

Definitions of Rubber Industry Words and Terminology

For the better understanding of our customers, **Ames Rubber Manufacturing** has compiled a list of rubber industry related words and phrases along with their definitions.

ABRASION RESISTANCE

The ability of a rubber compound to resist mechanical wear from frictional forces. It is very important in tire treads, soles on heels, hose, rubber rollers and the covers of conveyor belts and cables.

ACCELERATORS

Chemicals which are added to rubber compounds to accelerate the rate of vulcanization. Rubber compounds without accelerators can take much longer to cure.

ACID RESISTANCE

The resistance of a rubber specimen to the action of various acids either concentrated or diluted.

ACTIVATORS

Chemicals which are added to rubbers to activate curing.

AGE RESISTANCE

The ability of a compound to resist deterioration caused by aging.

ACCELERATED AGING TESTS

Accelerated aging tests are run on various rubber specimens to find out in a short period of time the destructive influence of light, oxygen, heat, cold and ozone. Natural or shelf aging requires many years for proper evaluation. Accelerated aging tests will give comparative values but not an absolute correlation to natural aging.

AMBIENT TEMPERATURE

The surrounding temperature relative to a given point of application.

AMS

Aerospace Material Specifications are utilized worldwide in the design and production of aircraft components and systems. AMS documents are standardized procurement documents designed to speed the process of delivery, reduce cost, and to reduce the number of individual company and government specifications. The use of AMS is voluntary.

ASTM INTERNATIONAL

Formerly known as the **American Society for Testing and Materials**, ASTM International is a global standards organization that develops international standards for materials, products, systems, and services.

AUTOCLAVE

A pressure vessel used to process material with pressure and heat. Steam pressure autoclaves are commonly used in the process of rubber vulcanization, particularly with extruded profiles.

BACKGRIND

A distortion at the parting line of a molded part, usually in the form of a ragged indentation.

BATCH

The product of one mixing operation.

BLISTERS

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

BLOOM

A dusty or milky looking deposit derived from residual cure or other processing chemicals, oils or waxes that can migrate to the surface of a rubber product after parts are cured and stored. Post curing or washing of parts may mitigate this condition.

Buna-N

(Nitrile) The most commonly used elastomer where resistances to petroleum fluids, as well as good physical properties are required.

Buna-S

(SBR) Co-polymers of Butadiene and Styrene.

BUTT SPLICE OR JOINT

Joining two ends of a seal whereby the junction is perpendicular to the mold parting line.

Butyl

A copolymer of Iso-Butylene and Isoprene.

CALENDER

A machine utilizing large steel rollers to form compounded rubber of various thickness and hardness into rubber sheeting in roll form.

CARBON BLACK

Is essentially elemental carbon in the form of extremely fine particles having an amorphous molecular structure. Rubber grade carbon blacks are characterized by four basic properties; surface area, particle size, structure and surface activity and is one of the major fillers used in rubber production as a backbone reinforcement and pigment for a compound.

CHEMICAL BONDING

A method of bonding rubber to inserts by applying special primers and adhesives to the insert prior to molding in Rubber to Metal Bonding applications.

CLAY

Commonly used as an "extender" in rubber compounds. Treated clays reinforce the rubber and are termed "hard" clays. Those which do not provide reinforcement are called "soft" clays.

CLOSURE DIMENSION

Dimensions of a molded rubber product that are affected by flash thickness (mold closure) variation.

COMPOUND

A mixture of polymers with all materials necessary (oils, carbon black, processing aids, curing agents, etc.) to create the rubber part prior to vulcanization.

COMPRESSION RUBBER PRESS

A hydraulic press that molds rubber compounds into a desired three dimensional shape. Created with different tonnages with different platen sizes and ram diameters to accommodate large or small molds with high or low pressure. These platens are normally heated with steam or electric heaters and are used for compression and transfer molding of rubber products.

COMPRESSION SET

Is a permanent deformation to a specimen resulting from compressive stress. It is measured:

- (1) as the amount by which a standard test piece fails to return to its original thickness after being subjected to a standard compressive load or deflection for a fixed period of time: or
- (2) as the distance returned relative to the amount deflected.

Nominally, the decrease in thickness of a test specimen 30 minutes after removal from a device in which the specimen has been subjected to compression deformation.

CONDUCTIVE RUBBER

A rubber capable of conducting electricity. Most generally applied to rubber products used to conduct static electricity.

CONTINUOUS VULCANIZATION

The condition where an extruded shape is processed through vulcanization reaction without pause. Hot Air Vulcanization (HAV) is one example of continuous vulcanization.

CO-POLYMER

A polymer made from two different monomers. For example, SBR is a rubber co-polymer and is made up of Styrene and Butadiene monomers.

CREEP

The progressive relaxation of a given rubber material while it is under stress. This relaxation eventually results in permanent deformation, or “set”.

CROSS-SECTION

A rubber part viewed as if cut at right angles to the molding line, showing internal structure.

CURETIVES (CURE PACKAGE)

The chemicals involved in curing the rubber, e.g. accelerators, vulcanizing agents, activators etc.

CURE DATE

Date when a rubber part was manufactured. “4Q12” indicates Fourth Quarter, 2012.

DAMPING

The quality of an elastomer to absorb forced vibrational energy.

DEFLASHING

Any of various processes used to remove the waste edge from a molded rubber part.

DUROMETER HARDNESS

Is the measurement most generally used for stating the hardness of elastomeric materials. For example, a rubber band is approximately 30 shore hardness, tire tread stock is approximately 60 shore "A" hardness and a typical hard rubber shoe heel is about 80 shore "A" hardness. Shore and Durometer are interchangeable. “A” scale is used for rubber, while “D” scale is used for plastic.

DYNAMIC SEAL

A seal required to prevent leakage past parts which are in relative motion.

ELASTICITY

The property of a rubber part which tends to return to its original shape after deformation.

ELASTOMER

A term used to describe elastic polymers with rubber-like behavior.

ELONGATION

The percentage of original length (length at rest), to which a rubber compound is stretched.

Percent Elongation or strain is the extension between 1" apart, bench marks produced by a tensile force applied to a specimen. It is expressed as a percentage of the original distance between the marks.) e.g. if a rubber reaches twice its length before breaking its elongation is 100%. See ASTM 214

Ultimate Elongation is the percent increase in original length of a specimen at the moment that it breaks or ruptures.

EPDM

A terpolymer of Ethylene-Propylene-Diene. Noted for excellent ozone resistance.

EXTRUSION, RUBBER

The process in which an uncured rubber compound is pushed through a die to produce the desired cross sectional shape and linear profile.

EXTRUSION OF A SEAL

Distortion or flow, under pressure, of a portion of a seal into clearance between mating parts.

FEATHER EDGE

The sharp, thin edge on parts, such as wiper seals and cups.

FILLERS

Fillers are chemically inert and are utilized as a processing aid in compounding to provide or improve consistency, durability, and performance in rubber products. Carbon Black is the most common reinforcing filler used in rubber production; non-black rubber fillers include calcium carbonate, kaolin clay, precipitated silica, talc, barite, amorphous silica and diatomite.

FIXED DIMENSION

Dimensions on a rubber product that are not affected by flash thickness or mold closure variation.

FLAME RESISTANCE

This is the resistance of a specimen to burning, or material that will not support combustion under ordinary conditions.

FLASH

Excess rubber left around a rubber part after molding, due to space between mating mold surfaces; removed by trimming.

FLEX CRACKING

Rubber specimens subjected to repeated flexing have been found to develop small cracks on the surface of the specimen.

Flex Life is the number of cycles required to produce a specified state of failure in a specimen that has been flexed in a prescribed method.

FLOW LINES OR CRACKS

Surface imperfections due to improper flow and failure of stock to knit or blend with itself during the molding operation.

FLUOROCARBON (VITON®)

A polymer designed to meet the most rigid requirements in oils, solvents, synthetic lubricants and corrosive chemicals, at elevated temperatures. Used extensively in oil field applications.

GASKET

A shaped piece of rubber or gasketing material that seals the junction between two surfaces.

GATES

The openings in an injection or transfer mold that ensure the even flow of material into the cavity.

Gate marks are a raised spot or small depression on the surface of an injection or transfer molded part, where the gates interface the cavity. (Also called "Sprue Mark")

HARDNESS OF RUBBER

The relative resistance of rubber to indentation as measured on a Shore "A" or Durometer Gauge. Higher numbers indicate harder materials; lower numbers, softer materials. Durometer or Shore, are interchangeable terms

HAV TUNNEL (HOT AIR VULCANIZATION)

A long heated tunnel used in-line during silicone extrusion to vulcanize cure the extrusion.

HEAT RESISTANCE

The ability of rubber to retain its useful properties under the destructive influence of heat.

HYDROCARBON SOLVENTS (AROMATIC)

These solvents have basic Benzene structure, usually coal tar types such as Benzene, Toluene and Xylene.

HYPALON

Trade name for Chlorosulphonated polyethylene.

HYSTERESIS

The difference between the amount of energy absorbed when a rubber is stretched and the amount of energy released when the rubber is relaxed. High hysteresis indicates a high loss of energy (and therefore is good for energy absorbing applications). Low hysteresis rubbers are more resilient.

INJECTION PRESS

A machine that injects heated viscous rubber into a mold to produce a desired three dimensional shape.

Injection Press molding is utilized for high volume runs due to faster cure times compared to Compression and Transfer Molding.

INSERT

Typically, a metal or plastic component to which rubber or plastic is chemically and/or physically bonded during the molding process.

IRHD (International Rubber Hardness Degrees)

A method to characterize an elastomer by its resistance to penetration of a known geometry indenter by a known force. This micro-technique is reproduced on irregular, as well as flat surfaces, and on cross sections as small as 1mm in thickness (.4").

The readings are similar, but not identical, to Shore "A" Durometer readings and require specialized IRHD testing equipment.

KNIT MARK

A witness mark on a molded part, usually occurring at the midpoint between two transfer or injection sprue locations. Caused by the incomplete joining of the uncured rubber or plastic from each sprue during molding.

LATEX

Latex is the milky sap of a variety of trees of the genus Hevea (Rubber trees). Latex is the base substance from which Natural Rubber (NR) products are derived.

LATHE CUT GASKETS

Precision tolerance rubber washers that are either molded or extruded in tubes. The outside diameters of these tubes are then precision ground, and then cut to the desired thickness with an indexing lathe cutter.

LIM (Liquid Injection Molding)

Refers to the processing of liquid silicone Rubber (LSR)

LSR (Liquid Silicone Rubber)

A specialized low viscosity silicone rubber compound utilized in the LIM process.

LOW TEMPERATURE FLEXIBILITY

This is the temperature at which the rubber becomes too stiff to function in its intended manner.

MILLABLE GUM RUBBER

Rubber that is processed on a rubber mill or internal mixer which has a much higher viscosity than liquid silicone rubber (LSR)

MISMATCH

Unsymmetrical seal caused by dissimilar cavities in mating mold sections. This can often be caused by a mold being out of register/alignment.

MODULUS

Tensile stress at a specified elongation. (Usually 100% elongation for elastomers).

Modulus of elasticity is used to express the amount of stress in pounds per square inch (psi) required to stretch the test specimen to a given elongation.

It expresses the resistance to extension or stiffness. *A higher modulus means a stiffer material.*

MOLD CAVITY

Hollow space, or cavity, in the mold, which is used to impart the desired form to the product being molded.

MOLD FINISH

The uninterrupted surface produced by intimate contact of rubber with mold surface at vulcanization.

MOLD REGISTER

Accuracy of alignment and fit of mold sections.
Off-Register is a misalignment of mold halves.

MOLD RELEASE

A lubricating material usually sprayed onto the mold cavity surface prior to the introduction of the uncured rubber, to facilitate the easy removal of the molded part.

MECHANICAL BOND

A method of physically bonding rubber to inserts through the use of holes, depressions or projections in the insert.

MOONEY VISCOSITY

Measurement of the plasticity or viscosity of an uncompounded or compounded vulcanized, elastomer seal material by means of the Mooney Shearing Disk Viscometer.

NEOPRENE® (CHLOROPRENE)

An excellent general purpose rubber.

NITRILE (Buna-N)

A rubber polymer with excellent resistance to petroleum fluids along with good physical properties.

NOMINAL DIMENSION

The nearest fractional equivalent to actual decimal dimension.

OIL RESISTANCE

Ability of a vulcanized rubber to resist the swelling and deterioration effects of various types of oils.

OIL SWELL

The change in volume of a rubber article due to absorption of oil or other fluids.

O-RING

A circle of rubber material with a round cross section which affects a seal through squeeze or pressure.

OUT-GASSING

A vacuum phenomenon wherein a substance spontaneously releases volatile constituents in the form of vapors or gases. In rubber compounds, this may include water vapor, plasticizers, air, inhibitors, etc.

OVERFLOW GROOVE

A groove around the mold cavity used to accept excess material from the cavity and to create a better "pack" for the part.

OXIDATION RESISTANCE

This is the ability of rubber to resist the reaction of atmospheric oxygen.

OXYGENATED SOLVENTS (ALIPHATIC)

Straight chain organic carbon structures such as petroleum type solvents.

PARTING LINE

The line on the surface of a molded part where the mold plates meet.

PERMANENT SET

When a piece of rubber is stretched and released it does not return to its exact original length but comes to rest somewhat longer than it was before stretching. This increase in the length of the rubber, expressed as percent of original length, is termed "permanent set" or "memory".

PERMEABILITY

The ability or ease in which a liquid or gas can pass through a film of rubber. In rubber terminology, it is the rate of gas flow expressed in atmospheric cubic centimeters per second through an Elastomeric material one centimeter square and one centimeter thick. (atm cc/cm squared / cm/sec)

PLASTICIZERS

Liquids which are incorporated into rubber are generally described as plasticizers because of their softening effect on the compound.

POLYMER

Many monomer units chemically linked together in repeating structural units. Rubber polymers available at Ames Rubber Manufacturing include: Silicone, Fluorosilicone, Viton®, EPDM, Nitrile, SBR, Natural Rubber, Neoprene® and many more.

POLYMERIZATION

The process of linking two or more molecules to form a new molecule having different properties.

POLYURETHANE

An organic material noted for its high abrasion, ozone, corona and radiation characteristics.

POST CURE

The final step in the vulcanization process for some specialized elastomers. Provides stabilization of parts and drives off residual cure and other decomposition products resulting from the vulcanization process.

RESILIENCE

The technical term used to describe "bounce" or "snap".

Increasing resilience means an increasing "bounciness".

It is the ratio of energy output to energy input in a rapid full recovery of a deformed specimen. It is usually expressed as a percent.

REBOUND

A measure of the resilience, usually as a percentage of vertical return of a body which has fallen and bounced.

RoHS COMPLIANCE

The Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC was adopted in February 2003 by the European Union. This directive restricts the use of six hazardous materials in the manufacturing of various types of electrical and electronic equipment. See the Ames Rubber Manufacturing RoHS Declaration.

RTV (Room Temperature Vulcanization)

Generally silicone rubber that after mixing will cure when exposed to air.

RUBBER, NATURAL

Raw or crude rubber obtained from vegetable sources.

RUBBER, SYNTHETIC

Manufactured or man-made elastomers.

RUNNER

The system for leading rubber and plastic materials into the gate of an injection mold.

RUNOUT

Expressed in inches and/or TIR (Total Indicator Reading); refers to twice the radial distance between shaft axis and axis of rotation.

SBR

Copolymer of Butadiene and Styrene; an all-purpose type synthetic, similar to natural rubber.

SCORCHING

Premature curing or vulcanization of a rubber compound during processing.

SCREW

The rotating component of an extruder or injection press which delivers the rubber to the die or mold.

SHORE HARDNESS

Interchangeable with Durometer to designate the Hardness of a material.

Shore “A” is the scale used for rubber. Shore “D” is used for plastics.

SHRINKAGE

1) The ratio between a mold cavity size and the size of a product molded in that cavity,

2) Decreased volume of a seal, usually caused by extraction of soluble constituents by fluids followed by air drying.

SILICONE RUBBER

Elastomer that retains good properties through extra wide temperature ranges.

SPRUE

The primary feed channel that runs from the outer face of an injection or transfer mold, to the mold gate in a single cavity mold, or to the runners in a multiple cavity mold.

SPRUE MARKS

Marks left on the surface of a rubber part, generally elevated, after removal of the sprue or cured compound in the gate, through which the compound is injected or transfer molded.

STATIC SEAL

Part designed to seal between parts having relative motion. (See Gasket)

SUN CHECKING

Surface cracks, checks or grazing caused by exposure to direct or indirect sunlight.

SPECIFIC GRAVITY

This is the ratio between the weight of unit volume of a specimen and the weight of the same volume in water at room temperature. This value is extremely helpful in identifying unmarked, black, rubber specimens. For example, the specific gravity of different polymers such as Viton® generally has a specific gravity of 1.83, while Neoprene is closer to 1.40, and Nitrile is generally around 1.24. These are approximate values but each compound will have its own measurable and repeatable specific gravity.

TEAR RESISTANCE

Resistance to growth of a cut or nick when tension is applied to the cut specimen. Commonly expressed as pounds per square inch thickness.

TEAR STRENGTH

Maximum force required to tear a specified specimen. The standard test pieces are designed to produce weak points where a tear is initiated. See ASTM D624

TENSILE STRENGTH

Tensile strength or stress is the force per cross-sectional area which is applied at the time of rupture of a specimen. It is usually expressed as pounds per square inch (psi), or Mega Pascal (Mpa).

THERMAL EXPANSION

Expansion caused by increase in temperature. May be linear or volumetric.

THERMOSET

Any material which melts on heating but then undergoes a permanent chemical change after which it is heat stable (i.e. it will degrade on further heating rather than "melt").

THERMOPLASTIC

A plastic capable of being repeatedly softened by increase of temperature, and hardened by decrease of temperature.

THERMOPLASTIC RUBBER (TPR OR TPE)

A melt processable rubber that does not require chemical vulcanization and will repeatedly soften when heated and stiffen when cooled; and which will exhibit only slight loss of original characteristics.

TOTAL INDICATION READING (TIR)

System that measures the roundness of a part in relationship to a center line.

TRANSFER MOLDING

A method of molding in which material is placed in a pot, located between the top plate and plunger, and squeezed from the pot through gates (or sprues) into the mold cavity.

TRAPPED AIR

Air which is trapped in a product or a mold during cure. Usually causing a loose ply or cover, or a surface mark, depression or void. Example: An undetected blister in a fused joint may eventually break down in a vacuum and suddenly (or slowly) release its entrapped air, thereby indicating a leak.

ULTIMATE ELONGATION

A measure of how far a material will stretch before breaking; expressed as a percentage of its original length.

UNDERCUT

A groove on either the outside or the inside of a molded part.

UNDERCURE

Removing rubber from the mold before the vulcanization process has been completed. Often results in porosity in the rubber or unusually poor compression set.

VIBRATION DAMPENING

The ability of an elastomer to absorb vibrational or shock energy.

VISCOSITY

The property of fluids by which they resist an instantaneous change of shape. (Ex: Resistance to flow)
Honey has a much higher viscosity than water.

VOID

The absence of material or an area devoid of materials where not intended.

VOLUME SWELL

An increase in the physical size of a rubber part during production, caused by the swelling action of oils, waxes and liquids in the compound.

VULCANIZATION

An irreversible thermosetting reaction involving the use of heat and pressure over time (crosslinking), resulting in greatly increased strength and elasticity of rubber-like materials. Cure and Vulcanization are interchangeable terms.

WEATHER RESISTANCE

The ability of a polymer or compound to withstand weathering factors, such as: oxygen, ozone, atmospheric pollutants, erosion, temperature cycling and ultraviolet radiation.