

P&M Plastics Altree Panels

Product Selection and Description

Altree panels, manufactured by P&M Plastics, Inc., are biobased composite panels composed of wood fiber from invasive tree species, or of scrub and plastic from recycled milk bottles. According to the manufacturer, the encapsulation of plastic in the product makes Altree less susceptible than other types of wood composite boards to thickness swelling when exposed to high humidity or water. The plastic also reduces the opportunity for decay from fungus, mold, and mildew and aids in resistance to termites and other insects, rodents, and parasites.

Altree panels are used in a variety of exterior and interior applications. For BEES, Altree panels are found in the Partitions product category.

Flow Diagram

The flow diagram below shows the major elements of the production of this product, as it is currently modeled for BEES.

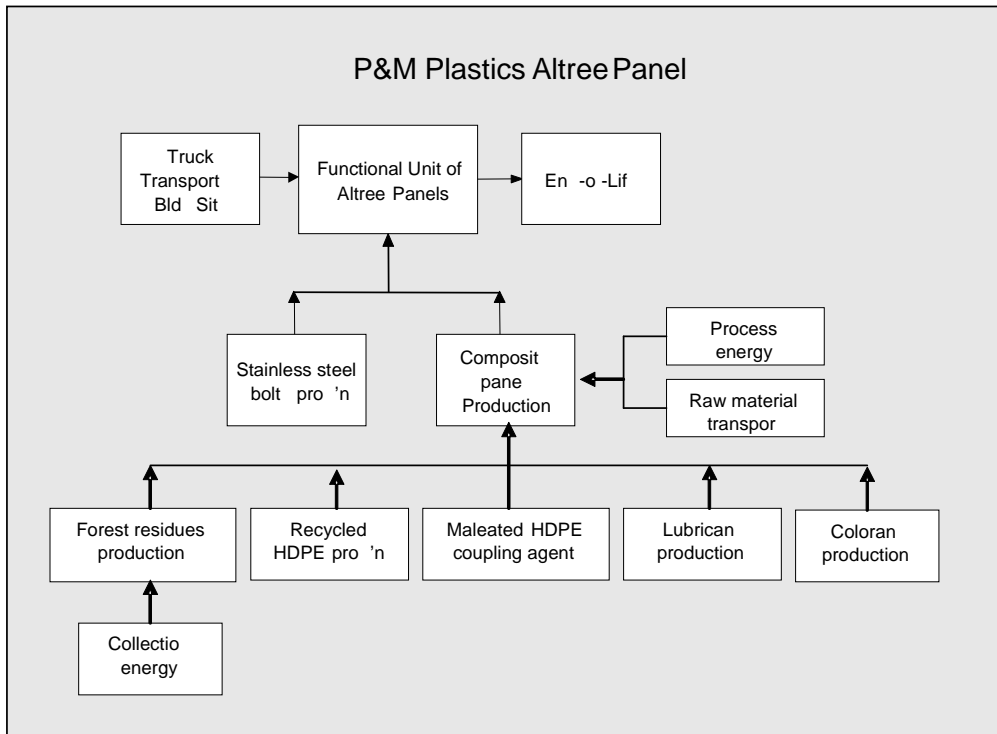


Figure 1: P&M Plastics Altree Panel System Boundaries

Raw Materials

Altree panels are comprised of the materials given in the table below.

Table 1: P&M Plastics Altree Panel Constituents

Constituent	Mass Fraction (%)
Woody forest residues	38.3
Recycled HDPE	57.3
Maleated HDPE coupling agent	2.2
Surfactant with lubricant	2.2
Colorant	0.6

Altree panels consist of wood fiber from invasive species, which is taken whole (and includes needles, branches, bark, and small and large woody stems) or in chips at the acquisition site. Because the wood used is either residuals from the forest or shrubs with no other use or value, and no planting has been done, the modeling of this input takes into account only the fuel used to collect the material.

The modeling of recycled high density polyethylene (HDPE) is based on the energy to produce clean flakes from milk jugs, and is calculated from an industry report to be 0.22 kWh/kg (0.36 MJ/lb) produced. Electricity is based on the U.S average grid mix and data is based on the U.S. LCI Database.

The maleated HDPE coupling agent is assumed to be a combination of maleic anhydride and virgin HDPE. Most of the data for maleic anhydride comes from a chemical process report produced for the U.S. Department of Energy. HDPE data comes from the U.S. LCI Database. For lack of other data on the specific lubricating surfactant used in Altree panels, it is modeled as linear alkylbenzene sulphonate (LAS) based on its anionic surfactant properties. Data for LAS comes from a European life-cycle inventory containing late 1990s data on European detergent production. The colorant is excluded because its exact composition is unknown and it only accounts for 0.6 % of the mass of raw materials.

Manufacturing

Energy Requirements and Emissions. At manufacturing, the forest residue is ground to a fine fibrous state. This and the other raw materials are compounded or fed and blended into the molten polymer. The compounded material is then pressed or shaped into an end product. These process stages require purchased electricity and natural gas in a boiler in the following amounts.

Table 2: P&M Plastics Altree Panel Energy Requirements

<i>Energy Carrier</i>	<i>Quantity per kg Altree panel</i>
Electricity ¹	4.3 MJ (1.2 kWh)
Natural gas ²	0.43 MJ (0.12 kWh)

In addition to energy, 0.061 L (0.016 gal) of cooling water is used per kg of product. No data are available on particulates resulting from the grinding process.

Transportation. Data for the transportation of raw materials from the supplier to the manufacturer is provided by P&M Plastics, with diesel truck as the mode of transportation. Diesel trucking is modeled based on the U.S. LCI Database.

Transportation

Diesel truck and rail are the modes of Altree panel transport from manufacturing to use, with the average distance traveled being 402 km (250 mi), shared equally by truck and rail. Both modes of transport are modeled based on the U.S. LCI Database.

Use

Altree is assumed to be installed using an average of 0.0023 kg (0.0051 lb) of stainless steel bolts for each 0.09 m² (1 ft²) of panel. The production of steel comes from the U.S. LCI Database. Approximately 3 % of the panel is lost to waste during the installation process from cutting the panels to fit the installation area.

End of Life

Altree is assumed to have a lifetime of 50 years. After year 50, the panel is removed and is modeled as being

¹ This figure is based on a purchased electricity rate of 5 MW of total yearly production and the estimated operating time, as provided by the manufacturer.

² This figure is based on total ft³ of natural gas purchased and total yearly production, as provided by the manufacturer.

recycled, or reused, 20 % of the time and landfilled 80 % of the time.

References

Life Cycle Data

National Renewable Energy Laboratory (NREL): *U.S. Life-Cycle Inventory Database*. 2005. Golden, CO.

Found at: <http://www.nrel.gov/lci/database>.

PRé Consultants: *SimaPro 6.0 LCA Software*. 2005. The Netherlands.

Climenhage, David, *Recycled Plastic Lumber* (Ontario, Canada, Environment and Plastics Industry Council and Corporations Supporting Recycling, January 2003), p. 34. Found at: <http://www.cpia.ca/epic/>

BRIDGES to Sustainability, *A Pilot Study of Energy Performance Levels for the U.S. Chemical Industry*, Contract # DE-AC05-00OR22725 (Oak Ridge, TN, U.S. Department of Energy, June 2001).

Dall'Acqua, S., et al., *Life Cycle Inventories for the Production of Detergent Ingredients*, Report #244 (St. Gallen: EMPA, 1999).

Industry Contacts

John Youngquist, P&M Plastics, Inc. (November 2004)