The Story of Grass Briquettes

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Localization of Energy

- Reduce transportation costs
  - Why transport large amounts of raw material to a central location only to then have to transport large amounts of fuel back away from that central location? It is expensive and wasteful.
- Offset your own heating costs
  - You can't drill for oil in your fields, but you can grow grasses even if your land is marginal
- Keep money in local communities
  - Sell or buy fuel to or from your neighbors. Keep your heating dollars within your own communities. Just like with food, buy local.
- Reduce urban sprawl
  - The best way to keep land open is to make that land profitable to keep

Densification Mechanisms in both pellets and briquettes

- Lignin
  - Found more in wood than grass this substance acts as a sort of glue when heat and pressure are applied
- Interlocking particles
  - This comes into play more with grass than wood, particularly in the briquetting process where the grind size is larger. The lack of lignin and requirement to grind the material so finely is likely one major reason why pelleting grass is difficult
- Van der Waals force
  - Comes into play whenever objects are pressed together these molecular forces act to hold pellets and briquettes together

Pelleting vs. Briquetting

- Pellet Mills
  - Large – often requires a building to be built to house operation
  - Expensive – rule of thumb is $1,000,000 / ton / hour in capital investment costs
  - Process requires very specific parameters to function properly and therefore requires frequent adjustment
  - Not suited to a wide range of feedstock materials
  - Requires a high level of operator expertise
  - Most suited to medium or large companies who produce fuel on a large, industrial scale
- Briquette Presses
  - Range in sizes from small to large
  - Less than 1/5 the cost of pellet mill (range from about $150,000 to $200,000 / ton / hour)
  - Process is more robust – can handle a wide range of moisture (about 6% up to 15%) and grind sizes
  - Can densify different feedstocks with little or no adjustments necessary
  - Requires only moderate or low level of operator expertise
  - Suited for individuals up through large companies

Types of Briquette presses

- Mechanical – uses a crank or cam to force material through die
  - Cost: Medium
  - Longevity: High
  - Fuel Quality: Medium
  - Throughput: Medium
- Auger / Screw type – rotation of auger directly forces material through die
  - Cost: High
  - Longevity: Low
  - Fuel Quality: High
  - Throughput: High
- Hydraulic type – Hydraulic cylinder actuates to force material through die
  - Cost: Low
  - Longevity: Medium
  - Fuel Quality: Medium
  - Throughput: Low
- Rotary type
  - Not Applicable – makes charcoal briquettes

Briquette Presses – Capital Investment

- **Large Scale**
  - C.F. Nielson
    Stationary, 3-phase, 3" diameter briquette
    - $350,000 ~ 2 tons per hour (~1.5 tons with grass)
      ~ $233,000 / ton / hour with grass
- **Medium Scale**
  - Biomass Briquette Systems LLC
    Stationary, 3-phase, 2" diameter briquette
    - $75,000 ~ 1250 lbs. per hour (850 lbs. with grass)
      ~ $175,000 / ton / hour with grass
  - BHS Energy LLC
    Mobile, PTO or 3-phase, 1.5" diameter briquette
    - $35,000 ~ 900 lbs. per hour (550 lbs. with grass)
      ~ $125,000 / ton / hour with grass
- **Small Scale**
  - Biomass Briquette Systems LLC
    - $14,000 ~ 120 lbs. per hour (80 with grass)
      ~ $325,000 / ton / hour with grass

Market for Medium-scale densification

- Farmers w/ 100+ acres of farmland and Farming Cooperatives
  - Can use grass and wood to make fuel for sale or self-use
- Greenhouses w/ 50+ acres of farmland
  - Offsetting the large heating requirements of a greenhouse make use of grass briquettes extremely feasible
- Municipalities
  - Leaves, ag wastes, grass, paper, etc. can all be made into fuel for use in municipal buildings or for sale to residents
- Ag Related Businesses
  - Landscaping companies, Chocolate factories and many other types of companies have wastes or byproducts that can be made into fuel

So now that I have a pile of briquettes, what do I do with them?

- Industrial biomass boilers ~ 1M BTU
  - Total Energy Solutions - Max Ox boiler
  - Bio Fuel Technologies – BFT Chain Grate Boiler

- Briquette boiler
  - Goliath Gasification Boiler
    - models range from 180k BTU to 6.8M BTU
- Gasifiers
  - Outdoor wood gasifiers 100k – 200k BTU
    - Outdoor - Central Boiler e-Classic
    - Indoor - BIOHEAT USA (formerly Tarm)

Future Trends

- North America will follow Europe
  - Wood is at its limit and is not quickly renewable – grasses will prevail because of the existence of marginal and underutilized farmland
  - Pellets will partially give way to a larger format – briquettes. This is partly because it is easier to briquette grass than pellet it, and partly because it is more efficient to do so
  - Biomass stoves and boilers will continue to develop to be able to utilize multiple fuel types in multiple size formats