

Terms and Definitions

Additive

A substance or compound added to polymer to alter or improve its characteristics. For ex. antiblock, color pigments and UVI.

Antiblock

Additive used to prevent or minimize adhesion between film layers during processing.

Antioxidant

Additive used to improve material resistance to degradation, weathering and oxidation when exposed to heat and oxygen during processing and storage.

Antistat

Additive used to reduce or prevent the build up of static electricity.

Backside Treat

Film defect that occurs when corona treatment intended for one side of the film appears on both sides, resulting in blocking and picking in the material.

Barefoot

An additive-free resin or film.

Biaxial Orientation

The process of stretching hot plastic film in both the machine and transverse directions resulting in molecular reorientation.

Bisphenol A (BPA)

A building block of several important polymers and polymer additives used in the production of polycarbonates, so named as it is formed by the condensation reaction of two (bis) molecules of phenol with one of acetone (A). Currently banned in baby bottles in Canada.

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Blister Pack

Pre-formed plastic packaging for small consumer goods usually comprised of a plastic cavity or pocket displaying the item, attached to a lidding made of paper, carton, plastic or aluminum which seals the packaging. Commonly used for pharmaceuticals, toys, hardware and electrical items. A clamshell is a more secure form of a blister pack.

Blocking

Unwanted adhesion between film layers or sheeting that may occur during processing or storage.

Bloom

The appearance of additives on a film's surface after a period of time.

Blown Film

Extrusion of a molten plastic material through a round die forming a continuous tube of plastic that is then inflated to form a bubble. The bubble is then flattened between rollers and slit to create lay flat film.

Cast Film

Film produced by extrusion through a flat die into a quench system.

Clarity

Degree of transparency

Coefficient of Friction (COF)

A value that represents the friction between two surfaces, in films it indicates how slippery or tacky the film is. A value near zero indicates the film as slippery while a high value of 7 or more indicates the film is tacky.

Coextrusion

Extrusion of multiple layers of material using two or more extruders through a single die assembly. Different resin combinations can be used during coextrusion producing a film with properties that cannot be achieved with a single layer extrusion.

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Cold Crack

Also known as Low Temperature Flexibility. The measure of a film's ability to withstand cracking at the lowest temperature it is subjected to. Measurements usually indicate the lowest temperature and a pass/fail result.

Copolymer

A polymer derived from two chemically different monomers polymerized together.

Core

Rigid cardboard tube around which film is wound or rolled. Typical core sizes are either 3 or 6 inches in diameter.

Corona Treat

Surface treatment process using an electric current to create an ozone generating spark (a corona) that then raises the surface energy (dyne level) to improve the bonding characteristics of the film and allow adhesion of different materials such as inks, and coatings.

Consumer Product Safety Improvement Act (CPSIA)

An Act written to improve the current existing statute of the Consumer Product Safety Act. It was enacted "to establish consumer product safety standards and other safety requirements for children's products and to reauthorize and modernize the Consumer Product Safety Commission." Most noted for introducing limits on lead and phthalates in children's toys and products.

Density

Weight per unit volume. A lower density film will offer more coverage per its weight for instance. (See Specific Gravity)

Die

A metal block usually circular with an inner and outer ring used to form materials via extrusion.

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Die Gap

Distance between the metal surfaces which form the die opening.

Die Lines

Visible lines on the surface of the film's machine direction caused by buildup of oxidized materials on the die.

Dimethylformamide (DMF)

An organic compound commonly used as a solvent in the production of acrylic fibers and plastics, as well as in the manufacture of adhesives, synthetic leathers, fibers, films and surface coatings. Dimethylformamide is harmful by inhalation and has been linked to cancer. It is not banned but certain workplace restrictions are in place that would limit workforce exposure to it.

Dimethyl Fumarate (DMF)

A methyl ester of fumaric acid usually used as a biocide attached to furniture or shoe leather in permeable paper sachets to prevent mold. The Dimethylfumarate evaporates and impregnates the leather to prevent it from mold deterioration during storage and transport, particularly in humid climates. DMF is banned in the EU, and is sometimes confused with dimethylformamide.

Dioxin

Term used for a family of structurally and chemically related *polychlorinated dibenzo para dioxins (PCDDs)* and *polychlorinated dibenzofurans (PCDFs)*, which are essentially environmental pollutants. Dioxins are by products of industrial processes such as manufacturing but can also result from natural processes, such as volcanic eruptions and forest fires. Common dioxin release into the environment is usually caused by incomplete burning from waste incinerators.

Dyne

Unit of measure for surface tension.

Elongation

Percentage increase in length that occurs before film breaks under tension.

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Electrostatic Discharge (ESD)

A sudden and momentary electric current or spark between two objects at different electrical potentials caused by either direct contact or induced by an electrostatic field.

Ethylene Vinyl Acetate (EVA)

A copolymer of ethylene and vinyl acetate. Many different grades are manufactured, with the vinyl acetate content varying from 5 to 50 percent by weight.

Extrusion

Heated plastic material is pushed or drawn through a die forming the resin into the desired shape or cross section. The material or “extrudate” is then cooled and solidified as it is pulled through the die or water tank.

Film

Plastic sheet material with a thickness of under 10 mils or .010” (as opposed to sheet which has a thickness of 10 mils or .010” and over)

Flame Retardant

Additive used to reduce polymer flammability and render it resistant to fire.

Flexible PVC

Polyvinyl Chloride film suitably compounded with plasticizers to yield a softer, more flexible film.

Gaylord

Heavy duty pallet sized box usually made of triple wall corrugated fiberboard.

Gauge

The thickness or diameter measurement of plastic film usually expressed in mils or inches. One mil equals one thousandth of an inch (0.001" or 0.001in.).

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Gloss

A film's surface reflectivity of light shone usually measured as a percentage. Higher percentages expressing higher shine and vice versa.

Haze

The measure of light expressed as a percentage which shows or transmits through plastic film, essentially its clarity or transparency. The lower percentage expresses higher clarity and vice versa. Higher haze percentage distorts colors and imparts a dusty, cloudy appearance to the film.

Heat Seal

Bonding two or more plastic films using heat and pressure to the area to be sealed.

High-Density Polyethylene (HDPE)

A polyethylene resins/film made from petroleum ranging in density from approximately 0.940 to 0.965. It is a harder, more opaque plastic able to withstand higher temperatures. It has an SPI resin code of 2.

Homopolymer

A polymer formed from a single monomer.

Impact Resistance

The relative susceptibility of plastics to fracture under stresses applied at high speeds.

Lamination

A single ply material formed out of two or more separate materials bonded together by an adhesive, solvent or extrusion coating, designed for specific protective functions.

Layflat

Measurement of the transverse/cross direction of film, also known as film width.

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Light Transmission

The amount of light that transmits through color pigmented films. Measured values range from 100% for clear film to 0% for opaque films.

Linear Low-Density Polyethylene

A process variation of low density polyethylene. It allows for higher draw down-gauging in extrusion and increased film strength.

Low-Density Polyethylene

A polyethylene resins/film made from petroleum ranging in density from approximately 0.910 - 0.940 g/cm³. It is weaker than HDPE being relatively soft, with a lower tensile strength and higher resilience. It has an SPI resin code of 4.

Low Temperature Flexibility (see Cold Crack)

Machine Direction (MD)

Direction of the film as it was produced through the die or film making machine. Also called Longitudinal Direction.

Melt Temperature

The temperature at which a resin changes from a solid to a liquid.

Metallized Films

Polymer films coated with a thin layer of metal, usually aluminum.

Migration

The exudation or bleeding of material from within a plastic film substrate to its surface or on to another material it is in contact with.

Mil

Gauge measurement commonly used in film manufacturing. One mil equals one thousandth of an inch (0.001" or 0.001in.).

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Modulus (Young's)

A measure of the stiffness of an isotropic elastic material usually expressed in psi in the US.

Monomer

A single small molecule of an organic compound which may chemically bond with other monomers and react to form a polymer.

Mono layer

Film comprised of a single ply polymer.

Opacity

The property of the material that hides what is behind it such for instance, how well pigmented film blocks light.

Orange Peel

Plastic film with a surface finish resembling an orange peel which was either the result of embossing or a surface distortion.

Phthalates

Esters of phthalic acid primarily used as plasticizers. It is most commonly added to soften Polyvinyl Chloride (PVC) polymer though its use is not limited to this.

Plasticizer

A substance or material blended into plastic or elastomer to increase its flexibility, workability or distensibility. Also known as a softener.

Polyamide (PA)

Otherwise known as Nylon, is a thermoplastic which has high strength and is very resistant to wear and abrasion. It also has good puncture resistance, heat resistance, and low gas permeability.

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Polycarbonate

Polycarbonate is a thermoplastic polymer with excellent temperature resistance, impact resistance and optical properties. Lightweight, easily molded and thermoformed, it is widely used in various applications from consumer products to engineering applications. Bisphenol A is a building block of polycarbonate plastic. It carries an SPI resin of 7.

Polyethylene (PE)

Polyethylene is a thermoplastic produced by polymerizing ethylene gas. It is classified into several different categories based mostly on its density and branching amongst which are Low Density (LDPE), Linear Low Density (LLDPE) and High Density (HDPE) polymers.

Polyethylene Terephthalate (PET)

PET is a thermoplastic polymer resin of the polyester family and is used in synthetic fibers; beverage, food and other liquid containers such as soft drink bottles. It is clear and tough, with good gas and moisture barrier properties. It has an SPI resin code of 1.

Polymer

A large molecule (macromolecule) composed of repeating structural units typically connected by covalent chemical bonds.

Polypropylene (PP)

A rigid plastic created from high purity propylene gas, polypropylene is tough, lightweight, and has high resistance to fatigue. It has an SPI resin code of 5.

Polystyrene (PS)

A thermoplastic substance, which is in solid (glassy) state at room temperature, but flows if heated above its glass transition temperature (for molding or extrusion), and becoming solid again when cooling off. It can be rigid or foamed and has a relatively low melting point. Typical applications are containers, bottles, cups, lids, trays, and protective packaging. It has an SPI resin code of 6.

Polyvinyl Chloride (PVC)

A thermoplastic material created by the polymerization of vinyl chloride, and depending on the composition may be flexible or rigid.

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Process Aid

Additives designed to enhance the extrusion ability of plastics, reduce surface defects and improve color consistency.

Proposition 65 (The Safe Drinking Water and Toxic Enforcement Act of 1986)

A voter initiative passed into law to address public concern over exposure to unsafe and toxic chemicals in the State of California. Most noted for its List of Chemicals and its notification requirements of potential exposure to harmful chemicals.

Polymerization

The combination or bonding of many like or unlike molecules of a simple substance (monomer) to form a more complex product of higher molecular weight.

Polyolefins

A category of polymers created through polymerizing a simple olefin, including ethylene, propylene, butene, isoprene, and pentene.

Post Consumer Plastic

Post Consumer plastic is plastic waste produced by the end consumer of a material stream. Simply put this would be individual waste routinely discarded by the end user.

Post Industrial Plastics

Any plastic resin or products such as factory regrind and plant scrap recycled outside of the original manufacturing facility and later reintroduced into the manufacturing process.

REACH (Registration, Evaluation, Authorization and Restriction of Chemicals)

A European Union Regulation (EC/2006/1907) which addresses the production and use of all chemical substances in the European Union “whether manufactured, imported, used as intermediates or placed on the market, either on their own, in preparations or in articles” with certain listed exceptions.

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Resin

Any of a class of solid or semi-solid organic products of natural or synthetic origin, generally of high molecular weight with no definite melting point. Most resins are polymers.

Rigid PVC Film

Polyvinyl chloride film which do not incorporate plasticizers or do so in such significantly low amounts so as not to lower the modulus (stiffness) appreciably. Also known as unplasticized PVC. When formed or molded, it maintains its shape when empty or unsupported.

RoHS (Restriction of Hazardous Substances)

A European Directive (2002/95/EC) which restricts the use of specific heavy metals and flame retardants in electrical and electronic equipment.

Sheet

A plastic web 10 mils and over in thickness (as opposed to plastic film which has a thickness of 10 mils (.010" under))

Sheeting

General term for single wound sheeting.

Shrinkage

Shrinkage occurs when the density of the polymer varies from the processing temperature to the ambient temperature. This is usually measured as a percentage.

Single Wound Sheeting (SWS)

A single layer of plastic film that is wound on a roll.

Slip

Low surface friction (expressed as the Coefficient of Friction) of a polymer against another polymer or against processing equipment.

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Slip Agent

Additive which lowers the film's surface friction to allow the film to slide easily over another layer of film or during processing against equipment.

Specific Gravity

The ratio of the density of material to the density of some other substance taken as standard - with water usually being the standard for liquids and solids at a given temperature. Also known as relative density. Identifying the specific gravity of raw material allows for calculations of weight in produced parts.

SPI - Society of the Plastics Industry

Founded in 1937, SPI is a US plastics industry trade association representing the entire plastics industry supply chain, including processors, machinery and equipment manufacturers and raw materials suppliers. SPI developed the SPI resin code system.

SPI Resin Codes

The SPI resin identification coding system was developed by the Society of the Plastics Industry (SPI) in 1988. It is a set of symbols ranging from 1 to 7 placed on plastics to identify the different polymer types and allow efficient separation for recycling. It has since been used internationally.

Stabilizer

Chemical added to virgin resins and post consumer plastics to increase strength and resistance to degradation. Examples of stabilizers are heat stabilizers, anti-oxidants and light stabilizers.

Surface Tension

An important parameter for adhesion, which is technically significant for the capability to print on it, and for adhesive bonding, as well as for adjustment of adhesive and anti-adhesive properties.

Talc

A filler or anti block agent made of hydrated magnesium silicate, essentially an additive.

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Tear Resistance (Elmendorf)

The measure of a film's resistance to tear after the film has been cut, usually expressed in psi.

Telescoping

Roll phenomenon characterized by layers of film sliding laterally in the transverse direction, causing the edge of the roll to have a conical shaped appearance resembling that of a telescope.

Tensile Strength

The maximum tensile stress a specimen can sustain before failure in a tension test.

Tensile Strength at Yield

The maximum tensile strength at which material strain changes from elastic deformation to plastic deformation causing it to deform permanently.

Tensile Strength at Break

The maximum tensile strength at the point of rupture.

Thermoforming

Common post extrusion process for plastic sheet stock where the sheet is heated until soft and formed via mold into a specific shape.

Tin Canning

Defect in a roll of plastic sheet or film where wavy, uneven or raised ridges appear around the circumference of the roll resembling a tin can.

Transverse Direction (TD)

Direction of the film that is at a right angle to the direction the film was produced. Also called Cross Direction.

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Ultra Violet Inhibitor (UVI)

Additive used to prevent degradation of plastic materials from prolonged exposure to sunlight.

Vacuum Forming

A simpler form of thermoforming where a sheet of plastic is heated to a forming temperature, stretched onto or into a single-surface mold and held against the mold by applying vacuum between the mold surface and the sheet.

Wrinkle

Plastic film imperfection such as a crease, fold or wave.

Yield

The area of film of a given thickness per unit of weight. Common units used are square inches of film per pound.