

Small-Scale Pellet or Brick Manufacturing

Wood pellet or fuel brick manufacturing could utilize both the incoming material streams at the Forest Biomass Business Center and heat produced by the biomass-to-energy plant. Both products require a drying system to bring the feedstock to the appropriate moisture content, and using heat from the energy facility could result in a significant reduction in capital and operating expense. However, most wood pellets are made from sawmill waste, which is free of bark and dirt. Making wood pellets from forest biomass can be problematic. Small amounts of bark and dirt will cause the pellets to fall apart, and the dirt in field chips wears out the extrusion machinery. Therefore, it may be more viable to produce fuel bricks, which are manufactured with hydraulic compression rather than extrusion. There is currently only one pellet producer in California - Mallard Creek, Inc. in Rocklin. They have received federal payments for their production under the Advanced Biofuel Payment Program, a USDA Rural Development program. Mallard Creek could be a good resource for learning about the economics of the pellet business.

To produce pellets, woody material is first been passed through a hammer mill to create a uniform mass. The mass is then fed to a press, where it is squeezed through a die with holes of the required size (usually 6 mm diameter, though sometimes 8 mm or larger). High pressures in the press cause the temperature of the wood to increase, causing the lignins in the wood to plasticize slightly and form a natural glue that holds the pellets together when they cool. The major steps in the production process are as follows:

1. *Drying* – Moisture content of the material needs to be maintained at approximately 15 percent. If the material becomes too dry, the heat caused by friction in the press will burn the pellet surfaces. If too moist, the build-up of steam pressure will weaken internal bonds, leading to breakage and dust formation during handling.
2. *Milling* – A hammer mill is used to reduce the size of the feedstock. Then the material may be treated additionally, such as with steam conditioning to soften the lignin that binds the cellulose together, to facilitate pellet formation during extrusion. Binding agents may be added to minimize breakage during transport.
3. *Pressing* – The resulting mass is extruded through dies and the emerging ribbons are cut to desired lengths.
4. *Cooling* – The hot pellets are cooled in a counter-flow cooler to allow lignin to reset and form a hardened pellet. The finished product is then bagged for sale in regional markets, or shipped in bulk to larger markets.

Torrefied pellets, which are made from woody material that has been heat-treated to increase energy density and material stability, are another potential product, but this process is not yet commercially available.

Feedstock Specifications:

- Wood fuel pellets: clean, dry wood chips (about 15% moisture content). Needs to be less than 1% ash.
- Wood fuel bricks: clean, dry wood chips (about 15% moisture content). Needles and bark are okay.

Jobs (Full-time Equivalent): 3 - 15

Equipment Needed:

- Pellet mill or brick machine
- Dryer
- Cooler
- Hammer mill
- Packaging machine

Challenges:

- Limited local and regional markets
- Lack of efficient access to global markets (transport)

General Notes:

- Japan and South Korea may become viable export markets for wood pellets produced on the west coast of North America.
- Affordable natural gas is likely to limit the growth of wood pellet consumption in North America.