temperature 131° F
- Biological activity -

Longitudinal agitator
- Energy saving & tight -

Internal inoculation
-Stable & quick process -

Digester to RNG/Biochar// Process

Photo of a similar project in Jonkoping, Sweden

Digester to RNG/Biochar// Process

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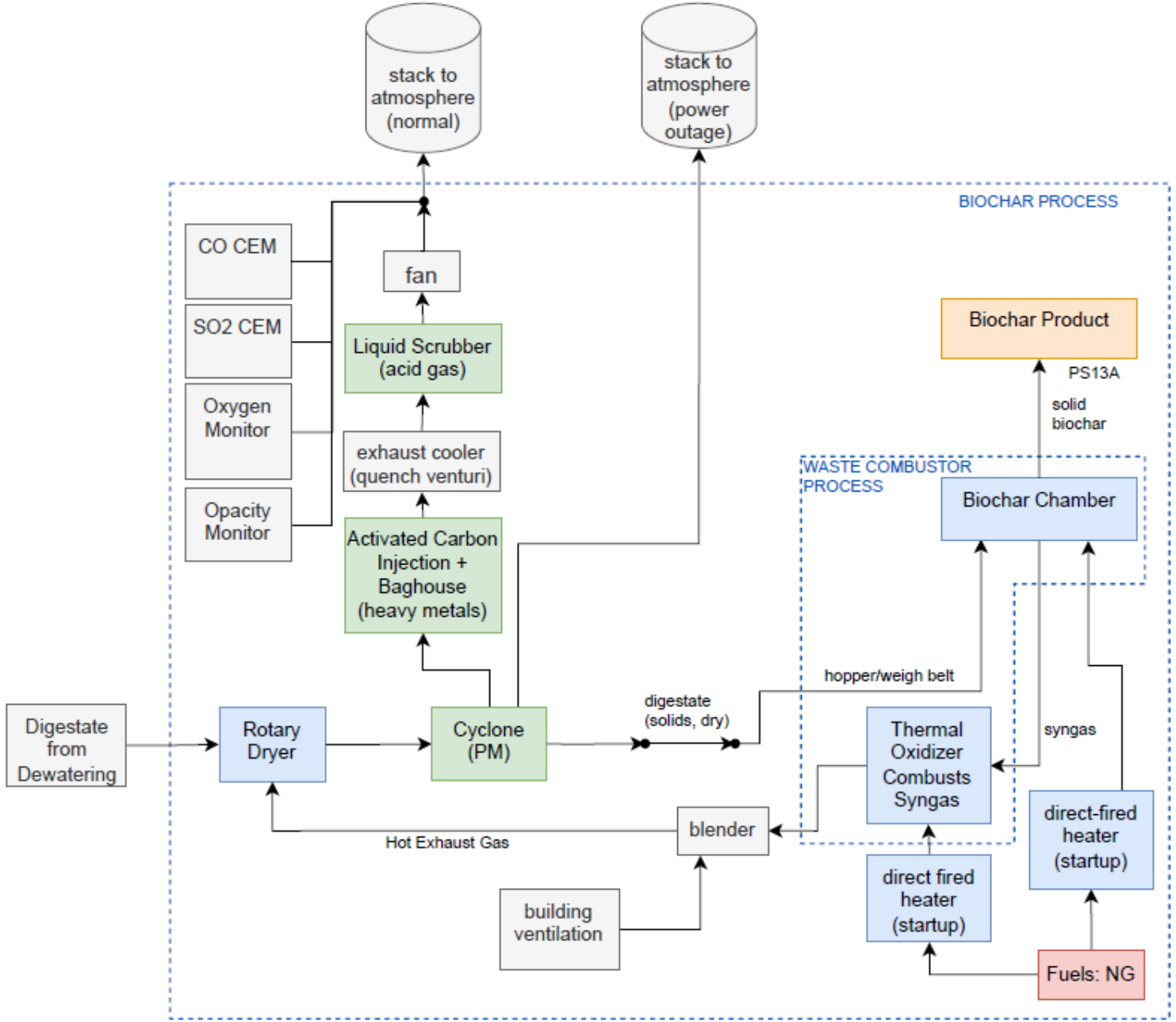
Digester to RNG/Biochar// Biochar Process.



§ 60.1010 Does this subpart apply to my municipal waste combustion unit?

Yes, if your municipal waste combustion unit meets two criteria:

(a) Your municipal waste combustion unit is a new municipal waste combustion unit.

(b) Your municipal waste combustion unit has the capacity to combust at least 35 tons per day but no more than 250 tons per day of municipal solid waste or refuse-derived fuel.

Municipal waste combustion unit means any setting or equipment that combusts solid, liquid, or gasified municipal solid waste including, but not limited to, field-erected combustion units (with or without heat recovery), modular combustion units (starved-air or excess-air), boilers (for example, steam generating units), furnaces (whether suspension-fired, grate-fired, mass-fired, air curtain incinerators, or fluidized bed-fired), and pyrolysis/combustion units. Two criteria further define municipal waste combustion units:

(1) Municipal waste combustion units do not include pyrolysis or combustion units located at a plastics or rubber recycling unit as specified under Applicability (§ 60.1020(h) and (i)). Municipal waste combustion units also do not include cement kilns that combust municipal solid waste as specified under Applicability (§ 60.1020(j)). Municipal waste combustion units also do not include internal combustion engines, gas turbines, or other combustion devices that combust landfill gases collected by landfill gas collection systems.

Organics Diversion // Regulatory Triggers NSPS Subpart AAAA

Municipal solid waste or *municipal-type solid waste* means household, commercial/retail, or institutional waste. Household waste includes material discarded by residential dwellings, hotels, motels, and other similar permanent or temporary housing. Commercial/retail waste includes material discarded by stores, offices, restaurants, warehouses, nonmanufacturing activities at industrial facilities, and other similar establishments or facilities. Institutional waste includes materials discarded by schools, by hospitals (nonmedical), by nonmanufacturing activities at prisons and government facilities, and other similar establishments or facilities. Household, commercial/retail, and institutional waste does include yard waste and refuse-derived fuel. Household, commercial/retail, and institutional waste does not include used oil; sewage sludge; wood pallets; construction, renovation, and demolition wastes (which include railroad ties and telephone poles); clean wood; industrial process or manufacturing wastes; medical waste; or motor vehicles (including motor vehicle parts or vehicle fluff).

Organics Diversion // Arguments this is not a MSW Combustor

Arguments that this is not a MSW combustor:

- DCHZI Bioenergy will engage in the manufacture of RNG and biochar and is not engaged in waste-related services.
- DCHZI will be a recycling facility and will not require a solid waste permit so how could this be considered MSW?
- This recycling process no different than picking aluminum cans out of a MSW stream.
- This is a legitimate recycling process such that the ORM is not being “combusted” for mass reduction or thermal energy as a primary purpose.
- If the digestate is considered MSW, then how can compost from digesters be land applied?
- ORM/digestate is not a “solid waste”; it is an “ingredient in an industrial process to make a product” and the product is not waste and does not go to a landfill.
- ORM/digestate is not “discarded” (important quality defining solid waste)
- RNG is listed as an EPA renewable fuel eligible for D3 RINs which, by definition, are produced from “renewable biomass”; therefore, the digestate is “renewable biomass” (not MSW)
- There are many more!

- **Advanced Air Pollution Control**: ACI/baghouse + acid gas scrubber
- **Extensive Stack Testing**: mercury (quarterly), dioxins/furans, PM, cadmium, lead, HCl, H_2S, opacity
- **Continuous Monitors**: CEMS for SO_2/CO/Oxygen, COMS
- **Numerous Plans**: ash management plan (even though there is no ash!), closure plan, contingency action plan, emergency preparedness plan, industrial solid waste management plan, materials separation plan, mercury separation plan, siting analysis, waste composition study
- **Part 70 Operating Permit**: Required for MSW waste combustor (would not need otherwise).

Started EAW and Air Permitting in late 2023

Frequent meetings with MPCA throughout the process

Air Permit Application Submission January 2024

EAW and Air Permit approved September 2024

DATA

Obtain more data to show why this process does not need to be regulated as a MSW combustor.

EDUCATE

Spread the word of this process to regulatory agencies and the public.

CHANGE

Petition EPA to change regulations; need a “carve-out” similar to LFG and tires

Thank You

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Digester to RNG/Biochar// Process Diagram