Shaw Industries 195 SBR Latex Broadloom Carpet

Product Selection and Description

A subsidiary of Berkshire Hathaway Inc. and headquartered in Dalton, Georgia, Shaw Industries sells floor covering and rugs for residential and commercial applications in the United States and abroad. Shaw's manufacturing facilities encompass every aspect of carpet and rug production, from basic chemicals and raw materials to advanced tufting, weaving, and finishing.

For commercial applications, Shaw offers carpet of EcoSolution Q solution-dyed nylon fiber with a 195 styrene butadiene resin (SBR) latex backing. This backing system is used in several products that are sold under the names of ActionBac, TekLok, StayLoc, Unitary, and Ultraloc Pattern. In BEES, this product is referred to as Shaw 195 SBR Latex carpet.

Flow Diagram

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

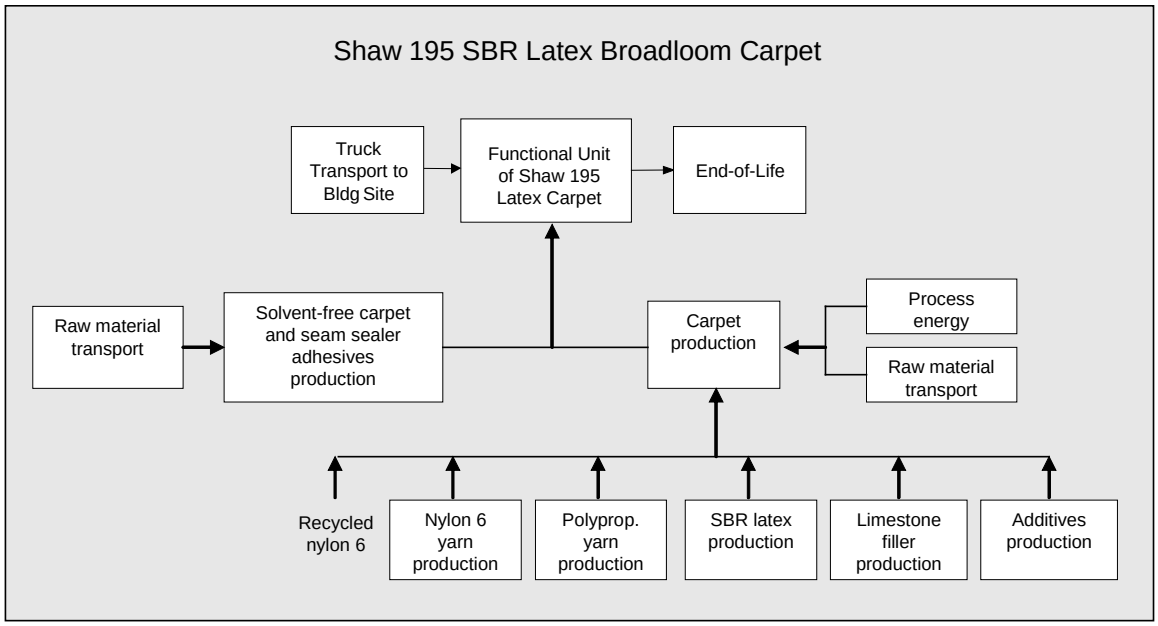

Figure 1: Shaw 195 SBR Latex Broadloom Carpet System Boundaries

Raw Materials

The following table presents the constituents by mass percentage of the 195 SBR Latex product.

Table 1: Shaw 195 SBR Latex Broadloom Carpet Constituents

Constituent	*Mass Fraction*
EcoSolution Q nylon yarn: virgin and recycled polyamide (PA 6)	40 %
Polypropylene yarn	7.8 %
SBR latex	17 %
Limestone filler	35 %
Other additives	0.2 %

EcoSolution Q nylon is Shaw Fibers' premium-branded solution dyed nylon. It is cradle-to-cradle certified and contains a minimum of 25 % recycled content. Data for its production were provided by the manufacturer, and were based on the following assumptions:

- For nylon yarn recycling, no raw materials are consumed during the recycling process and the efficiency of the recycling process is 90 %.
- Electricity use for the recycling process is an average of "yarn/backing separation" electricity use and "contract recycling" electricity use.
- Transport for all raw materials to the manufacturing plant is set at 402 km (250 mi).
- The data for energy use for yarn spinning and type of yarn are based on the following site data:

Table 2: Nylon Yarn Production Requirements

Flow Name	*Units*	*Quantity/kg yarn*
Electricity	MJ	9.8
Natural Gas (used as fuel)	MJ	0.13
Polyamide (PA 6)	kg	0.75
Recycled Polyamide (PA 6)	kg	0.25

Data for polypropylene, used in both the primary and secondary backing, come from the Plastics Division of the American Chemistry Council.[1] The nylon yarn is back-coated with SBR to provide stability. Data for Nylon 6 come from EcoInvent, whose data are based on those from Eco-profiles of the European plastics industry (PlasticsEurope). Styrene butadiene resin is compiled using butadiene and styrene unit process data from the same ACC study.

The limestone filler is based on data from the U.S. LCI database, and most all of the additives are included in the model, based on elements of the EcoInvent and SimaPro databases. Data for only one of the additives were not available, yet this is considered insignificant since it represents 0.002 % by mass of the entire carpet (backing plus face).

Manufacturing

Energy Requirements. Shaw provided electricity, natural gas, fuel oil, and propane requirements for the construction, treatment, and finishing of the carpet. Some of the main processes at the facility include "tufting" the nylon fiber to produce the carpet face and attaching the face yarn to the polymer backing using a primary coating and tufting needles. Data for all energy precombustion and use come from the U.S. LCI database.

Transportation. Transportation distances for shipment of the raw materials from the suppliers to the manufacturing plant were provided by Shaw. The materials are transported by diesel truck, which is based on data from the U.S. LCI database.

Transportation

The transportation distance from Shaw's manufacturing plant to the building site is modeled as a variable in BEES. The product is shipped by diesel truck, which is based on data from the U.S. LCI database.

Installation

The 195 SBR Latex carpet is installed with Shaw 1000 Superior Grade Adhesive and Shaw Subset 4000 Carpet Seam Sealer Adhesive, which are applied at rates of 0.6 kg/m^2 (0.12 lb/ft^2) and 0.13 kg/m^2 (0.003 lb/ft^2), respectively. According to the specification sheets for these products, they release minimal to no volatile organic compounds during application and use. The Shaw 1000 adhesive is a resin blend synthetic rubber and the Shaw 4000 seam sealer is made up of a latex/polymer mixture. These have been modeled based on elements of the EcoInvent and SimaPro databases. None of the adhesives are assumed to be wasted during installation, yet 5 % of the carpet is assumed to be wasted due to cutting waste, and this is modeled as going to the landfill for disposal.

[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).

Use Phase

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

End-of-Life

At end of life, 99 % the 195 SBR Latex carpet is sent to a landfill for disposal. Shaw estimates that approximately 1 % or less is recycled.

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.

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).

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

Industry Contacts

Zach Breedlove (2008)