GLOSSARY

A

A-stage
This is a very early stage in the reaction of certain thermosetting resins where the molecular weight is low and the resin is still soluble in some liquids and still fusible.

Additive
A substance compounded into a resin to enhance or improve certain characteristics.

Antifogger
An additive that prevents condensation of moisture on glass and other transparent materials, such as windshields or lenses.

Antioxidants &Antiozonants
These additives are are used to prevent the negative effects of oxygen and ozone on the resin materials.

Antistats
The use of these additives will eliminate or lessen static electricity.

B

B-stage

This describes an intermediate stage of reaction where the material will soften when heated and swells in the presence of certain liquids, but may not completely fuse or dissolve. The resin is usually supplied in this uncured state.

Bulk-molding compounds (BMC)

Bulk-molding compounds are used as a premix in composite manufacturing. A BMC consists of a mixture of resin, reinforcements, inert fillers, and other additives which form a puttylike preformed shape, rope or sheet.

Binder

A resin or other material used to hold particles together. The binder is the continuous phase in a reinforced plastic which provides mechanical strength or ensures uniform consistency, solidification, or adhesion to a surface coating. Typical binder materials include resin, glue, gum and casein.

Biocides & Fungicides

These additives act as pesticides and are used to inhibit the growth of fungus and other pests.

Blocking & Anticaking Agents

These additives are used to prevent the adhesion of two touching layers of film during fabrication and storage.

Blowing & Foaming Agents

Upon addition to plastics or rubbers and then heating, this chemical generates inert gases which results in the resin assuming a cellular structure.

Blow Molding

Method of fabrication in which a warm plastic parison (hollow tube), is placed between the two halves of a mold cavity and forced to assume the shape of that mold cavity by use of air pressure.

Brighteners

Are used to add smoother or brighter coatings.

Brittle Temperature

A measure for judging the relative merits of materials for low temperature flexing or impact—i.e., the temperature at which materials rupture by impact under specified conditions.

Bulk Density

ASTM D1182-54 test method describes this measurement of mass per unit volume of a molding powder (in large volume determinations).

C

C-stage

This term describes the final stage of the reaction where the material is relatively insoluble and infusible.

Calendering A

Form of extrusion using two or more counter rotating rolls in which film and sheet is produced by squeezing a hot, viscous material between them.

Cast Film

A cast film is made by depositing a layer of plastic onto a surface then solidifying and removing the film from that surface. The plastic layer can be in molten form, in a solution, or in a dispersion.

Casting

The process of forming solid or hollow articles from fluid plastic mixtures or resins by pouring or injecting the fluid into a mold or against a substrate with little or no pressure, followed by solidification and removal of the formed object.

Co-extrusion

The process of combining two or more layers of extrudate to produce a multiple layer product in a single step.

Cold Flow or Creep

A time-dependent strain of solids resulting from stress.

Cold Molding
The process of compression molding involving shaping an unheated compound in a mold under pressure then heating the article to cure it.

Colorants & Pigments
Are additives used to change the color of the plastic. They can be a powder or a resin/color premix.

Composite
A structural material consisting of a combination of materials. Typically, one of the materials is a strengthening agent, the other being a thermoset or thermoplastic resin.

Compound
These are chemical combinations of materials which include all all the materials necessary for the finished product. They include BMC (Bulk Molding Compounds), SMC (Sheet Molding Compounds) and TMC (Thick Molding Compounds).

Compounding
The process required to mix the polymer with all of the materials that are necessary to provide the end user with a finished product.

Compression Molding
The process of molding a material in a confined shape by applying pressure and usually heat.

Compressive Strength
The ability of a material to resist a force that tends to crush it.

Continuous Service Temperature
The highest temperature at which a material can perform reliably in long term application – long term being, however, inconsistently defined by the manufacturers.

Copolymer
The chemical reaction of two different monomers with each other, result in a

compound.

Coupling Agents
A material that is used to form a chemical bridge between the resin and glass fiber or mineral fiber. By acting as an interface, bonding is enhanced.

Crazing
Small cracks near or on the surface of plastic materials.

Cross-linking
The formation of chemical links between the molecular chains in polymers. This process can be achieved by chemical reaction, vulcanization, and electron bombardment.

Cure
The process of changing properties of polymer into a more stable and usable condition. This is accomplished by the use of heat, radiation, or reaction with chemical additives.

Cure Cycle
The time periods at defined conditions to which a reacting thermosetting material is processed to reach a desired property level.

D

Density
The equivalent property to specific gravity; measured by displacement.

Deflection Temperature (1)
The measurement of temperature at which a specimen deflects 0.01 inches under a load of 66 lb/in2.

Deflection Temperature (2)
The measure of temperature at which a specimen deflects 0.01 inches under a load of 264 lb/in2.

Dielectric Constant

The ratio of the capacity of a condenser made with a particular dielectric material to the capacity of the same condenser with air as the dielectric. Measured at a frequency of 106 cycles per second.

Dielectric Strength

The voltage that an insulating material can withstand before dielectric breakdown occurs.

Dissipation Factor

The ratio of the power dissipated in watts in an insulating material to the product of the effective voltage and the current. Measured at a frequency of 106 cycles per second.

E

Effect of Strong Acids

A descriptive notation to indicate the material's performance.

Elongation, Break

The increase in distance between two gauge marks at the break point divided by the original distance between the marks. A zero value in the field indicates that it measured less than one.

Elongation, Yield

The increase in distance between two gauge marks at a yield point divided by the original distance between the marks. A zero value indicates that it measured less than one.

Extender

A material added to a plastic compound used to reduce the amount of resin required per unit value.

Extrusion

The process of forming a continuous piece of plastic by forcing it through a shaping orifice with or without the presence of heat.

F

Fabricating

The manufacture of plastic products by appropriate operations. This includes plastics formed into molded parts, rods, tubes, sheeting, extrusion and other forms by methods including punching, cutting, drilling, tapping, fastening or by using other mechanical devices.

Fillers & Reinforcements

Fillers are used to make a resin less costly. They can be inert or they can alter some properties of the plastic. Reinforcements are substances used to strengthen or give dimensional stability to a material.

Film

Flat materials that are extremely thin in comparison to its length and breadth. Typically, a film has a maximum nominal thickness of 0.25 millimeters.

Flame, Fire & Smoke Retardants

Are added to the resin to retard these undesirable effects.

Flash Gate

Wide gate extending from a runner which runs parallel to an edge of a molded part along the parting line of a mold.

Flexural Modulus

The ratio, within the elastic limit, of the applied stress on a test specimen in flexure to the corresponding strain in the outermost fibers of the specimen.

Flexural Strength, Yield

The measure of resistance of the material to fracture during bending.

Flow Line

A mark on a molded piece made by the meeting of two flow fronts during molding. Also called weld line.

Forming
The process whereby the current shape of a plastic is transformed to another desired configuration.

H

Hardener
A substance or mixture of substance added to a material to increase or control the curing reaction by taking part in it.

Hardness
The resistance of a material to compression, indentation and scratching. There are several scales, and the data in the book gives both the scale used and the value on it.

Haze
The cloudy or turbid appearance of an otherwise transparent material caused by light scattered from within the specimen or from its surfaces.

Heat Stabilizers
These additives increase the ability of the material to withstand the negative effects of heat exposure. They are used to increase the overall service temperature of the material.

I

Impact Modifiers
Are additive used to enhance the material's ability to withstand the force of impact.

Injection Blow Molding
Blow molding process by which the plastic parison to be blown is formed by injection molding.

Injection Molding
The process of forming a material by forcing it from a heated cylinder, under pressure, through a sprue into a cavity of a confined mold.

Injection Molding Pressure
The pressure applied to the cross-sectional area of the molding cylinder.

Izod, Notched, LT
The energy required to break specimens in which there is a v-notch to create an initial stress point but measured at low temperature (minus 40°C).

Izod, Notched, RT
The energy required to break specimens in which there is a v-notched to create an initial stress point.

L

Laminar Flow
Laminar flow of thermoplastic resins in a mold is accomplished by solidification of the layer in contact with the mold surface that acts as an insulating shell through which molten material flows to fill the remainder of the cavity.

Light, UV Stabilizers & Absorbers
These additives increase the ability of the material to withstand the negative effects of light and UV exposure, thus increasing the service life of the material.

Linear Mold Shrinkage
The difference between the size of the part and the size of the mold cavity. Values given are often the average of a range.

Linear Thermal Expansion
The fractional change in length of a material for a unit change in temperature.

Liquid Injection Molding (LIM)
The process that involves an integrated system for proportioning, mixing, a

dispensing two component liquid resin formulations and directly injecting the resultant mix into a mold which is clamped under pressure.

Lubricant

Internal lubricants, without affecting the fusion properties of a compound, promotes resin flow. External lubricants promote release from metals which aids in the smooth flow of melt over die surfaces.

M

Machine Shot Capacity

Refers to the maximum weight of thermoplastic resin which can be displaced or injected by the injection ram in a single stroke.

Masterbatch

A concentration of a substance (an additive, pigment, filler, etc.) in a base polymer.

Melt Flow

Rate of extrusion of molten resin through a die of specified length and diameter. The conditions of the test (e.g. temperature and load) should be given. Frequently, however, the manufacturer's data lists only the value, not the condition as well.

Mold Release Agent

A lubricant used to coat a mold cavity to prevent adhesion of the molded piece when removed.

Moldability

The characteristics of being easy to mold without rupturing or developing flaws due to movement of the polymer during gelation.

O

Odorants & Deodorants

Odorants are used to add odor to materials, usually for safety reasons.

P

Plasticizer

Are usually low-melting solids or high-boiling organic liquids which, when added to hard plastics, impart flexibility. They have varying degrees of softening action and solvating ability resulting from a reduction of intermolecular forces in the polymer.

Plastisol

Mixtures of plasticizers and resins that can be converted to continuous films by applying heat.

Polymer

High-molecular-weight organic compound, natural or synthetic, whose structure can be represented by a repeated small unit, the mer: e.g., polyethylene, rubber, cellulose. If two or more monomers are involved, a copolymer is obtained.

Processing Aids

Some processing aids include thixotropic agents, flatting agents, and blocking and anticaking agents.

Processing Methods

The kind of processing (extruding, molding, casting, etc.) techniques recommended by the manufacturer.

Processing Temperature

An average value is given rather than the temperature range often specified by the manufacturer.

R

Reaction Injection Molding (RIM)

A process that involves the high pressure impingement mixing of two or more reactive liquid components and injecting into a closed mold at low pressure.

Refractive Index, Sodium D

The ratio of the velocity and light in a vacuum to its velocity in the material.

Regrind Waste

Material from injection molding, blow molding and extrusion operations, which has been reclaimed by shredding or granulating.

Reinforced Plastics

A plastic material with enhanced mechanical properties due to the addition of high strength fillers imbedded in the composition.

Resin

A pseudosolid or solid organic material often of high molecular weight. It has a tendency to flow when subjected to stress, usually has a softening or melting range, and usually fractured conchoidally.

S

Sheet

Sheets are made of continuous phase plastic in a form in which the thickness is very small in proportion to length and width. The thickness is greater than 0.25 millimeters.

Slip Agent

An additive that provides surface lubrication during and immediately following processing of the plastic material. It acts as an internal lubricant which will eventually migrate to the surfaces.

Spruce

The main feed channel that connects the mold-filling orifice with the runners leading to each gravity gate. Spruce is also the piece of plastic material form in this channel.

Spruce Gate
The passage through which molten resin flows from the nozzle to the mold cavity.

Stabilizers & Surface Modifiers
Some additives included in this category include antioxidants and antizonants, antistats, biocides and fungicides, heat stabilizers, light, and UV stabilizers and absorbers.

Stress Crack
A crack, either external or internal, in a plastic caused by tensile stresses less than its short-time mechanical strength.

Structural Foam Molding
The process of molding thermoplastics articles with a cellular core and integral solid skins in a single operation.

Surface Resistivity
The ratio of the potential gradient parallel to the current along its surface to the current per unit width of the surface.

Surfactants
The use of these chemicals allows the formation of an emulsion or intimate mixture of otherwise incompatible substances by modifying the surface properties and influencing the wetting and flowing properties of liquids.

T

Tackifiers
Additives used to enhance the adhesiveness or bonding ability of a material.

Tensile Modulus (Also called modulus of elasticity)
The ratio of nominal stress to the corresponding strain below the proportional limit of a material.

Tensile Strength, Break
The maximum stress that a material can withstand without breaking when subjected to a stretching load.

Tensile Strength, Yield
The maximum stress that a material can withstand without yielding when subjected to a stretching load.

Thermal Conductivity
The rate of heat flow under steady state conditions through unit area per unit temperature gradient in a direction perpendicular to an isothermal surface.

Thermoplastics
Resins capable of undergoing a chemical reaction leading to a relative infusible and insolvable state.

Thermosets
Resins or plastic compounds, which in their final state are infusible and insoluble. After being fully cured, thermosets cannot be resoftened by heat.

Transfer Molding
A process of forming articles by fusing a plastic material in a chamber then forcing the whole mass into a hot mold to solidify.

U

UL Temperature Index
The maximum temperature below which a material maintains its electrical and mechanical integrity over a reasonable period.

V

Vacuum Forming
A process whereby a heated plastic sheet is drawn against a mold surface evacuating the air between it and the mold.

Vicat Softening Point
The temperature at which a flat ended needle will penetrate a specimen under a specific load using a uniform rate of temperature rise.

Virgin Material
A plastic material that has not been subjected to use or processing other than that required for its initial manufacture. It can be in the form of pellets, granules, powder, floc, or liquid.

Void
An unfilled space in a cellular plastic which is substantially larger than the individual cells. Can also be an empty space in any material or medium.

Volume Resistivity
The measure of ratio of the potential gradient parallel to the current in the material to the current in density.

W

Warpage
A nonuniform change in internal stresses resulting distortion or warp of the material.

Water Absorption, 24 hours
The percentage of water absorbed by a material when immersed in water for 24 hours; water absorbed in a material chiefly affects its electrical properties.

Wet Lay-up
A reinforced plastic manufacturing process where the polymer compound is applied as a liquid as the reinforcement is put into place.

Wet Winding
A fiber reinforcement material is coated with a polymer compound as a liquid prior to wrapping on a mandrel in the filament wound manufacturing process.

Wetting Agent

Wetting is produced when this surface active agent decreases the cohesion within a liquid. For wetting to occur, the adhesive force between the two phases (solid and liquid) is greater than the cohesive force within the liquid.

Whisker

A single-crystal, short fiber.