Glossary

Accelerator, A chemical used to increase the rate of cure of resin at room temperature.
Acetone, A cleaning fluid used in RP/C context to remove uncured resin. A Flammable Liquid.
Additive, substances added to resin to impart specific performance qualities, such as ultraviolet inhibitors, fire retardant and air inhibitors.
Adhesive Failure, A loss of bond that appears to be a separation at the adhesive /adherent interface.
Air Dry, cure at room temperature without the application of heat or pressure.
Air-Inhibited Resin, a resin whose surface will remain tacky to the touch after hardening because the oxygen in the air prevents completion of the reaction.
Alligatoring, Wrinkling of the gel coat.
Antimony Trioxide, An additive used to impart fire retarding characteristics to a resin.
Aramid, Aromatic polyamide fibers characterized by excellent flame-resistance, high-temperature, and electrical properties. Aramid fibers are used to achieve high-strength, high-modulus reinforcement in plastic composites.
Areal Weight, a measurement unit consisting of the weight at a specified width times length, of the product. Woven fabrics are designated by weight per square yard. Mat by weight per square foot.
Aspect Ratio, The ratio of length to width or diameter.
Autoclave, A closed vessel that permits application of pressure and heat.
Auto-Ignition Temperature, The lowest temperature required to initiate or cause self-sustained combustion in the absence of a spark or a flame.
Axial Winding, A type of filament winding in which the filaments are parallel to the axis.
Bag Molding, A technique for forming plastic laminates or composites by means of air pressure, vacuum and/or heat in a flexible or semi-flexible bag or autoclave, usually in connection with a rigid die or mold
Barcol Hardness, A determination of hardness of a polyester using a Barcol Impresser.
Benzoyl Peroxide (BPO), The catalyst used in conjunction with aniline accelerators or where heat is used as an accelerator.
Bi-Directional, An arrangement of the reinforcing fibers strands in which the strands are laid at right angles to each other, a directional pattern which gives maximum product strength in two planes.

Bias Fabric, A fabric in which warp and fill fibers are at an angle to the length.
Biaxial Winding, A type of filament winding in which the helical band is laid in sequence, side by side, with no crossover of the fibers.
Binder, Bonding resin applied to glass fibers to hold fibers in position.
Blank, The foam core of a surfboard or sailboard that the shaper begins with.
Bleeder Cloth, A layer of woven or non-woven material, not a part of the composite, that allows excess air and resin to escape during vacuum or pressure bagging.
Bond Strength, As measured by load/bond area, the stress required to separate a layer of material from that to which it is bonded. The amount of adhesion between bonded surfaces.
Braiding, Weaving fibers into a tubular shape.
Breather, A loosely woven material that does not come in contact with the resin but serves as a continuous path for release of entrapped air and resin during vacuum or pressure molding.
Buckling (composite), A failure mode usually characterized by fiber deflection rather than breaking because of compressive action.
Butt Joint, A joint in which parts are joined with no overlap.
Carbon Fiber, An important reinforcing fiber known for light weight, high strength and high stiffness that is produced by pyrolysis of an organic precursor fiber in an inert atmosphere above 1800'F. The material may also be graphitized by heat treated above 3000'F.
Carcinogen, A substance that can promote the development of cancer.
Catalyst In the common terminology of the reinforced composite industry, a catalyst is actually the initiator that causes the chemical reaction that turns a liquid polyester resin into a solid. The type of initiator employed depends upon the temperature at which the reaction will take place.
Cavity, The space between matched molds (pressure molds) in which the laminate is formed. Also a term for a female mold.
Centipoise, Measurement of viscosity as compared to water **(1** centipoise).
Chemical, Any element, chemical compound or mixture of elements and/or compounds.
Chemical Abstract Service Registry Number (CAS) - Identification number assigned to a chemical substance by the service. Many chemical data-base's use this number.
Chemical Name, The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the Chemical Abstracts Service rules of nomenclature.

Chopped Strand, Continuous strand yam or roving cut up into uniform lengths, usually from 1/32" to 1/2" long.

Chopper Gun, A special spray gun used for spray-up laminating which chops predetermined lengths of fiberglass roving or strands, and deposits them together with catalyzed resin at the same time onto the mold surface.

Cloth, A fine weave of woven fiberglass fabric.

Cobalt, Used as the accelerator for Methyl Ethyl Ketone Peroxide catalyzed polyesters.

Coefficient of Thermal Expansion, A material's fractional change in length for given unit change of temperature.

Color Pigment, Dispersions ground coloring materials in a thick liquid, which are compatible with the resin system in which it will be used. When added to the resin, the pigment dispersions give it color

Combustible, A solid, liquid or gas substance that will burn.

Common Name, Any designation or identification such as a code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.

Concentration, The amount of one substance in another substance.

Container, Any bag, barrel, bottle, box, can cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical.

Contingency Plan, A document setting out an organized, planned and coordinated course of action to be followed in case of a fire, explosion or release of hazardous waste that could threaten human health or the environment

Corrosive, A substance, either liquid or solid, that can cause visible destruction or irreversible alterations in human skin at the site of contact. Or, RCRA defines "corrosive" as any chemical with a pH less than 2 or more than 12.

Commingled yarn, A hybrid yarn made with two types of materials intermingled in a single yarn; for example, thermoplastic filaments intermingled with carbon filaments to form a single yarn.

Composite, Dissimilar materials laminated together to form a single structure, for example, resin, gel coat, glass. A material created from a fiber (or resin-reinforcement) and an appropriate matrix material in order to maximize specific performance properties. The constituents do not dissolve or merge completely but retain their identities as they act in concert.

Compression Molding, A technique for molding thermoset plastics in which a part is shaped by placing the fiber and resin into an open mold cavity, closing the mold,, and applying heat and pressure until the material has cured or achieved its final form.

Compressive Strength, A material's ability to resist a force that tends to crush or buckle; maximum compressive load a specimen sustains divided by the specimen's original cross-sectional area.

Contact Molding, A molding technique in which reinforcement and resin are placed in a mold, with cure taking place at room temperature with a catalyst/promoter system or in a heated oven. No additional pressure is used.

Continuous Filament, An individual, small-diameter reinforcement that is flexible and indefinite in length.

Continuous-Filament Yarn, Is formed by twisting two or more continuous filaments into a single continuous strand.

Continuous Roving, Parallel filament coated with sizing, gathered together into single or multiple strands, and wound into a cylindrical package. It may be used to provide continuous reinforcement in woven roving, filament winding, pultrusion, prepregs, or high-strength molding compounds, or it may be used chopped.

Copolymer, A large chemical chain composed of two or more dissimilar groups.

Core, The central component of a sandwich construction to which the sandwich faces or skins are attached; also, part of a complex mold that forms undercut parts.

Crazing, Cracking of the resin due to internal stains. Hairline cracks either within or on the surface of fiberglass laminates, caused by stresses generated by excessive heat during cure, removal from the mold, impact, or flexing.

Creep, The dimensional change in a material under physical load over time beyond instantaneous elastic deformation.

Crimp, A fiber's waviness, which determines the capacity of the fiber to cohere.

Critical Length, The minimum length of fiber necessary for matrix shear loading to develop fiber ultimate strength by a matrix.

Cross-Linking, The process of bridging two polymer chains which converts a thermoplastic to a thermoset.

Cure, To change the physical properties of a material irreversibly by chemical reaction via heat and catalyst, alone or in combination, with or without pressure.

Cure Temperature, The temperature at which a material attains final cure.

Cure Time, The time required for the liquid resin to reach polymerized state after the catalyst has been added.

Curing Agent, A catalytic or reactive agent that brings about polymerization when it is added to a resin.

Damage Tolerance, A measure of the ability of structures to retain load-carrying capability after exposure to sudden loads.

Damping, Diminishing the intensity of vibrations.

Decomposition, The breakdown of a chemical.
Delamination, Failure of internal bonding between layers of resin and reinforcement. It appears as a separation of the layers.
Denier, A numbering system for yarn and filament in which yarn number is equal to weight in grams of 9000 meters of yarn.
Density, Weight per unit of volume, usually expressed as pounds per cubic foot.
Dermal, By or through the skin.
Design Allowable, A limiting value for a material property that can be used to design a structural or mechanical system to a specified level of success with 95 percent statistical confidence
Diethylaniline (DEA), Accelerator used in conjunction with BPO catalyst or as a co-promoter for cobalt/MEKP systems.
Diluent, Diluting (reducing or thinning) agent.
Dimensional Stability, Capability of an item to retain constant shape and size under normal changes in atmospheric pressures and temperatures.
Dimethyl Aniline (DMA), Accelerator used in conjunction with BPO catalyst or as a co-promotor for cobalt/MEKP systems. More effective than DEA.
Dimples, Small sunken dots in the gel coat or resin surface, generally caused by a foreign particle in the laminate.
Dispersion, The means of incorporating pigments into a polyester.
Distortion, A wavy gel coat image often found in conjunction with print through.
DOT, The U.S. Department of Transportation, the federal agency that regulates the transportation of chemicals.
Draft, The degree of taper allowed on the sides of a mold so the part can be removed.
Draft Angle, A mandrel's taper or angle for ease of part removal.
Drape, The ability of a reinforcement to conform to the shape of a contoured surface.
Duplication Mold, A mold made by casting over or duplicating another article. Also referred to as splashing.
E-Glass, (Electrical Glass), The borosilicate glass most often used for the glass fibers in conventional reinforced plastics.
Elongation, The increased length of a bar or section under tension test expressed as a percentage difference between the original length and the length at the movement of rupture.
Encapsulating, Enclosing an article in a closed envelope of plastic by immersion. Milled fibers or short chopped strands are often poured with the catalyzed resins into open molds for casting electrical components.

End, A strand of roving consisting of a given number of filaments is considered an end before twisting.

Epoxy Resin, Thermosetting resin usually of a two-part type, that when combined, cure and form into an extremely hard and tough product. They will adhere better and shrink less than polyester resins, have generally greater strength, although they are more costly.

Exothermic Heat, The heat given off by the resin developed internally during the curing process, or "polymerization." It is caused by the reaction of the accelerator and the catalyst when mixed in polyester resins, and by the hardener in epoxy resins.

Fabric, Nonwoven, A material formed from fibers of yarns without interlacing.

Fabric, Woven, A material constructed of interlaced yarns, fibers or filaments.

Fading, Loss of color in the gel coat.

Fatigue, The failure of a material's mechanical properties as a result of repeated stress.

Feather Edge, The process of tapering the edge of a resin-saturated fiberglass material to blend with the adjoining surface, as opposed to having an abrupt edge.

Fatigue Strength, Maximum cyclical stress withstood for a given number of cycles before material fails.

Female Mold, The type of mold where the part is made inside a cavity with the inter surface of the mold (cavity) being the outer surface of the part, Commonly used in the production of fiberglass boats where the outer surface of the molded part is formed by the inter surface of the mold.

Fiber, An individual rod of glass of sufficiently small diameter to be flexible, having a known or approximate limit of length.

Fiberglass, Fibers similar to wool or cotton fibers, but made from glass; sometimes called fibrous glass. Glass fiber forms include cloth, yarn, mat, milled fibers, chopped strands, roving, woven roving and knitted fabrics.

Fiber Orientation, The fiber alignment in a nonwoven or a mat laminate in which most of the fibers are in the same direction, thereby affording higher strength in that direction.

Filament, A single, hair like fiber characterized by extreme length (usually of glass) which permits its use in yarn with little or no twist and usually without the spinning operation required. Filaments are used in tows, yarns or roving.

Filament Winding, A process for production of high strength, lightweight products in which tape, roving or single strands are fed from a creel through a bath of resin (or fed dry using pre-impregnated roving) and wound on a suitable designed mandrel. The wound mandrel is cured at room temperature or in an oven.

Fill or Sanding Resin, A general purpose polyester resin used to fill voids in reinforcing material in the initial lay-up of a surfacing application. It usually contains wax.

Fillers, Relatively inert organic or inorganic materials which are added to plastics and resins to extend volume and lower the cost of the article being produced.

Fillet, A rounded filling on an inside corner or angle.

Finish, Materials applied to fibers, after sizing is removed, to improve matrix-to-fiber coupling. The surface cleaning treatment applied to the glass fibers after weaving them into cloth in order to allow the resin to flow freely around and adhere to them. The finish determines the quality of the adhesion between the glass and the resin. The common finishes for fiberglass in boat work are chrome ("Volan") and for surfboards, silane.

Finishing Resin, A polyester Resin containing wax (surfacing agent) which floats to the surface to exclude the air from the resin surface, thereby allowing it to cure or "set up."

Fire-Retardant Resin, A Resin type which has been formulated with chemicals to reduce or nearly eliminate its tendency to burn when once cured or "polymerized." It should be noted that fire retardant resins are not "fire proof."

Fire Point, The lowest temperature at which a liquid in an open container will give off enough vapors to continue to burn once ignited. Fire point generally is only slightly higher than flash point.

Fish Eye, A circular separation in a gel coat film generally caused by contamination such as silicone, oil, dust, water.

Flammable, The susceptibility of materials to burn.

Flash Point, The lowest temperature at which the vapor of a substance catches fire, even momentarily if an ignition source is applied. Provides an indication of how flammable a substance is. The lowest temperature at which a substance gives off enough vapors to form a flammable or ignitable mixture with air near the surface of the substance being tested.

Flexural Modulus, Measures the resistance of materials to bending loads. It is used to determine how far a material will bend when a given weight is applied across a given space. It is measured in millions of pounds per square inch. Higher numbers mean that there is more resistance to deflection.

Flexural Strength, Also known as bending strength, it describes how much of a non-moving weight can be applied before a material yields or breaks. It is measured in thousands of pounds per square inch. High numbers mean the material is stronger and can withstand a heavier load.

Foam, In RP/C context this term usually refers to rigid foam plastics of three types: polystyrene ("Styrofoam"), polyurethane (including the pour-in-place type), and polyvinyl chloride (PVC).

Fracture, A rupture of the surface of a laminate because of external or internal forces, with or without complete separation.

Flow meter, An instrument designed to measure the flow of a liquid. Normally used with catalyst injection equipment.

Free Radicals, Highly reactive molecule fragments capable of initiating chemical reactions, such as polymerization of polyester resins**.**

FRP, Fiberglass Reinforced Plastics.

Fumed Silica, Aerosil, Cabosil.

Gel, A partial cure stage of plastic resins in a viscous, jelly-like state where the liquid material starts to transform into a solid.

Gel Coat, A surface coat layer of either colored or clear, non-reinforced polymer resin. It provides a protective coating for the fiber glass composite part and a cosmetic enhancement of the molded part.

Gel Time, The length of time from when catalyst or hardener is added and remains workable until it starts to solidify.

Glass Content/Glass-Resin Ratio, The amount of fiberglass reinforcing material in a laminate compared to the amount of resin. Glass content assumes that sufficient resin exists to convert the materials into a stiff, structural laminate.

Glassing, Applying (laminating) fiberglass cloth with resin to a shaped blank.

Gloss Resin, The specialized resin that is applied to surfboards as a final coat.

Glug, A measurement unit used by some experts to determine the amount of catalyst to add to polyester surfboard resin to initiate the cure cycle.

Hand Lay-up, A fabrication method in which reinforcement layers, pre-impregnated or coated afterwards, are placed in a mold by hand, then cured to the formed shape.

Hardener, A substance used to promote or control curing action by taking part in the reaction.

Hazard Classes, Hazardous materials classed by group by the DOT. The classes include explosives, flammable liquids, flammable solids, oxidizers and organic peroxides, compressed gases, corrosives, poisons and etiologic agents.

Hazard Communication Standard, A chemical right-to-know law under the OSHA Act that requires chemical manufacturers and users to assess the hazards of the chemicals they make or use and to distribute this information for use in informing workers of the hazards associated with the chemicals in their work area.

Hazard Warning, Any words, pictures or combination thereof appearing on a label or another appropriate form of warning that conveys the hazard(s) of the chemical(s) in the container(s).

Hazardous Chemical, Any chemical that is a physical hazard or a health hazard.

Hazardous Material, A substance designated by the DOT to pose potential hazards when transported

Health Hazard, A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term includes chemicals that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosive, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the body's blood system, and agents that damage the lungs, skin, eyes or mucous membranes.

Heat-Distortion Temperature, The temperature at which a test bar deflects a certain amount under specific heat and a stated load.

Honeycomb, Resin-impregnated material manufactured in usually, hexagonal cells that serve as a core material in sandwich constructions. Honeycomb may also be metallic or polymer materials in a rigid, open cell structure.

Hoop Stress, Circumferential stress in a cylindrically shaped part as a result of internal or external pressure.

Hot Pot, Catalyst is mixed with the gel coat or resin in a pressure pot prior to spraying, as opposed to internal or external gun mixing.

Hot Coat, A resin layer applied to fill the weave of the cloth in the lamination process.

Humidity, Moisture content of the air.

Hybrid Composite, A composite that has two or more reinforcing fibers.

Hydrophobic, Moisture resistant capability, moisture repelling.

Hydroscopic, Moisture absorbing capability.

Impact Strength, A material's ability to withstand shock loading as measured by the work done in fracturing a specimen.

Impregnate, To saturate the voids and interstices of a reinforcement with a resin.

Impregnated Fabric, See prepreg.

Inhibitor, A chemical which retards polymerization, thus extending shelf life, Inhibitors are used to influence gel time and exothermic heat.

Interface, The surface between two different materials; in fibers, the area at which the glass and sizing meet; in a laminate, the area at which the reinforcement and the laminating resin meets.

Interlaminar, Existing or occurring between two or more laminates that are adjacent.

Interlaminar Shear, The shearing force tends to produce displacement between two laminates along the plane of their interface; usually the weakest element of a composite.

Irritant, A chemical that is not corrosive and that causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Isophthalic Resin ("ISO"), Isophthalic acid based polyester resin which has somewhat higher physical properties than orthophthalic resins

Isotropic, Having uniform properties in all directions independent of the direction of load application.

Kevlar®, A proprietary aramid fiber made by Du Pont Chemical for making reinforcing materials.

Label, Printed, written or graphic material displayed on or affixed to packages, overpacks and freight containers of hazardous materials, as required by DOT.

Laminate Ply, One layer of a laminated product.

Laminate, A material composed of successive layers of composite materials (resin and reinforcements) bonded together. The product.

Lamination, The layering of composite materials and the eventual bonding together of these layers. The process.

Laminating Resin, A resin formulated to bond successive layers of reinforcements. A polyester resin that will not completely cure tack-free in the presence of air.

Lap Joint, A joint made by positioning one material over another end-to-end or side-by-side (as opposed to a butt joint). The joint consists of more than one layer of material.

Lay-up, Placing reinforcing material onto the mold and applying resin to it; can be done by hand or using mechanical applicators. Lay-up is sometimes used as term for the work piece itself.

Male Mold, The type of mold where a part is made up over the mold instead of inside the mold, with the outside surface of the mold creating being inner surface of the molded part. A swimming pool is an example.

Mandrel, The form around which resin-impregnated fiber or tape is wound to form structural shapes or tubes.

Mat, A fibrous reinforcing material composed of chopped filaments (for chopped-strand mat) or swirled filaments(for continuous-strand mat) with a binder to maintain form; available in blankets of various widths, weights and lengths.

Master (Plug), The tool used to build molds for the manufacture of fiberglass parts.

Matched-Metal Molding-Matched-Die Molding, A method of molding reinforced plastics between two close-fitting metal molds mounted in a hydraulic press. Generally considered the most economical mass production method for manufacturing RP parts.

Material Safety Data Sheet (MSDS), Written or printed materials concerning a hazardous chemical that includes information on the chemical's identity; physical and chemical characteristics; health hazards; primary routes of entry; exposure limits; whether the chemical is a carcinogen; precautions for safe handling and use; control measures; emergency and first aid procedures; and the name, address and telephone number of the manufacturer, importer or employer distributing the MSDS.

Matrix, A material in which the fiber of a composite is embedded; it can be plastic, metal, ceramic or glass.

MEK Peroxide (MEKP), Abbreviation for methyl ethyl ketone peroxide; a strong oxidizing agent (free radical source) commonly used as catalyst for polyester resins.

MEK Solvent, Abbreviation for methyl ethyl ketone; a colorless, flammable liquid commonly used in clean-up procedures.

"Microballoons" - "Microspheres", Any of the several available types of microscopic gas filled balloons or balloon aggregates. They may be composed of glass, phenolic, Saran@ or various silicates. When added to resins they make light weight patching pastes sometimes referred to as "syntactic foams."

Milled Fibers, Crushed glass used generally for making glass filled putty.

Mixture, A combination of two or more substances not involving a chemical reaction.

Modulus, A measure of the ratio of load (stress) applied to the resultant deformation of a material, such as elasticity of shear.

Modulus of Elasticity, The ratio of unit stress to unit strain within the proportional or elastic range of a material. Also known as "Young's Modulus."

Moisture Absorption, The pick-up of water vapor from air by a material. It relates only to vapor withdrawn from the air by a material and must be distinguished from water absorption, which is the gain in weight due to the take up of water by immersion.

Mold, (1) The tool from which a plastics part is made and from which it takes its form. (2) The process by which a plastic part is made. (3) To shape plastics parts

by heat and pressure. (4) The assembly of all components that function collectively in the molding process.

Mold Release, A substance used to coat the mold to prevent sticking of the resin that will be used to make a part. It facilitates the substance used to coat the mold in order to prevent sticking and for ease of part release.

Molding, The forming of plastic and composite materials by various means, such as contact, pressure, matched die, and continuous laminating into a given shape of a mold, and holding that shape by the mold until the resin cures or hardens.

Monofilament, A single filament of indefinite length. Monofilaments are generally produced by extrusion.

Monomer, A relatively simple compound capable of polymerization with itself or with a compatible resin while acting as a diluent.

Multifilament, A yarn consisting of many continuous filaments.

Non-Air Inhibited Resin, A resin in which the surface cure will not be inhibited or stopped by the presence of air. A surfacing agent has been added to exclude air from the surface to the resin.

Non-Volatile Material, The portion remaining as solid under specific conditions short of decomposition.

Non-Woven Roving, A reinforcement composed of continuous rovings loosely gathered together.

Orange peel, Backside of the gel coated surface that takes on the rough wavy texture of an orange peel.

Oriented Materials, Composites whose constituents are aligned in a particular way.

Orthophthalic Resin ("Ortho"), Orthophthalic acid based polyester resin. Considered a "general purpose" resin.

Oxidizer, In RP/C context a chemical agent that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Parallel-Laminated, Laminated so that all layers of material are oriented approximately parallel with respect to the grain or strongest direction in tension. Also called unidirectional, this pattern allows the highest loading of reinforcement, but gives maximum strength in only one direction.

Parting Agent, Any material used to coat the mold to prevent the molded part from sticking to the mold when being removed, or a material used to keep resin from sticking to any part of the work. Common release agents are wax, polyvinyl alcohol (PVA), cellophane, glass, and "Formica". Wax and PVA are commonly used in female mold factory production boat-building. See mold release.

Pattern, The initial model for making fiberglass molds.

Peel Ply, A layer of material applied to a laminate surface that is removed from the cured laminate prior to subsequent bonding operations, Leaves a clean resin-rich surface ready for bonding or filling.

Peel Strength, The strength of an adhesive bond obtained by stress applied "in a peeling mode".

Peroxides, Category of compounds containing unstable O - O Group: Oxygen to Oxygen atoms.

Physical Hazard, A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water reactive (HC standard definition).

Pitch, A residue petroleum product used in the manufacture of certain carbon fibers.

Pigment, An opaque ingredient used as a coloring agent for resin and in gel coats to impart color.

Pinholes, Small air bubbles in the laminate or gel coat surface. few enough to count. Generally larger in size than porosity.

Planer, A power tool used to form or shape foam blanks quickly and easily

Plastics, Usually synthetic materials chemically created from organic substances classified as thermoplastics or thermosets.

Ply, The number of single yarns twisted together to form a plied yarn; one of the layers that make up a stack or laminate.

Plug, See Master - Both terms used to imply the same meaning. Form identical in shape to the finished object over which a mold is fabricated.

Polar Winding, A type of filament winding in which the filament path passes tangent to the polar opening at one end of the chamber and tangent to the opposite side of the polar opening at the other end of the chamber.

Polyester, A resin formed by the reaction between dibasic acid and a dihydroxy alcohol. Modification with multifunctional acids and/or bases and some unsaturated reactants permit cross-linking to thermosetting resins. Polyesters modified with basic oils are called alkyds.

Polymer, The end product, usually a solid, produced from a single or combination of monomers. A very large molecule formed by combining a large number of smaller molecules, called monomers, in a regular pattern.

Polymerization, The chemical chain composed of many identical groups, such as polystyrene. The chemical reaction of cross-linking the molecules in the resin. See also Cure.

Polyvinyl Alcohol (PVA), A liquid water soluble release agent for polyester.

Porosity, Small air bubbles in the gel coat film; too numerous to count. Generally smaller in size than pinholes. The formation of undesirable clusters of air bubbles in the surface or body of a laminate.

Post Cure, An additional elevated-temperature exposure that is performed often without tooling or pressure to improve elevated-temperature mechanical properties, for example**,** Post-Cure-Exposure of the cured resin to higher temperatures than during curing in order to obtain a more complete cure or more rapid cure.

Pot Life, The length of time that a catalyzed resin remains workable.

Potting, Similar to encapsulating, except that steps are taken to insure complete penetration of all the voids in the object before the resin polymerizes.

Pre-cure, The full or partial setting of a resin or adhesive before the clamping operation is complete or before pressure is applied.

Ppm, Parts of a substance per million parts of air, soil or water. It is a measure of concentration by volume in air.

Precursor, For carbon fibers, the rayon, PAN, or pitch fibers from which carbon fibers are made.

Preform, Mat-Fiber reinforced mat shaped like the mold in which it will be used. It eliminates the need for overlapping the corners in molding.

Preheating, The heating of a compound prior to molding or casting in order to facilitate the operation or to reduce the molding cycle.

Premix, Reinforcing material mixed with resin, and usually with pigment, filler and catalyst, before placing in the mold. Premix can be extruded into ropes or used in bulk form.

Prepreg, Abbreviation for pre-impregnated glass fibers. Resin-impregnated cloth, mat, or filaments in flat form that can be stored for later use. The resin is often partially cured to a tack-free state called "B Staging". Such additives as catalyst, inhibitors, flame retardant and others, may be added to obtain specific end-use properties and improve processing, storage and handling characteristics.

Pre-Release, Premature release of the gel coat or laminant from the mold.

Pressure-Bag, A tailored bag (usually rubber sheeting) which is placed against the lay-up process. Air or steam pressure (up to 50 psi) is applied between the bag and a pressure plate located over the mold.

Pressure-Bag Molding, A molding technique in which a flexible bag is placed over the contact layup in the mold, sealed and clamped in place, and pressure applied by compressed air, which forces the bag against the part while the part cures.

Primary Laminate, Laminate applied after the skin coat has cured. Generally thicker than the skin coat.

Print Through, "Telegraphing" of the image of glass strands through the gel coat film. The weave or pattern of reinforcing material showing through the exterior surface or gel coat of a laminate.

Promoter, -See accelerator.

Promoted Resin, Polyester resin to which an accelerator has been added. Resin which does not have accelerator is said to be "unpromoted ". Resin which has the promoter added before the user adds the catalyst is said to be "pre-promoted".

Pultrusion, A continuous process for manufacturing composites in rods, tubes, and structural shapes having a constant cross section. After the reinforcement is passed through the resin-impregnation bath, it is drawn through a shaping die to form the desired cross section; curing takes place before the laminate can depart from that cross section.

Ramping, A gradual, programmed increase/decrease in temperature or pressure to control cure or cooling.

Reactive, A material that can enter into a chemical reaction with other stable or unstable materials.

Recycling, Converting solid waste into new products by using the resources contained in discarded materials.

Release, Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment of a chemical, including the abandonment or discarding of barrels, containers and other closed receptacles.

Reinforced Molding Compound, A compound supplied by raw material producer in the form of ready-to-use materials, as distinguished from premix.

Reinforcement, A material added to the matrix to provide the required properties; ranges from short fibers through complex textiles forms.

Release Agents, Materials that are used to prevent cured matrix material from bonding to tooling. A lubricant, often wax, that prevents the adhesion of the part to the mold. An internal lubricant such as zinc stearate is used in high temperature molding to obtain release where wax would melt or be absorbed.

Reportable Quantity, The amount of a substance above which it must be classified as a hazardous substance when transported. Also, the amount above which transport must be reported to EPA, excluding water and formulating materials.

Resin, A material, generally a polymer, that has an indefinite and often high molecular weight and a softening or melting range and exhibits a tendency to flow when it is subjected to stress. Resins are used as the matrices to bind together the reinforcement in material in composites.

Resin Rich, Localized area filled with resin but lacking reinforcement fiber. Rich- An area, especially in a laminate, where too much resin has been applied in relation to the fiberglass reinforcing material. The opposite of a Dry Spot or "resin starved" area. Also referred to as a "resin pocket" and "resin streak."
Resin Starved, Localized area lacking sufficient resin for wetout of the fibers.
Resin Transfer Molding (RTM), A molding process in which catalyzed resin is transferred into an enclosed mold into which the fiber reinforcement has been placed; cure normally is accomplished without external heat. RTM combines relatively low tooling and equipment cost with the ability to mold large structural parts.
Rocker, The bottom contour of a surfboard or sailboard.
Roving, A collection of bundles of continuous filaments either as untwisted strands or as twisted yarns.
Sags/Runs, Sag - slumping of the gel coat or resin film. Run - draining of the gel coat film or laminating resin.
S-Glass, A particular glass formula having higher strength properties than E-Glass. See structural glass.
Sand Coat, The resin layer which is sanded to blend and refine contours of the board (also referred to as the hot coat).
Sandwich Construction, A type of fiberglass construction which resembles a sandwich consisting of relatively dense but high-strength facings bonded to a less dense but thicker intermediate material or "core". Core materials include plastic foams, end grain balsa, honeycomb, lumber and plywood.
Sandwich Lay-up, A lamination composed of two outside layers of reinforced material such as glass mat and inside layer or layers of honeycomb, glass cloth, or other lightweight material.
Scarf Joint, A bonded joint in which similar segments of adherends are cut away, with cut areas overlapped and bonded.
Selvage, The narrow edge of woven fabric that runs parallel to the warp. It is made with stronger yarns in a tighter construction than the body of the fabric to prevent raveling.
Set, To convert a resin into a fixed or hardened state by chemical or physical action, such as condensation, polymerization, vulcanization, or gelation.
Sensitizer. A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.
Shape, The foam blank as completed by the shaper
Shaper, Craftsman who shapes foam

Shear, An action or stress, resulting from applied forces which causes two contiguous parts of a body to slide relative to each other in a direction parallel to their plane of contact. In Cross Shear, the plane of contact is composed of resin and glass fibers. In Interlaminar Shear (ILS), the plane of contact is composed of resin only.

Shelf Life, The length of time a material can be stored and continue to meet specification requirements, remaining suitable for its intended use.

Sizing, A compound that binds together and stiffens warp yarn, providing resistance to abrasion during weaving; normally removed and replaced with finish before matrix application.

Skeg, The name for the fin on a surfboards built prior to the introduction of fin boxes.

Skin, A layer of relatively dense material used in a sandwich construction on the surface of the core.

Skin Coat, The first layer of laminate next to the gel coat.

Sheet Molding Compound (SMC), A ready-to-mold fiber glass reinforced polyester material. The compound is thermosetting resin and a chopped or continuous strand reinforcement sandwiched between two thin layers of polyethylene film. The primary use of SMC is in compression molding.

Solubility, The amount of a substance that can be dissolved in a solvent, usually water.

Solution, Any homogeneous liquid mixture of two or more chemical compounds or elements that will not undergo any segregation under conditions normal to transportation.

Solvent, Usually, a liquid in which other substances are dissolved. The most common solvent is water.

Specific Gravity, The ratio of the weight of any volume of a substance to the weight of an equal volume of some substance taken as a standard unit; usually water for solids and liquids, and air or hydrogen for gases.

Spray-Up, A process in which glass fibers and resin are simultaneously deposited in a mold

Stabilizer, An additive for polyesters to maintain liquid characteristics such as; gel time, viscosity and liquidity.

Staple Fiber, A glass fiber of short length formed by blowing molten glass through holes.

Starved Joint, A joint that does not have the proper amount of adhesive because of insufficient spread or excessive pressure.

Stiffness, The relationship of load to deformation for a particular material.

Storage Life, The length of time a material can be stored and remain suitable for use.

Strain, The elastic deformation of a material as a result of stress.

Strands,-A primary bundle of continuous filaments combined in a single compact unit without twist.

Stress, The internal force that resists change in size or shape, expressed in force per unit area.

Stringer, A material, usually wood that runs lengthwise on a surfboard or sailboard blank, primarily to maintain a pre calculated rocker prior to shaping.

Structural Adhesive, Adhesive used to transfer loads between adherends.

Structural Bond, A bond joining load-bearing components of an assembly.

Styrene Monomer, A water-thin, liquid used to thin polyester resins prior to cure and which serves as the chemical which links the polyester chains together to form a dense solid during the curing process. An unsaturated hydrocarbon, used in plastics. In polyester, it is a co-reactant diluent.

Substrate, Any material which provides a supporting surface for other materials.

Surfacing Agent, Solution added to polyester resin or used in association with it to prevent air from reaching the surface of polyester resin so the resin can cure.

Surfacing Mat, A tissue of staple fibers well bonded with a medium which "wets-out" rapidly in polyester and other contact resins. It is principally used to provide resin rich surfaces on RP moldings.

Surform, A hand plane that uses cheese grater like blades useful for forming foam. Also referred to as a "cheese grater".

Syntactic Foam, Resin which has been made lower in density, weight, viscousity, and generally "stretched out" by the addition of fillers-usually microspheres.

Tensile Modulus, Measure of the ability of a material to withstand load without permanent deformation. It is normally measured as the slope of the straight line portion of a plot of stress vs. strain. It is measured in millions of pounds per square inch.

Tensile Strength, The maximum tensile stress sustained by a plastic specimen before it fails in a tension test.

Thermal Coefficient of Expansion, Measures how much the length of a material will change when the material is heated or cooled. The value given is based on the inch as a unit. The number given shows how much this material is raised one degree Fahrenheit (in.in.°F.). Higher numbers mean that the material will expand or lengthen more for each degree rise in temperature. Smaller numbers indicate relative stability to change no matter what temperature.

Thermal Conductivity, The ability of a material to conduct heat.

Thermoplastic, A plastic material that is capable of being repeatedly softened by application of heat and repeatedly hardened by cooling. Members of the thermoplastic family are the styrene polymers and copolymers, acrylics, cellulose, polyethylenes, vinyls and the various fluorocarbon materials.

Thermoset, A plastic material that once cured cannot be returned to the uncured state. Thermoset will undergo or has undergone a chemical reaction caused by heat, catalyst, ultraviolet light, etc., before it becomes a solid.

Thickener, Material added to resin to thicken or increase the viscosity of the resin so it will not flow as readily. A common thickener used with polyester and epoxy resins is fumed silica, which helps make the resin thixotropic.

Thinner, Material added to resin in order to thin or lower the viscosity of the resin. There is a limit to the amount of thinner that can be added without affecting the desirable qualities of the resin. It is generally better to choose an alternative resin.

Thixotropic, A term describing material more jelly-like at rest than when stirred or agitated, as agitation (shear) reduces the gel and increases the flow. Thixotropic resins are used where it is necessary to minimize runs and sags on vertical surfaces.

Tint, A transparent coloring agent for resin.

Tooling Resins, Resins, chiefly epoxy and silicone, that are used as tooling aids.

Toughness, Tendency of a material to absorb work.

Tow, An untwisted bundle of continuous filaments, usually designated by a number followed by **"K"** indicating multiplication by 1 000.

Undercut, Negative or reverse draft on the mold. Split molds are necessary to laminate (fabricate) parts with undercuts.

Unidirectional, Refers to fibers that are oriented in the same direction, such as unidirectional fabric or tape.

Vacuum Bag Molding, A molding technique, that applies uniform pressure to a laminate by enclosure in a layer film from which air is removed by vacuum.

Vapor Barrier, A material through which water vapor will not pass readily or at all.

Vapor Pressure, A measure of how readily a liquid or a solid mixes with air. A higher. vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of inhaling it.

Vinyl Ester Resin, A type of polyester resin with improved physical properties, especially at elevated temperatures, over either Ortho or Iso polyesters.

Viscosity, A measure of the internal resistance to flow of a fluid. Thickness of a liquid.

Voids, Pockets of entrapped gas that have been cured into a laminate.
Volatiles, Materials in a sizing or a resin formulation that can be vaporized at room or slightly elevated temperature.
Volatile Portions, Those portions vaporizing under specific conditions short of decomposition or total ignition temperatures. Non-volatiles remain.
Volatility, A measure of how quickly a substance forms vapor at ordinary temperatures.
Warp, The yarns running lengthwise and parallel to the selvage in a woven fabric.
Water Absorption, The gain in weight due to the take up of water by immersion.
Wax, A mold release agent.
Weave, The construction of a fabric through a pattern of interlacing of yarns. In plain weave, the warp and fill fibers alternate to make both fabric faces identical; in satin weave, the pattern produces a satin appearance, with the warp tow over several fill tows and under the next one (for example, eight harness satin would have warp tow over seven fill tows and under the eighth).
Weft, The yarns running perpendicular to the warp in a woven fabric; also called fill or "woof"'.
Wetout, The saturation of all voids between strands and filaments of porous materials with resin.
Wetout Rate, The speed with which a reinforcing material can be completely saturated with resin. This rate is usually determined visually and measured in elapsed time.
Wetting Agent, A surface-active agent that promotes wetting by decreasing the cohesion within a liquid.
Wet Winding, A type of filament winding in which the fiber strand is impregnated with resin immediately before it contacts the mandrel.
Wicking, The travel of moisture or water through fibers in a laminate not totally saturated or encapsulated with resin.
Winding Pattern, The regular recurring pattern of the filament path in a filament winding after a certain number of mandrel revolutions.
Woven Cloth, A woven continuous filament cloth used where very high strength is important.
Woven Roving, A heavy, coarse fabric produced by the weaving of continuous filament roving bundles. They drape well, are quickly impregnated, and intermediate in price between mats and knitted fabric reinforcements.
Woven Tape, Tapes of various thickness woven from continuous filament yarns.
Yarn, A twisted strand or strands of glass fibers which can be woven, braided, served and processed on conventional textile equipment.