

used to make adhesives and coatings for paper and cardboard. Polyesters are produced by bacteria through fermentation processes and are used in biomedical applications.

The plastic materials made with biobased monomers, such as plant oils, propane diol, and lactic acid, can be made to closely resemble the molecular structures of petroleum-based plastics and provide particular performance and application benefits, *e.g.*, thermoplastic or thermoset characteristics, pressure sensitivity, elastomeric, or other characteristics. When used for disposable items such as food packaging, the biobased plastic packaging can be fully compostable.

Used in durable goods for insulation and cushioning, biobased plastics may be rigid for panels in appliances, flexible in cushions, or molded for automotive dashboards, for example. Examples of biodegradable plastic films are biofilms, plastic films made biodegradable by formulation with starch. Examples of durable films and coatings are components in durable goods such as automotive and construction equipment, tools, electrical equipment, and appliances. Water-soluble polymers are biobased items used in wastewater facilities and can help mining and heavy industry clean heavy metals from their wastewater. Examples of biodegradable/compostable molded plastic items are table flat ware, knives, forks, and spoons. Examples of durable molded plastic items and composites using biobased resins are thermoset automotive parts and equipment hoods and doors and access panels for farm and industrial equipment. Examples of molded composite items using biobased fibers are automotive parts combining petroleum-based resins with natural fibers, such as interior door panels and trunk liners. Examples of synthetic fibers from biobased raw materials are synthetic fibers, similar in function to nylon, woven into various textiles such as carpeting.

#### *Proposed Minimum Content—Plastics Category*

To be included in this bioplastics and biopolymers category, the minimum biobased content of each item must be:

Items	Minimum biobased content (%)
Biodegradable foams .....	50
Durable foams .....	15
Biodegradable films .....	25
Durable films and coatings .....	20
Water soluble polymers .....	50

Items	Minimum biobased content (%)
Compostable molded products ...	75
Molded plastics and composites/ biobased resins .....	10
Molded composites/biobased fi- bers .....	20
Synthetic fibers .....	50

#### *Paints and Coatings Category*

Paints and other types of coatings such as stains, varnishes, and sealants can be derived from agricultural materials. These coatings enhance the appearance and protect the materials onto which they are applied. The protective function includes reducing corrosion, water infiltration, weathering from sun and wind exposure, and other damage. Biobased paints and coatings are important alternatives to traditional paints and coatings that are derived from petroleum-based chemicals and metal pigments.

A wide variety of agricultural materials can be used to produce items for biobased paint and coatings applications, including: xanthan gum to help thicken latex paints and coatings, and to uniformly suspend zinc, copper, and other metal additives in corrosion control coatings; cellulose esters and ethers can be used to make lacquers and paints; guayule derived epoxy-amine can be used to make coatings for metal panels that help protect the metal from corrosion during exposure to fog and salt; corn, soy, wheat, and other proteins are used to make coatings for paper and cardboard; and epoxidized linseed oil and soybean oil can be used as plasticizers, as well as intermediate chemicals in the manufacture of paints.

Biobased paints and coatings have a wide range of item uses that include protection of seeds to enhance germination, marine coatings, concrete and wood sealers, stains, corrosion inhibitors, and polishes. Architectural coatings made from soybean and linseed oils constitute a significant portion of the coatings market. Industrial coatings made from vegetable oils have been the mainstay in architectural and industrial paints for corrosion prevention, weatherability, and ease of application.

#### *Proposed Minimum Content—Paints and Coatings Category*

To be included in the paints and coatings category, the minimum biobased content of each item must be:

Items	Minimum biobased content (%)
Formulated product .....	20

#### *Solvents and Cleaners Category*

Biobased solvents and cleaners are widely used as cleaners and de-greasers in manufacturing and other processes and as ingredients in adhesives, paints, and coatings. Solvent and cleaner applications are broad and include alternatives to petroleum chemicals such as mineral spirits, ketones, acetone, trichloroethylene, xylene, toluene, and methylene chloride. As a cleaning item, uses include fabric and textile cleaning; fruit and vegetable cleaning; removal of grease, tar, oil, stains, paints from concrete and metal surfaces; paint stripper from metals and wood; carpet and upholstery cleaner; solvent for inks, paints; agricultural chemicals such as fertilizers, herbicides and pesticides; graffiti remover; and industrial parts cleaning. Some biobased solvents may also be used as carrier solvents for paints, inks, lotions, insect repellents, polishes, and other uses.

Biobased solvents and cleaners are made from renewable agricultural materials including crops and livestock.

Diluent items made from soybean oil, linseed oil, and tung oil can reduce the viscosity of a paint or coating. These diluents can act as both a solvent and a resin, thus eliminating the need for volatile organic compounds (VOCs). These solvents can be used in a variety of specialty applications such as metal finishing and ink formulation.

Parts cleaning compounds can contain one or more biobased solvents that are formulated with other performance additives such as surfactants, biocides, and rheology agents. These items are used in manufacturing and fabrication operations for cleaning parts prior to assembly, or in repair operations such as automotive shops or jet aircraft engine repair. Printing ink removers can be formulated items used for the removal of ink from printing presses and other printing equipment, such as press and blanket washes and screen cleaners. Adhesive/mastic removers are generally formulated items designed to remove adhesives or mastics from machinery used in gluing applications or from surfaces where an adhesive or mastic has been applied, such as with tile removal. Paint strippers are generally formulated items designed to remove paints from wood or metal surfaces. Asphalt removal and release materials are formulated or neat solvent