



PENNSYLVANIA FUELS FOR SCHOOLS AND COMMUNITIES

Promoting the use of local, sustainable biomass for heat and power projects

Field Crops as a Biomass Fuel

Field crops are an exciting alternative to forest-source wood chips as a combustion fuel in biomass combustors. Not only is the fuel ecologically sound and sustainable, but it also provides a potential additional revenue stream for local farmers.

Possible fuel crops:

Many different field crops can be used as a biomass fuel, including perennial grasses, crop residues, and woody crops.

Perennial Grasses - Perhaps the most commonly mentioned field crop biofuel is switchgrass, a perennial grass that grows well on marginal lands and can yield up to 5 tons per acre, depending on conditions. Other perennial grasses may be good candidates as well, depending on climate and growing conditions.

Crop Residues - Residues from traditional crops are another good option as a fuel. They have similar combustion properties to perennial grasses, and may be available at a low cost. Common crop residues include wheat straw, corn stover, grain hulls, and spoiled grains. Old seed grain should not be used as a fuel, because of the chemical coating typically found on seeds.

Woody Crops - Short rotation woody crops (SRWC), such as hybrid poplar or willow, also show potential as an energy field crop, and can be grown without much trouble in a field crop setting. Typically, the tree seedlings are planted in close-spaced rows, and are harvested and chipped every 3-5 years using mechanized equipment. Chipped SRWC fuel is very similar to forest-grown wood that is chipped for fuel.

Annual Crops - Purpose-grown high yielding annual energy crops, such as Sorghum or Sudan Grass, may be available from farmers that are including energy crops as part of their crop rotation schedule.

Properties of fuel crops:

Agricultural field crops tend to burn well as a combustion fuel. Test burns in Pennsylvania have been quite successful. However, the field crop fuels typically have a higher ash content than wood fuel, and can cause problems with fouling (deposits on the inside of the combustor) if the combustion temperature is too high. Therefore, it is important to ensure that your equipment is compatible with energy crops before you start using them as a fuel. Field crop fuels tend to work fine in existing feed systems, provided that the size of the fuel particles is compatible with the equipment. Grasses and field crop residues are typically fairly dry when harvested (~15% moisture is common), which may lead to dusty conditions in the fuel storage area. Short rotation woody crops usually have a higher moisture level at harvest - similar to that of forest wood. Field-grown fuel crops are not as readily available as forest wood at present, but this situation may change in the coming years.

Densifying the fuel crop:

Freshly harvested energy crops are usually quite bulky – they are difficult to store, transport, or utilize. Usually, it is necessary to “densify” the material before it is useful as a fuel. Some of the densification options are as follows:

Baling – tying the material together in a tight bale does allow for easier transport and utilization, but most combustors would require special feed equipment (i.e. Bale Grinder) in order to be able to use baled biomass.

Pelleting – this process uses pressure to squeeze biomass into compact pellets that are easy to use in automated feed systems and high in energy. However, pellets are expensive to manufacture, and add a significant premium to the cost of the fuel.

Briquetting – this is a large scale version of the pelleting process. It can be less expensive than pelleting, but is not as common than pelleting at present.

Cubing – this process creates a very similar product to the pelleting or briquetting process, but uses a more energy-efficient direct-pressure process, that shows great promise for creating low cost densified biomass fuel. Cubing equipment is still fairly uncommon, and may not be available in your area.

Short rotation woody crops are often chipped, resulting in wood chips that perform much like wood chips from forest-grown wood.

Fuel Availability:

A robust ag-crops fuel industry does not currently exist in Pennsylvania. Therefore, it is not possible to simply phone a local supplier in the same way that you can for wood chips. However, many farmers are interested in meeting this market need, and it may be possible to cultivate a relationship with local growers for them to supply your fuel needs.

Contracting for Fuel:

Your fuel supplier is probably not familiar with the specific requirements of your combustion equipment. Therefore, it is important to provide a written “fuel specification” which describes the required fuel quality and delivery schedule. This will save you from misunderstandings, and will invariably save you from headaches down the road. It is imperative that the fuel you use be compatible with the combustion equipment you install – work closely with your equipment supplier to make sure that your fuel specification falls within the range of acceptable parameters for the equipment. Your specification should include, at minimum, the required size, moisture content, composition, average annual use, maximum weekly use, and type of delivery equipment.

In the final analysis, field crop biomass can be an excellent fuel for a combustor if the equipment is compatible and the fuel is readily available. As with wood chips, it is important to specify IN WRITING the required quantity, size, and properties of the fuel so as to avoid any misunderstandings with your fuel supplier.

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