UTT Soy Backed Nylon Carpet

Product Selection and Description

Based in Dalton, GA, Universal Textile Technologies (UTT) supplies the carpet and synthetic turf industries with multiple backing systems, including polyurethane backings. BEES includes a nylon carpet made with Biocel, a polyurethane backing for carpets and artificial turf in which a soybean-based polyol replaces a portion of the inputs required to make traditional polyurethane backing.

Flow Diagram

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

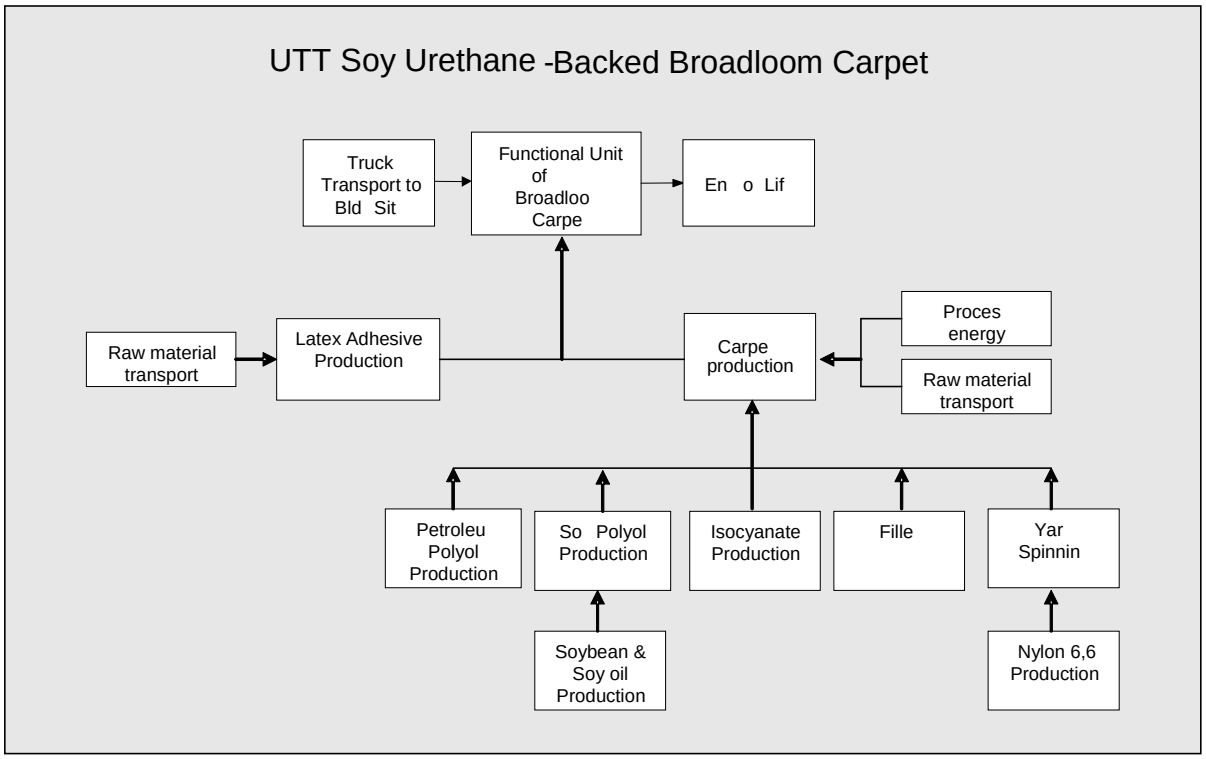

Figure 1: UTT Broadloom Carpet System Boundaries

Raw Materials
The following Table presents the product constituents and their relative shares of the product mass.

Table 1: UTT Broadloom Carpet Constituents

Constituent	*Mass Fraction*
Soy Polyol	11 %
Petroleum Polyol	11 %
Nylon Yarn	31 %
Isocyanate	9 %
Fillers	31 %
Other Additives	7 %

The yarn consists of Nylon 6,6. Data for Nylon 6,6 come from EcoInvent, whose data are based on those from Eco-profiles of the European plastics industry (PlasticsEurope). Data for the production of polyether polyol and isocyanate are provided by the Plastics Division of the American Chemistry Council.[1] Soy polyol production is based on life cycle soybean oil production data developed for the U.S. Department of Agriculture (USDA),[2] updated to reflect a newer manufacturing process for the oil processing.

Fillers include limestone and fly ash. Limestone data comes from the U.S. LCI Database. Fly ash, the mineral residue produced by burning coal, is captured from electricity-generating power plants' exhaust gases and collected for disposal or use. When used, this byproduct is assumed to be an environmentally "free" input material, although its transport to the production site is included in the BEES model. Data for all other additives are taken from elements of the EcoInvent and SimaPro databases.

Manufacturing
Energy Requirements and Emissions. The manufacturing process for UTT soy backed nylon carpet consists of forming the polyurethane backing, curing the backing, and adhering it to the nylon facing. Site data are used to quantify the energy inputs to the production process, which consist of purchased electricity (0.021 kWh/ft^2) and natural gas (0.23 MJ/ft^2). Data for all energy precombustion and use comes from the U.S. LCI Database.

Transportation. Transportation distances for shipment of the raw materials from the suppliers to the manufacturing plant are provided by UTT. The materials are transported by diesel truck, based on the U.S. LCI Database.

Transportation
Transport by diesel truck from the manufacturing plant in Dalton, Georgia to the building site is based on data from the U.S. LCI Database. The BEES user is free to adjust the default transportation distance.

Installation
The installation adhesive for the standard UTT carpet product is assumed to be the same traditional contact adhesive used to install the generic BEES carpet products. The other UTT carpet product is installed using a low-VOC adhesive . For both, the average application is assumed to require 0.65 kg adhesive/m^2 (0.13 lb/ft^2). About 3.5 % of the product is wasted during its installation.

[1] Franklin Associates, a Division of ERG, for the Plastics Division of the American Chemistry Council: *Cradle-to-Gate Life Cycle Inventory of Nine Plastic Resins and Four Polyurethane Precursors* (Prairie Village, KS, 2010).

[2] Sheehan, J. et al., NREL/SR-580-24089 (Washington, DC: US Department of Agriculture and US Department of Energy, May 1998).

Use

The lifetime of UTT broadloom carpet is assumed to be 11 years, consistent with the 11-year lives assumed for the other broadloom carpets in BEES, so it is replaced 4 times after the initial installation over the 50-year BEES use period. As with all BEES products, the life cycle environmental burdens from these replacements are included in the inventory data.

End of Life

At each replacement, it is assumed that 5 % of the used carpet is recycled, with the remaining 95 % going to a landfill.

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.

Sheehan, J. et al., *Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus*, NREL/SR-580-24089 (Washington, DC: U.S. Department of Agriculture and U.S. Department of Energy, May 1998).

EcoInvent Centre: *EcoInvent data v2.0* (Dübendorf: Swiss Centre for Life Cycle Inventories, 2007). Found at: www.ecoinvent.org.

Franklin Associates, a Division of ERG, for the Plastics Division of the American Chemistry Council: *Cradle-to-Gate Life Cycle Inventory of Nine Plastic Resins and Four Polyurethane Precursors* (Prairie Village, KS, 2010).

Industry Contacts

Jim Pollack, Omnitech International (2005)