

On-Farm Biomass Conversion Technology

Biomass Furnace & Boiler



Image credit: UIUC Energy Farm

DESCRIPTION

Biomass furnaces can convert perennial biomass feedstocks into thermal energy that can provide heat & power to buildings, greenhouses, and other farm infrastructure. Perennial grasses and wood biomass can be chipped for these systems to produce renewable energy in lieu of propane.

CONSIDERATIONS

Moisture content for biomass feedstock is crucial for this system. Storage for these crops are necessary to maintain target moisture levels of feedstock between harvest and end use.

Anaerobic Digester & Biogas System



Image credit: US EPA

DESCRIPTION

Digesters use bacteria to break down biomass in absence of oxygen. An anaerobic digestion (AD) chamber can take in biomass feedstocks and convert them into renewable energy. Biosolids (**Digestate**) can be applied to fields for added value and reduce input costs.

CONSIDERATIONS

There are 4 basic types of digesters for on-farm use:

- covered lagoon digester
- complete mix digester
- plug flow digester, and
- temperature - based AD.

Pyrolysis Systems & Biochar Kilns



Image credit: Qualterra

DESCRIPTION

Pyrolysis is the process of super-heating biomass at high temperatures in an oxygen limited environment. These systems convert biomass into biogas and bioproducts. **Biochar** is the primary product of this conversion method that can be applied to agricultural fields to hold carbon in the soil long term.

CONSIDERATIONS

Pyrolysis & biochar systems are new emerging technologies. Design and construction of these systems may need to be done using consulting services to ensure successful installation.

On-Farm Biomass Conversion Technology

Biomass Furnace & Boiler

Equipment Specifications

Manufacturer: Heizomat GmbH

Model: RHK-AK 200

Rated Output: 198kW (675,000 btu/hr)

Feedstocks: Chopped perennial grasses, wood chips, sawdust.

Additional equipment needed:

- Järnforsen cyclone particulate separator (for flue gases)
- Two 1,000-gallon thermal storage tanks

Systems can be scaled larger to meet energy output needs of large farm operations.

Cost Estimate

Implementation range:
\$9,000 - \$12,000
for small scale systems.

Anaerobic Digester & Biogas System

Equipment Specifications

Manure management for methane recovery (biogas) may require additional equipment like generators and emission controls for on-farm use. Technical Assistance from EPA may be required depending on scale of system.

Feedstocks: Chopped perennial bioenergy crops, manure, compost, sewage, etc.

Additional equipment needed:

- Engine generator
- Vapor controls (Flare unit)



Photo of a 120 kW engine generator set combusts recovered biogas, generating electricity for on-farm use

Cost Estimate

Implementation cost range: \$1 - 2M
Operating & maintenance: \$30,000
All systems have varying costs and operational specifications.

Pyrolysis Systems & Biochar Kilns

Equipment Specifications

Feedstocks: Biomass including perennial grasses, wood chips, manure, crop residues, etc.

Operating temperatures: 300-700 C

Outputs:

- Bio-oils
- Biochar
- Biogas/syngas

Additional equipment needed:

- Storage tanks (optional)
- Engine generator
- Piping & instrumentation for biogas delivery

Cost Estimate

Implementation cost range:
\$30,000-75,000

All systems have varying costs and operational specifications.

**Small biochar kilns can be built without biogas capture systems that may be easier to design and implement on small farms.*



To learn more about biomass technologies, scan here to visit the Perennial Bioenergy Resource Directory


American Farmland Trust

For more information on this project, please contact Marlee Giacometti, Midwest Program Associate
mgiacometti@farmland.org
815-267-1326.