

# Use of Biomass for Heating Greenhouses in Ontario – Rules\* and Best Management Practices

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## Factsheet

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**\* TAKE NOTICE THAT** the relevant legislation relating to the use of biomass as a source for heat for greenhouse operations supercedes this Factsheet if any discrepancies arise between them, or if any regulatory requirement has been omitted herein. This Factsheet is meant to serve as a guideline only. The reader should consult all of the relevant Acts and the regulations before taking any decisions about a greenhouse where the use of biomass as a source of heat is concerned. This Factsheet has been published as a service for Ontario greenhouse operations only. Readers use it at their own risk. The Ontario Government does not accept any liability for any injuries arising from the use of this Factsheet.

The higher cost of heating a greenhouse using natural gas or oil has resulted in many growers switching to alternate fuels. This document describes the opportunities, challenges, regulations and types of best management practices related to the use and storage of these alternate fuels.

### FUELS FOR GREENHOUSE OPERATIONS

Traditionally, commercial greenhouse growers have used natural gas as their primary source of fuel to heat the greenhouse. The advantages include:

- clean-burning fuel, resulting mainly in carbon dioxide and water as the final by-products
- ease of initial hook-up and use
- minimal equipment maintenance
- improved boiler technology with increased heating efficiency and safety
- flue gas carbon dioxide available for greenhouse supplementation
- fuel delivered to the farm via a pipeline

Many greenhouse operations using natural gas as their primary source of heating fuel have used light oil (#2 oil) as a secondary source of fuel to provide a back-up in case of natural gas supply interruption. In some situations, a gas supply company may request a

greenhouse operator switch to an alternate fuel source to increase the availability of natural gas to a residential user during exceptionally cold periods in the winter. When the price of natural gas increased significantly, some growers switched to heating with heavy oil (#6 oil). The boilers were easily convertible to accept heavy oil as a fuel, and growers had oil storage tanks on site. Despite the lower cost of heavy oil, there were several disadvantages:

- parasitic losses
  - energy required to keep fuel fluid
  - increased expense to maintain boilers in efficient working condition
  - increased potential of fouling boiler tubes, requiring shut-down and cleaning
- potential for oil spills, especially during transfer from delivery truck to storage tanks
- disruption of supply due to delivery failure
- inability to use flue gas carbon dioxide to supplement the greenhouse crop

Because energy prices for both natural gas and oil have remained high, more vegetable and flower growers have shifted, or plan to shift, to the use of alternate fuel sources.

## FACTORS TO CONSIDER BEFORE USING ALTERNATE FUELS

Before using alternate fuels, numerous factors should be considered, including, without limitation:

- fuel source characteristics, including:
  - reliability of supply over the long term
  - current and future pricing
  - quality of fuel (uniformity, thermal value, ash content and percent moisture)
- ease of on-site management of fuel
- transportation system to transfer fuel to the combustion chamber
- combustion chamber and its combustion characteristics
- health and safety considerations
- potential impacts on the natural environment (e.g., particulate emissions or surface water contamination)
- possible approval requirements from the Ontario Ministry of the Environment (MOE), such as a certificate of approval
- dispersion modelling of stack emissions
- waste disposal site designation (if required)
- long-term availability of the fuel and pricing

## TYPES OF ALTERNATE FUELS

There are many alternate fuels available to heat a greenhouse, including:

- biomass fuels for incineration (woodchips, sawdust (from fresh-cut, wood mills, furniture factories, pallets, etc.), construction and demolition debris (wood-based), energy crops, farm-waste (plant materials, seeds), food processing waste, pelletized agricultural- and wood-based products)
- biofuel (biodiesel or ethanol)
- biogas (bio-digestion gas from energy crops, manure and food by-products, landfill gas, etc.)

## CHOOSING AN ALTERNATE FUEL

The factors listed above, as well as the cost and return on investment, will likely determine which fuel a grower selects. A Certificate of Approval (C of A) from the Ministry of the Environment (MOE) is not required for combustors using agricultural waste, biofuel or biogas. Other alternate fuels may require a C of A based on the type of fuel, its storage and transportation requirements and its combustion emissions in an approved combustion vessel (under the jurisdiction of the Technical Standards and Safety Authority).

Greenhouse production is considered part of the agricultural sector. This has the following effects:

- Section 9 of the *Environmental Protection Act* (EPA) does not apply to any plant, structure, equipment, apparatus, mechanism or thing used in agriculture. Due to this exemption, greenhouses do not generally require a C of A for the air discharge from the combustion vessel used for heating the facility. However, some monitoring may still be required.
- Part V of the EPA and Ontario Regulation 347 made under the EPA do not apply to agricultural waste resulting from farm operations. In addition, approval under Part V of the EPA is not required for the use of waste wood as a fuel, unless large volumes of the waste are stored. Agricultural waste and waste wood have different exemptions. Therefore, greenhouses combusting these materials do not require a C of A for waste management from the MOE. A greenhouse operation that accepts other kinds of waste (as defined in the *Environmental Protection Act* and Regulation 347 made under the EPA) may be required to obtain a C of A. Any mixing of these wastes with an exempt material (such as agricultural waste) may also require a C of A. Note that even if an approval is not required, a greenhouse operation must not cause an adverse effect (defined below) or violate other environmental regulations.

Under the EPA, **adverse effect** means one or more of:

- impairment of the quality of the natural environment for any use that can be made of it
- injury or damage to property or to plant or animal life
- harm or material discomfort to any person
- an adverse effect on the health of any person
- impairment of the safety of any person
- rendering any property or plant or animal life unfit for human use
- loss of enjoyment of normal use of property
- interference with the normal conduct of business

For more information about C of A requirements, please contact the Environmental Assessment and Approvals Branch (EAAB) at 416-314-8001 in Toronto, 1-800-461-6290 outside Toronto, or by e-mail at [EAABgen.moe@ontario.ca](mailto:EAABgen.moe@ontario.ca).

As of December 2006, applicants for a C of A for a Waste Disposal Site must complete the following sections of their application unless otherwise expressly instructed in writing by the MOE:

- facility description
  - property location
  - storm water management
  - property ownership and description
  - existing land uses
- proposed site plan and operation specifications
- proposed maximum volume of materials
- volume calculations
- biomass boiler description and operating specifications
- pre-processed material quality control
- hours of operation
- description of material movement on-site
- material storage time
- fencing and site security
- proposed record-keeping
- vehicle movement on-site
- facility maintenance and training
- financial assurance and liability assurance
- contingency plan
- emergency response plan
- notification of neighbours
- notification of municipality
  - municipalities may have zoning restrictions requiring rezoning to accommodate a waste disposal site as an agricultural use
- posting a financial assurance
- fees
- emission and dispersal modelling

Some key points to note are:

- notification of neighbours
- notification of municipality. Municipalities may have zoning restrictions requiring rezoning to accommodate a waste disposal site as an agricultural use.
- posting a financial assurance for the implementation of remedial action if necessary
- fees
- lead time to obtain a C of A
- C of A details. Each C of A is specific to the initial submission request. Any changes to the fuel source, hours of operation, etc., will require an amendment to the C of A. It is best to apply for all foreseeable options when obtaining a C of A.

## STORAGE OF BIOMASS

When storing biomass, greenhouse operators should consider, without limitation, the following:

- Biomass is bulky and requires large storage facilities.
- Biomass has a higher moisture content. There is more shipping weight and lower heating efficiency with biomass.
- Biomass will absorb moisture if left in the open. In most cases, when the outer layer of the pile is wet, the interior of the pile remains relatively dry.
- **Biomass may spontaneously combust** under the wrong conditions:
  - Material was too wet when piled.
  - There is a large variation in particle size, creating pockets of trapped air.
  - Compacted materials prevented heat dissipation from the storage pile.
- There is a potential for odours when fuel source breaks down.
- There is a potential for wind-blown dust and debris off the storage piles.
- There is a potential for runoff or leachate from the storage facility. This must not be allowed to reach surface or groundwater in a manner that will impact the environment.

Storage structures constructed to store biomass must comply with the *Building Code Act* requirements, and with requirements of the Fire Marshal. The size of the storage must be adequate to house the amount of fuel stored. Ideally, the storage facility should be located close to the boiler room to ease fuel delivery to the combustion vessel. It should be located on a solid surface to allow easy all-weather access for delivery trucks (as well as emergency vehicles). The storage site should be graded to manage and capture surface water. These must be specified on the C of A application (if required). To prevent contamination of the surface and groundwater, the storage facility should be located away from drains, drainage ditches and watercourses and on an impervious floor to prevent potential leachate contaminating the groundwater. For setback distances, see the Best Management Practices publications *Manure Management*, Order No. BMP16, and *Water Wells*, Order No. BMP12, and the Environmental Farm Plan.

In most cases, outside storage is necessary. A C of A (if required) or Regulation 347 could limit its size. Best management practices for storing the biomass fuel should include/consider, without limitation, the following:

- Keep piles less than 8 m in height.
- Do not use machines to compact material. Do not build up piles by driving loaders or dozers onto the fuel pile.
- Limit pile size to less than 1,000 m<sup>3</sup>/ pile.
- Maintain fire breaks of at least 6 m between piles (Source: Ontario Fire Marshal's Office).
- Provide easy access for emergency vehicles in all weather conditions.
- Ensure fire hydrants or a large volume of available water are in close proximity to biomass storage area.
- Develop a "Fire safety plan" document for both indoor and outdoor storage. Review the document with the local Fire Department and with staff.
- Establish a no smoking policy. Post "No Smoking" signs in clear, visible locations around the fuel storage site, and enforce the policy.
- Invest in appropriate portable fire extinguishing equipment or other control measures (contact local Fire Chief).
- Erect fencing to limit access to storage site and to prevent vandalism.
- Install security lighting.
- Landscape around the perimeter of the site using berms, trees and fences to improve the visual aspects of the site and to minimize wind-blown dust/particles and odours.
- Use infrared thermography to assist in identifying hot spots to mitigate the risks of spontaneous combustion.
- Grade land to manage surface water runoff.
- Locate site on impervious soils to minimize leachate entering the groundwater.

Spontaneous combustion in biomass can usually be prevented by following these steps:

- Store only dry or seasoned fuel.
- Prevent segregation of particle sizes in the piles by forming the piles with an inclined conveyor.
- Store in small piles.
- Keep piles low.
- Use oldest fuel first.
- Monitor temperatures within the piles regularly, using infrared thermography, if available.

## ASH DISPOSAL

There are two types of ash:

- ash remaining in the combustion chamber
- fly ash (ash collected from the cyclone and smoke stack)

Ash generated from an agricultural activity is exempt from Part V of the EPA and Ontario Regulation 347. However, ash must be disposed of responsibly after the combustion of biomass. Ash remaining in the combustion chamber may be disposed of in landfill or incorporated into the soil as a soil amendment. Fly ash can be considered hazardous and should be disposed of in a facility approved to receive this type of waste. If the material remaining in the ash chambers is composed of more than 10% unburned fuel, it should be disposed of at a landfill site.

## SUMMARY

Rising fuel costs may make burning of alternate fuels a viable option for some greenhouse operators. Careful consideration of the information provided above is necessary to determine if alternate fuels will work for you. All greenhouse operators are responsible for ensuring that their choice of fuel does not cause an adverse affect on the environment.

**If a greenhouse operation accepts any waste, other than 100% agricultural waste resulting from farm operations or wood waste, it may require a Certificate of Approval – Waste Disposal Site from the Ontario Ministry of the Environment. Please note that Regulation 347 does prescribe some conditions for the use of waste wood and that these must be followed to ensure that a Certificate of Approval is not required in relation to the use of the waste wood. It is a violation of the EPA to accept non-exempted waste at a site that has not been approved.**

## DEFINITIONS

**Agricultural waste** — waste, other than sewage, resulting from farm operations, including animal husbandry and, where a farm operation is carried on in respect of food packing, food preserving, animal slaughtering or meat packing, includes the waste from such operations.

**Biomass** — materials organic in origin that can be used as fuel (e.g., wood, straw, stover, husks, grains and even manure and biodegradable wastes that can be burned as fuel).

**Biofuel** — fuel derived from biomass, including liquid and gaseous fuels such as ethanol and biodiesel, produced from agricultural products such as corn, soybeans, flaxseed, canola and sugar cane.

**Energy crop** — crop grown for the production of fuel wherein the whole plant is used or processed for this purpose.

**Processed organic waste** — waste that is predominantly organic in composition and has been treated by aerobic or anaerobic digestion, or other means of stabilization, and includes sewage residue from sewage works that is subject to the provisions of the *Ontario Water Resources Act*.

**Wood waste** — waste:

- that is wood or a wood product, including tree trunks, tree branches, leaves and brush
- that is not contaminated with chromated copper arsenate, ammoniacal copper arsenate, pentachlorophenol or creosole, and
- from which easily removable hardware, fittings and attachments, unless they are predominantly wood or cellulose, have been removed

Wood waste does not include:

- upholstered articles
- articles to which a rigid surface treatment is affixed or adhered, unless the rigid surface treatment is predominantly wood or cellulose

**Waste biomass** — organic matter that is derived from a plant or an animal, that is available on a renewable basis and that is any of:

- waste from harvesting or processing agricultural products or forestry products
- waste resulting from the rendering of animals or animal by-products
- solid or liquid material that results from the treatment of wastewater generated by a manufacturer of pulp, paper, recycled paper or paper products, including corrugated cardboard
- water from food processing and preparation operations
- wood waste

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