

Glossary of Terms

A -

Abraded- Worn away by friction.

Abrasion- Wear due to friction.

Abrasion Test- Determination of the rate of wearing away by friction.

Abrasion Tester- A machine for determining relative abrasion resistance.

Accelerated aging- Intensive exposure to operating conditions to obtain an early change in physical properties of an elastomer.

Accelerated life test- A method designed to approximate in a short time the deteriorating effects obtained under normal service conditions.

Additive - A material which does not effect the chemical reaction but is included to alter the final product such as fillers, flame retardant, etc.

Adhesion- Basically, the adhering, clinging, bonding or sticking of two material surfaces to one another, such as polyurethane to polyurethane, polyurethane to metal, polyurethane to rubber.

Adhesion failure - The separation of two adjoining surfaces due to service conditions.

Adhesive - A material which, when applied, will cause two surfaces in contact with each other to stick together.

Adhesive coating - A coating applied to a surface to increase its bond to an adjoining surface.

Aftercure - A continuation of the stabilization process after the cure has been carried to the desired degree for a predetermined length of time.

Aging - To undergo changes in physical properties with age or lapse of time.

Air bomb aging - A means of accelerating changes in the physical properties of material by exposing them to the action of air at elevated temperature and pressure.

Air checks - The surface markings or depressions which occur due to air trapped between the material and the mold or pouring surface. (see bubble)

Air oven aging- A means of accelerating a change in the physical properties of polyurethane compounds by exposing them to the action of air at an elevated temperature at atmospheric pressure.

Air trap - See air checks.

Alloy - A composite material produced by blending polymers or copolymers with other polymers under controlled conditions to achieve enhanced physical properties.

Ambient temperature - The environment temperature surrounding the object under consideration.

ANSI - American National Standards Institute

Anti-static - See static conductive.

Antioxidant - A compounding ingredient used to retard deterioration caused by oxygen.

Antiozonant - A compounding ingredient used to retard deterioration caused by ozone.

Antislip surface - A specially treated surface to obtain greater than normal traction.

Aperture - The clear opening size, as in length, width or diameter of the opening. Apertures may also involve special shapes such as rectangular (oblong) or triangular configurations.

Artificial weathering - Exposure to cyclic laboratory conditions involving changes in temperature, relative humidity, and radiant energy, with or without direct water spray, attempting to produce changes in the material similar to that observed after long-term continuous outdoor exposure.

ASME - American Society of Mechanical Engineers.

ASTM - American Society for Testing and Materials.

Average modulus - The total change of stress divided by the total change of strain.

- B -

Banbury mixer - A specific type of internal mixer used to incorporate filler and other ingredients in polyurethane or plastic operations.

Bench test - A modified service test in which the service conditions are approximated in the laboratory.

Bending force - The force required to bend a given cross-section under prescribed conditions.

Bending modulus - That force required to induce bending around a specified radius and, hence, a measure of stiffness.

Bleeding - Migration to the surface of plasticizer, waxes or similar materials to form a film or beads. See also Bloom.

Blemish - A mark, deformity, or injury which impairs the appearance.

Blisters - A raised spot on the surface or a separation between layers usually forming a void or air-filled space in the molded article.

Bloom - A discoloration or change in appearance of the surface of a polyurethane product caused by the migration of a liquid or solid to the surface. Examples: sulfur bloom, wax bloom. Not to be confused with dust on the surface from external sources.

Blow-up - A blister between plies of a dual durometer article.

Bond - See Adhesion.

Boss - A protuberance designed to add strength, facilitate alignment, provide fastenings, etc.

Brand - A mark or symbol identifying or describing a product and/or manufacturer: may be either embossed or inlaid.

Breaking strength - The tensile which polyurethane is at rupture.

Buffing marks - The characteristic surface condition after a secondary buffing operation.

Butt seam - A seam made by placing the two pieces to be joined edge to edge.

- C -

Castfilm - A film made by depositing a layer of polyurethane in solution, or in a dispersion onto a surface, solidifying and removing the film from the surface.

Casting - The process of filling (pouring) open molds with liquid (uncured) polyurethane.

Catalyst - The ingredient in polyurethane which initiates a chemical reaction or increases the rate of chemical reaction.

Cement - A mixture of polymeric compound or elastomer used as an adhesive or sealant.

Cemented edge - An application of cement around the edge of a fabricated product with or without internal reinforcement for protection or adhesion.

Chain reaction - Lengthening of the main chain (backbone) of polymer molecules by end-to-end attachment.

Chalking - Formation of a powdery surface condition due to disintegration of surface binder or elastomer due in turn to weathering or other destructive environments.

Chalking may be detected by rubbing the film with the fingertip. It can be measured by rubbing a piece of felt or velvet of contrasting color across the sample and comparing the amount of chalk picked up by the cloth with the photographic standards shown in ASTM D-699.

Checking - Short shallow cracks on the surface generally due to effect of destructive action of severe environmental conditions.

Chute lining - Highly abrasion resistant elastomeric (polyurethane) lining in a chute to protect the metal chute from abrasion wear.

Coefficient of friction - The ratio of the force required to move an object across a surface to the weight of the object.

Cog - A tooth on the rim of a wheel or polyurethane product.

Cohesive - Tendency of a material to stick to itself.

Cold flex - See low temperature flexing.

Cold flexibility - The relative ease of bending following exposure to low temperature.

Cold flow - Continued deformation under stress. See Creep.

Cold splice/bond - Usually the joining of two or more sub-straits together, using a two-part cement that is chemically cured without using supplemental heat from an external source. "Cold bond cement" usually is an uncured mixture of varied elastomers, chemicals, and solvents that will not self-cure until mixed with an activator to create a chemical vulcanization (usually exo-thermic).

Commercially smooth - A degree of smoothness of an article which is acceptable in accordance with industry practice.

Component - A separately metered stream of liquid which is introduced directly into the mixing head.

Compound - A mixture of a polymer(s) and other materials to give the desired chemical and physical properties in the elastomeric components of a polyurethane product.

Compression set - The deformation in a material remaining after it has been subjected to and released from a compressive force.

Conductivity - Quality of power of conducting or transmitting heat or electricity.

Contact stain - When staining occurs on the area of an object directly in contact with the rubber article it is known as "contact stain".

Control - A material or a product of known characteristics included in a series of tests to provide a basis for evaluation of other products.

Copolymer - A substance consisting of molecules characterized by the repetition of two or more types of monomeric units.

Cracking - A sharp break or fissure in the surface. Generally due to excessive strain.

Crater - A small shallow surface imperfection.

Crazing - Crazing is the phenomenon manifested by slight breaks in the surface. The break should be called a "crack" if the underlying surface is visible. For precision evaluation, crazing is described as "microscopic crazing" (as observed with a stated magnification, minimum), "visible crazing" (as seen at close range with the naked eye, 12 inches), and as "distant crazing" (as seen at 3 feet with the naked eye).

Creep - (1) The deformation occurring with the lapse of time in both cured and uncured polyurethane, in a body under stress in addition to the immediate elastic deformation. Some related terms and properties are stress-relaxation, hysteresis, damping, flow, compression set and viscosity. See Cold Flow.

Cross linking - The formation of chemical links between molecular chains.

Crystallization - A change in physical properties resulting from the crystalline reorientation caused by temperature.

Cure - The process which completes the chemical reaction. The term also refers to the state of completeness of the chemical reaction.

Cure time - Time required, at a given temperature, to produce optimum physical properties in an elastomer.

Curing agent - An additive that increases chemical activity between the components, resulting in an increase or decrease in the rate of cure.

Curing temperature - The temperature at which the elastomer product is cured.

Cut resistance - The ability of polyurethane to withstand the cutting action of sharp objects

Cycle time - The amount of time required to complete a molding cycle including mold preparation, insert loading (when applicable), release agent application (when required), mixing and dispensing of components, reaction (preliminary cure) and demolding.

- D -

Dam - A device installed within a mold to prevent the flow of material into areas of the mold cavity to reduce, alter, or eliminate a portion of the cast part, of which the mold is intended to produce.

Deformation - Any change of form or shape produced in a body by a stress.

Degradation - A deleterious change in the chemical structure of a material.

Demold time - The time period between dispensing the liquid components into the mold and removing the molded article.

Delamination - The separation of layers of material in a laminate.

Density - The ratio of the mass of a body to its volume or the mass per unit volume of the substance. For ordinary practical purposes, density and specific gravity may be regarded as equivalent.

Dew point - The temperature at which a vapor begins to condense.

Diameter - The length of a straight line passing through the geometric center to the periphery of an object.

Dip coat - A thin coat on a surface obtained by dipping the material to be coated into the coating materials.

Draft - Tapered relief provided on the vertical element of polyurethane components to facilitate removal from the mold. The minimum draft angle utilized in most applications is two degrees per side.

Dumbbell - A test specimen with lesser width at the middle of its length than at its ends.

Durometer - An instrument for measuring the hardness of polyurethane. Measures the resistance to the penetration of an indenter point into the surface of rubber.

Durometer hardness - An arbitrary numerical value which measures the resistance to penetration of the indenter point of the durometer. Value may be taken immediately or after a very short specified time.

Dynamic fatigue - Loss in properties of a material when continually subjected to flexing and or cyclic stress.

- E -

Elastic limit - The limiting extent to which a material may be deformed and yet return to approximately its original shape after removal of the deforming force.

Elasticity - The property of an article which tends to return it to its original shape after deformation.

Elastomer - An elastic rubber-like substance, such as polyurethane or synthetic rubber.

Elastomeric properties - The chemical and physical properties of an elastomer.

Elongation - Increase in length before rupture occurs, expressed numerically as a fraction or percentage of initial length.

Embossing - Operation of transferring a design to a polyurethane surface.

Exotherm - Heat generated by a chemical reaction.

Extraction test - A test in which certain components are separated from a solid by dissolving them in a liquid solvent under suitable conditions.

Extruded - Forced through die of tubing machine in either solid or hollow cross section.

Extrusion - A process whereby heated or unheated plastic forced through a shaping orifice becomes a continuously formed piece.

- F -

Family mold - A multi-cavity mold where each of the cavities forms one of the component parts of the assembled product.

Fatigue - The weakening or deterioration of a material caused by a repetition of stress or strain.

Filler - A material mixed with a polymer to improve quality or lower cost of a compound.

Film - A sheet of polyurethane not greater than 0.010" in thickness.

Finger splice - Molded product with ends cut into mating fingers.

Finish, plate - See plate finish.

Finish, platen - See platen finish.

Fire resistance - See flame retardance.

Fire resistant - Retards the burning action of fire or flame.

Fisheye - A small globule that has not blended completely into the surrounding material.

Flame performance - The manner in which cured polyurethane after being ignited will burn and/or self extinguish.

Flame retardance - Intensity of flame diminished by fire retardant ingredient(s) in the polymer compound.

Flame retardant - A substance (additive) which is added to a polymer formulation to reduce or retard its tendency to burn.

Flame test - A means, under specific condition, for establishing the flame performance of a polyurethane product. This will not indicate the performance of the product in any fire in which the product may be involved.

Flange - A raised edge on a polyurethane article.

Flash - Material protruding from the surface of a molded part, appearing at the mold parting line or mold vent points.

Flex cracking - A surface cracking induced by repeated bending or flexing.

Flex life - The relative ability of a polyurethane article to withstand dynamic bending stresses.

Flex life test - A laboratory method used to determine the life of a plastic product when subjected to dynamic bending stresses.

Flexibility - The ability to be bent repeatedly without cracking.

Friction - (1) The resistance to motion of an object due to the contact between two surfaces. (2) Improperly used to indicate the bond between two surfaces.

Friction, coefficient of - The ratio between the force pressing the surfaces together and the force required to move it.

Friction, kinetic - The force which is required to keep a body sliding at a uniform rate. Also called "friction of motion".

Friction pull - See adhesion.

Friction, static - The force which is required to start a body sliding.

- G -

Gel - The initial semi-solid stage that develops during the solvation of a resin by a plasticizer.

Gel point - The stage at which a liquid begins to exhibit pseudo-elastic properties.

Ground finish - Surface produced by grinding or buffing. See Buffing.

- H -

Hardening - An increase in resistance to indentation.

Hardness - Property or extent of being hard. Measured by extent of failure of the indenter point of any one of a number of standard hardness testing instruments to penetrate the product.

Haze - The cloudy appearance of an otherwise transparent film.

Hazing - A dull finish.

Heat degradation - Change in chemical and/or physical properties due to excessive exposure to heat.

Homogenous - Of uniform composition throughout.

- I -

Immediate set - The amount of deformation measured immediately after removal of the load causing the deformation.

Impact - The single instantaneous stroke or contact of a moving body with another either moving or at rest, such as a large mass of heavy material dropping on polyurethane product.

Impact energy - The effective combination of force (weight of the body and height) when one body falls on another.

Impact force - The energy power of impact.

Impact resistance - The relative ability to withstand mechanical or physical blows without the loss of protective properties.

Impulse - An application of force in a manner to produce sudden strain or motion.

Indentation - (1) The extent of deformation by the indenter point of any one of a number of standard hardness testing instruments; (2) A recess in the surface of a polyurethane component.

Injection molding - A method frequently utilized in the manufacture of polyurethane products. While this method is extremely cost effective when producing huge quantities, the properties of the injection molded polymers (thermoplastics) do not offer the superior characteristics of "open cast" (thermoset) polyurethane.

ISO - The abbreviation for the International Organization for Standardization.

- J -

Jaws - Clamps to hold a specimen when applying stress to the specimen for certain tests.

Joint - The area where two ends of a component are fastened together, either by chemical or mechanical means. See also splice.

- K -

(empty)

- L -

Laminate - A product made by bonding together two or more layers of material.

Laminated - Build up from thinner layers.

Lap - A part that extends over itself or a like part.

Lap seam - A seam made by placing the edge of one piece of material extending flat over the edge of the second piece of material.

Lateral - Coming from the side.

Life test - A laboratory procedure used to determine the resistance of polymer article to a specific set of destructive forces or conditions.

Longitudinal - A lengthwise direction.

Longitudinal seam - A seam joining two materials in the length of the finished product.

Low spot - A depression below the general surface of an object.

Low temperature flexibility - The ability of a polyurethane to be bent or flexed at low temperatures without loss of serviceability.

Low temperature flexing - The act of bending a product under conditions of a cold environment.

- M -

Masterbatch - A preliminary mixture of two or more compound ingredients for purposes of more thorough dispersion or better processing, and which will later become part of the final compound in a subsequent mixing operation.

MDI - The abbreviated term for diphenylmethane diisocyanate.

Mil - One thousandth of one inch, 0.001".

Mildew - Mildew is evidenced by the presence of mold or fungus growth. Two types are common: (1) Spore type which resembles caviar in appearance. (2) Mycelium or filament type. A microscope is necessary to distinguish the spore type from dirt collection. When it has reached an advanced stage, the mycelium type is often recognizable with the naked eye, but a microscope is recommended for any examination of the mildew. Test results show the effect of

mildew is primarily one of appearance and not one of physical properties.

Mirror finish - A bright, polished surface appearance.

Mix - See compound

Modulus - (1) A coefficient or numerical measure of some property. (2) In polymers, modulus usually refers to one of several measurements of stiffness or resistance to deformation. The use of the word without modifying terms may be confusing and such use should not be encouraged. Modulus in polyurethane may be either static or dynamic; static moduli are subdivided into tangent, chord, and compounder's. Compounder's modulus is always in tension, but all the others may be in shear, compression or tension. Other terms used in connection with "modulus" are elasticity, rigidity, Young's tangent, and elongation. (3) All elastic moduli in rubber (except compounder's) are ratios of stress to the strain produced by that stress, the stress, usually p.s.i.

Modulus of elasticity - The force divided by the percent elongation (divided by 100) to cause the elongation.

Mold lubricant - The material used to coat the surfaces of a mold to prevent the polyurethane adhering to the metal during the initial chemical reaction (cure).

Mold mark - An indentation or embossment on the surface of a molded product caused by irregularities in the mold surface.

Mold register - The means used to align the parts of a mold.

Mold release - See mold lubricant.

MSHA - Abbreviation for Mine Safety and Health Administration.

- N -

NCO - Abbreviation for Nitrogen, Carbon, Oxygen.

NDI - Abbreviation for Napthalene Dilsocyanate.

Nominal - An approximate amount.

- O -

Oil proof - Not adversely affected by exposure to oil.

Oil resistant - Withstands the deterioration effect of oil (generally refers to petroleum) on the physical properties.

Open cast - The method of manufacture utilized to obtain maximum wear characteristics in polyurethane modules.

Optimum cure - The time and temperature of fusion at which a desired combination of properties is attained in an elastomer.

Oven - A low pressure hot air chamber equipped with precise temperature controls, used for the purpose of POST curing open cast polyurethane products. See Aging.

Ozone resistant - Withstands the deteriorating effects of ozone (generally cracking).

- P -

Permanent set - The amount by which an elastic material fails to return to its original form after deformation.

Permeability - The quality or condition of allowing passage of liquids or gases through a material layer.

Physical properties - A measure of mechanical characteristics of a material.

Pimple - A small sharp or conical elevation on the surface of a molded product.

Pit - A small crater in the surface of a molded product with width about the same as its depth.

Plastic - A material that contains as an essential ingredient one or more organic polymeric substances of large molecular weight, is solid in its finished state, can be shaped by flow.

Plasticity - (1) A measure of the resistance to shear of an uncured elastomer; (2) a measurement of resistance to shear with heat history.

Plasticizer - A compounding ingredient which can change the physical and chemical properties and processibility of a polymeric compound.

Plastisol - A dispersion of a powderous polymer in a plasticizer.

Plate finish - A finish resulting from contact with commercially smooth but not polished heated pouring table.

Polyester - A polymeric compound, with the reactive hydroxyl groups containing ester linkages.

Polyether - A polymeric compound, with the reactive hydroxyl groups containing ether linkages.

Polymer - A macromolecular material formed by the chemical combination of monomers having either the same or different chemical composition.

Polyol - A chemical compound with more than one reactive hydroxyl group attached to the molecule.

POST cure - The period of cure after the product has been removed from the mold. In many cases, accelerated curing at elevated temperatures is utilized.

Pot life - The period of time during which a reacting polymeric compound remains suitable for its intended use after having been mixed with a reaction-initiating agent.

Prepolymer - A chemical intermediate, manufactured by reacting all the isocyanate with a portion (or all) of the polyol.

PTMEG - Poly Tetra Methylene Glycol

PU - The abbreviation for Polyurethane

- Q -

Qualification conformance inspection - The examination of samples from a production run to determine conformance to a given specification.

Qualification inspection test - The examination of samples from a typical production run to determine conformance to a given specification for approval to become a supplier

- R -

Recovery - The degree an elastomeric material returns to its original dimensions after being stressed.

Reinforcement - The strengthening member of a polyurethane component.

Reinforcement agent - An ingredient in a polymeric compound used to increase its chemical and physical properties.

Reinforcing element - The strengthening members of polyurethane component or product.

Resin - Certain materials produced by chemical synthesis.

Resistance - The property or ability of matter to withstand the effects of force, pressure, heat or chemical action.

- S -

Sample - A piece of material removed for evaluation.

Scraper - A open cast polyurethane device for cleaning the surface of conveyor belting.

Seam - The place where two edges of fabric or elastomer are adjacent to each

other to form a single ply or layer.

Semi-cure - A partial or incomplete cure.

Service test - A test in which the product is made to operate under service conditions in the actual equipment.

Set - The amount of deformation remaining after complete release of the load producing the deformation.

Sheeting - A form of plastic in which the thickness is very small in proportion to length and width and in which the plastic is present as a continuous phase throughout.

Shelf storage life - The period of time prior to use during which a product retains its intended performance capability.

Shore hardness - The scale by which a polyurethane screen module or component is measured for hardness, typically expressed as "shore A". As the hardness is increased, abrasion resistance tends to increase while impact resistance decreases proportionately. As the hardness is decreased, abrasion resistance tends to decrease while impact resistance increases proportionately.

Shrinkage - The difference found on a molded part as compared to the actual mold cavity dimension. The typical shrinkage for thermoset polyurethane is about 2%.

Simulated service test - See bench test.

Sink - A collapsed blister or bubble leaving a depression in a product.

Skive - A cut made on an angle to the surface to produce a tapered or feathered cut.

Specification - Detail description of specific requirements.

Specimen - A piece cut from a sample of polyurethane to test.

Static conductive - Capability to conduct static electricity.

Static electricity - Electrical potential resulting from two surfaces rubbing together or parting one from the other.

Static friction - The resistance which must be overcome to start a body sliding down a surface.

Stiffness - Resistance to flexing.

Strain - Deformation resulting from a force applied to a body.

Stress - Force applied to a body that results in the body being deformed.

Stretch - An increase in length.

Sun check - Fine cracks and crazing of an elastomeric surface primarily due to the sun's ultraviolet rays.

- T -

Tack - Having a property of temporary adhesion.

Tear Propagation - Continuation of tear.

Tensile strength - The maximum force, stress, applied to a specimen at rupture.

Tensile stress - The force applied to stretch a test piece (specimen).

Tension - Stress on a material tending to cause extension of the material.

TDI - Abbreviation for Toluene Diisocyanate.

Thermoplastic - Capable of being repeatedly softened by heating and hardened by cooling and in the softened state can be shaped by flow.

Thermoset - A material that can undergo a chemical reaction by the action of heat or catalyst, leading to a relatively infusible and cross-linked state.

Thermoset polyurethane is not altered by elevated temperatures until reaching the decomposition point.

Tolerances - The limiting values for a dimension.

Trapped air - Air which is enclosed in a product or between a product and a mold surface during cure.

- U -

Ultimate elongation - Elongation at rupture.

Ultimate strength - The force required to rupture a specimen.

Ultimate tensile - Tensile stress at rupture.

Undercure - A less than optimal state of cure which may be evidenced by tackiness or inferior physical properties.

- V -

Viscosity - The flow property of a material. The lower the number, the thinner the liquid.

Void - The absence of material or an area devoid of materials where not intended. See also blister and sink.

- W -

Warpage - Dimensional distortion in a molded product.

Weathering - Surface deterioration, evidenced by cracks and crazing of an elastomer, during outdoor exposure.

- X -

(empty)

- Y -

Yield point - The stress in a material at which a substantial increase in strain occurs with a minimum increase in stress.

Yield strength - The stress at which a material exhibits a specified limiting permanent set. Determined by a measurable value of plastic yielding of the material, above which the material is considered to be damaged and below which the damaging effects are considered to be negligible.

- Z -

Zero load - A reference load applied in taking an initial reading and prior to determining compressibility or extensibility.