

# Glossary of terms used in the fibreglass industry

**ACETONE:** Commonly used wipe solvent. Also known as 2-propanone and Di-methylketone. Used for cleaning composite surfaces prior to bonding and also metal surfaces prior to other treatments. Can also be used to remove uncured epoxy resin from tools and other items. Classed as "Seriously Flammable" with a flashpoint of -4 F (-20 C). Has a high evaporation rate.

**ADDITIVE:** Any substance added to another substance, usually to improve properties, such as plasticizers, initiators, light stabilizers, and flame retardants. See also filler. Fillers

**ADHESIVE:** A substance capable of holding two materials together by surface attachment. Adhesive can be in film, liquid, or paste form. In this context, the term is used to denote structural adhesives, i.e., those which create attachments capable of transmitting significant structural loads. Adhesives

**ARAMID:** A type of highly oriented organic material derived from polyamide (nylon) but incorporating aromatic ring structure. Used primarily as a high-strength, high-modulus fibre. Kevlar and Nomex are examples of aramids. Aramid and Carbon Fibre

**BAGGING:** Applying an impermeable layer of film over an uncured part and sealing edges so that a vacuum can be drawn. Vacuum Bagging

**BIAS FABRIC:** Warp and fill fibres at an angle to the length of the fabric. Knitted Fabric

**BLISTER:** Debond of paint or other coating from part surface. Undesirable rounded elevation of the surface of a plastic with boundaries that are more or less sharply defined, resembling in shape to a blister on the human skin. The blister may burst and become flattened.

**BREATHER (BREATHER CLOTH):** A loosely woven material such as glass fabric that will serve as a continuous vacuum path over a part or the repair area, but is not in direct contact with the part or the repair area. Vacuum Bagging

**CARBON FIBRE:** Fibre produced by the pyrolysis of organic precursor fibres, such as rayon, polyacrylonitrile (PAN), and pitch in an inert environment. The term is often used interchangeably with the term graphite; however, carbon fibres and graphite fibres differ. The basic differences lie in the temperature at which the fibres are made and heat treated, and in the amount of elemental carbon produced. Carbon fibres typically are carbonized in the region of 1315 C (2400 F) and assay at 93 to 95% carbon, while graphite fibres are graphitized at 1900 to 2480 C (3450 to 4500 F) and assay at more than 99% elemental carbon.

**CAST:** To form material into a certain shape by pouring it into a mold and letting it harden without applying external pressure. Mould Making

**CASTING RESIN:** A resin in liquid form that can be poured or otherwise introduced into a mold and shaped without pressure into solid articles. Polyester Resin

**CATALYST:** A substance that changes the rate of a chemical reaction without itself undergoing permanent change in composition or becoming a part of the molecular structure of the product. A substance that markedly speeds up the cure of a compound when added to minor quantity as compared to the amounts of primary reactants. Solvents and Reducers

**CHOPPED STRAND MAT:** A mat formed of strands cut to a short length, randomly distributed, without intentional orientation, and held together by a binder.

**CHROME FINISH (VOLAN 'A'):** Applied to glass fibres to give good bonding to polyester and epoxy resins.

**COMPOSITE MATERIAL:** A combination of two or more materials (reinforcing elements, fillers, and composite matrix binder), differing in form or composition on a macro scale. The constituents retain their identities; that is, they do not dissolve or merge completely into one another although they act in concert. Normally, the components can be physically identified and exhibit an interface between one another.

**COMPOUND:** The intimate admixture of a polymer with other ingredients, such as fillers, softeners, plasticizers, reinforcement, catalysts, pigments, or dyes. A thermoset compound usually contains all the ingredients necessary for the finished product, while a thermoplastic compound may require subsequent addition of pigments, blowing agents, etc.

**CORE:** (A) The central member, usually foam or honeycomb, of a sandwich construction to which the faces of the sandwich are attached or bonded. (B) The central member of a plywood assembly. (C) A channel in a mold for circulation of heat transfer media (D) Part of a complex mold that forms undercut parts. (E) A device on which prepreg is wound.

**CORROSION:** The deterioration of a metal by chemical or electrochemical reaction resulting from exposure to weathering, moisture, chemicals, or other agents or media.

**CURING AGENT:** A catalytic or reactive agent that, when added to a resin, causes polymerization. Also called hardener.

**DELAMINATION:** Separation of the layers of material in a laminate, either local or covering a wide area. Can occur in the cure or subsequent life.

**E-GLASS:** A family of glasses with a calcium aluminoborosilicate composition and a maximum alkali content of 2.0%. A general purpose fibre that is most often used in reinforced plastics and is suitable for electrical laminates because of its high resistivity.

**EPOXY RESIN:** A polymerizable thermoset polymer containing one or more epoxide groups and curable by reaction with amines, alcohols, phenols, carboxylic acids, acid anhydrides, and mercaptans. An important matrix resin in composites and structural adhesives. Epoxy Resin

**FIBRE CONTENT:** The amount of fibre present in a composite. This is usually expressed as a percentage volume fraction or weight fraction of the composite.

**FIBRE COUNT:** The number of fibres per unit width of ply present in a specified section of a composite.

**FIBREGLASS REINFORCEMENT:** Material used to reinforce a resin matrix using continuous or discontinuous glass fibres. Available as mat, roving, fabric, etc. It is incorporated into both thermosets and thermoplastics.

**FIBRE-REINFORCED PLASTIC (FRP):** A general term for a composite that consists of a resin reinforced with cloth, tape, mat, or strands of any fibre form and using any type fibre.

**FILL:** Yarn oriented at right angles to the warp in a woven fabric. Also called "weft" or "woof".

**FILLER:** A relatively inert substance added to a material to alter its physical, mechanical, thermal, electrical, and other properties, or to lower cost or density. **FLAME RETARDED RESIN:** A resin compounded with certain chemicals to reduce or eliminate its tendency to burn. Polyester Resin

**GEL COAT:** A quick setting resin applied to the surface of a mold and gelled before lay-up. The gel coat becomes an integral part of the finished laminate, and is usually used to improve surface appearance and bonding. Gelcoats

**HAND LAY-UP:** The process of placing (and working) successive plies of reinforcing material or resin-impregnated reinforcement in position on a mold by hand.

**HARDENER:** A substance or mixture added to a plastic composition to promote or control the curing action by taking part in it. The term is also used to designate a substance added to control the degree of hardness of the cured film.

**IMPREGNATE:** In reinforced plastics, to saturate the reinforcement with a resin.

**KNITTED FABRICS:** Fabrics produced by interlooping chains of yarn. Knitted Fabric

**LAMINATE (noun):** A product made by bonding together two or more layers (plies) of material.

**LAY-UP:** (A) The reinforcing material placed in position in the mold. (B) The process of placing the reinforcing material in position in the mold. (C) The resin-impregnated reinforcement.

**MEKP:** Methyl ethyl ketone peroxide, a catalyst for polyester resins. Highly corrosive. Solvents and Reducers

**MICROSPHERES:** Small, hollow glass spheres used as fillers in epoxy and polyester compounds to reduce density. Fillers

**MILLED FIBRE:** Continuous glass strands hammer milled into very short glass fibres. Useful as inexpensive filler or anticrazing reinforcing fillers for adhesives. Fillers

**MOLD:** The cavity or matrix into or on which the plastic composition is placed and from which it takes form. To shape plastic parts of finished articles by heat and pressure. The assembly of all the parts that function collectively in the molding process.

**MOLDING:** The forming of a polymer or composite into a solid mass of prescribed shape and size by the application of pressure and heat for given times. Sometimes used to denote the finished part.

**MOLD-RELEASE AGENT:** A lubricant, liquid, or powder (often silicone oils and waxes), used to prevent sticking of molded articles in the cavity. Mold Release

**MOLD SURFACE:** The side of a laminate that faced the mold (tool) during cure, often called the tooled surface.

**PEEL PLY:** A layer of open-weave material, usually fibreglass, polyester, or heat-set nylon, applied directly to the surface of a prepreg lay-up. The peel ply is removed from the cured laminate

immediately before bonding operations, leaving a clean resin-rich surface that may need no further preparation for bonding, other than application of a primer where one is required. Vacuum Bagging

**PLAIN WEAVE:** A weaving pattern in which the warp and fill fibres alternate, that is, the repeat pattern is warp/fill/warp/fill, etc. Both faces of a plain weave are identical.

**POLYMER:** A large molecule created by a large number of smaller molecules, called monomers, in a regular pattern.

**POT LIFE:** The length of time, at some specified temperature, that a catalyzed resin is workable. Also known as working life.

**PRIMER:** A coating applied to a surface, before the application of an adhesive, lacquer, enamel, etc., to improve the adhesion performance or load carrying ability of the bond. Some primers contain a corrosion inhibitor.

**REINFORCEMENT:** A strong material bonded into a matrix to improve its mechanical properties. Reinforcements are usually long fibres, chopped fibres, etc. A material used to reinforce, strengthen or give dimensional stability to a part.

**RELEASE AGENT:** A material that is applied in a thin film to the surface of a mold to keep the resin from bonding to the mold. Also called parting agent. Mold Release

**RELEASE FILM:** An impermeable layer of film that does not bond to the resin being cured. Mold Release

**RESIN:** In reinforced plastics, the material used to bind together the reinforcement material; the matrix. Most resins are polymers.

**RESIN TRANSFER MOLDING (RTM):** A process whereby catalyzed thermosetting resin is transferred or injected into an enclosed mold in which the fibre reinforcement has been placed. Cure is normally accomplished without external heat. RTM combines relatively low tooling and equipment costs with the ability to mold large structural parts. In general, thermoplastics are too viscous to be used in RTM even if heat is applied.

**ROOM-TEMPERATURE VULCANIZING (RTV):** Vulcanization or curing at room temperature by chemical reaction; usually applies to silicones and other rubbers.

**ROVING:** A number of yarns, strands, tows, or ends collected into a parallel bundle with little or no twist. This term is applied most commonly to glass and Kevlar. Roving

**SANDWICH CONSTRUCTIONS:** Panels composed of a lightweight core material, such as honeycomb, foamed plastic, etc., to which two relatively thin, dense, high-strength or high-stiffness faces or skins are adhered.

**SATIN WEAVE:** Weaving pattern producing a satin appearance. "Eight-harness" means the warp yarn crosses over seven fill yarns and under the eighth (repeatedly). Also produced as four harness and five harness.

**SELVAGE:** The woven-edge portion of a fabric parallel to the warp, finished off so as to prevent the yarns from unravelling.

**SOLVENT:** A substance (usually a liquid) used for dissolving and/or cleaning materials during reinforced plastics operations. Often flammable or toxic. Should be handled in accordance with safety instructions. Solvents and Reducers

**STRUCTURAL ADHESIVE:** Adhesives used for transferring required loads between adherends exposed to service environments typical for the structure involved.

**SUBSTRATE:** A material upon the surface of which an adhesive or resin is spread for any purpose such as bonding or coating.

**TACK-FREE:** A condition in which a plastic material can be dented with an inert object without sticking to it. It is indicative of a definite stage of hardening.

**THIXOTROPIC:** Concerning materials that are gel-like at rest, but fluid when agitated. Having high static shear strength at the same time. To lose viscosity under stress.

**THREAD COUNT:** The number of yarns (threads) per inch or centimetre in either the lengthwise (warp) or crosswise (fill or weft) direction of woven fabrics.

**TOOLING:** The molds and fixtures used to produce a composite article. Tooling may be made of any suitable material, including composites.

**TWO-COMPONENT ADHESIVE:** an adhesive supplied in two parts that are mixed before application. Such adhesives usually cure at room temperature. Adhesives

**UNIDIRECTIONAL:** All of the fibres are oriented in the same direction.

**VACUUM BAG MOLDING:** A process in which a sheet of flexible transparent material plus bleeder cloth and release film are placed under the layup on the mold and sealed at the edges. A vacuum is applied between the sheet and the lay-up. The entrapped air is mechanically worked out of the lay-up and removed by the vacuum, and the part is cured with temperature, pressure, and time. Vacuum Bagging

**VINYL ESTERS:** A class of thermosetting resins containing esters of acrylic and/or methacrylic acids, many of which have been made from epoxy resin. Cure is accomplished as with unsaturated polyesters by copolymerization with other vinyl monomers, such as styrene. Vinylester Resin

**VULCANIZATION:** A chemical reaction in which a rubber is cured by reaction with sulphur or other suitable agents.

**WARP:** The yarn running lengthwise in a woven fabric. A group of yarns in long lengths and approximately parallel. Fabrics are tensional in the warp direction during weaving. The weft is not tensioned.

**WEATHERING:** Exposure of plastics to the outdoor environment.

**WEAVE:** The particular manner in which a fabric is formed by interlacing yarns. Usually assigned a style number.

**WEFT:** The transverse threads or fibres in a woven fabric. Those fibres running perpendicular to the warp. Also called fill, filling yarn or woof.

**WET LAY-UP:** A method of making or repairing a reinforced product by applying the resin system as a liquid when the reinforcement is put in place.

**WET-OUT:** The condition of an impregnated roving or yarn in which substantially all voids between the sized strands and filaments are filled with resin.

**WORKING LIFE:** The period of time during which a liquid resin or adhesive, after mixing with catalyst, solvent, or other compounding ingredients, remains usable. Also called pot life.

**WOVEN ROVING:** A heavy glass fibre fabric made by weaving roving or yarn bundles.