

Elastomer Market Terminology

Abrasion resistance	A function of tear strength, friction co-efficient, resilience, heat dissipation and other properties. Generally, copolymer elastomers are superior to flexible materials such as vinyl and some rigid plastics.
Air oven aging	A procedure to determine the influence of elevated temperature on the physical properties of various polymers.
Amorphous	Having no real or apparent crystalline form.
ASTM 1 oil	Characterized as a high aniline point, moderate viscosity immersion/extraction fluid used for rubber applications. Extracting oil in ECO and NBR. Swelling oil in CR, SBR, EPDM.
ASTM 2 oil	Characterized as a medium aniline point, moderate viscosity immersion/extraction fluid used for rubber applications. Represents service fluids such as engine oil, power steering fluid, etc. and has slight swelling effect. Usually used to test seal compounds.
ASTM 3 oil	Characterized as a low aniline point, high viscosity immersion/extraction fluid used for rubber applications. Extracts plasticizer from compound. Will be absorbed by compound.
ASTM (reference) fuel A	100 percent isooctane. Generally an extracting fuel in NBR.
ASTM (reference) fuel B	70 percent isooctane, 30 percent toluene. Represents high octane leaded fuels.
ASTM (reference) fuel C	50 percent isooctane, 50 percent toluene. Represents high octane unleaded fuels.
Banbury	The name of the inventory of an internal mixer for rubber. See Internal Mixer.

Brittle point values	Temperature at which five specimens first “pass”.
Copolymer	A polymer formed from two types of monomers.
Crystalline	An arrangement of polymer segments of repeating patterns into geometric symmetry.
Durometer	An instrument for measuring the indentation hardness of rubber.
Elongation	<p>The extension of a uniform section of a specimen expressed as percent of the original length.</p> $\text{Elongation \%} = \frac{(\text{final length} - \text{original length})}{\text{original length}} \times 100$
Extruder	Machine designed to force rubber or rubber mix through an orifice that is often shaped to the geometry of the desired product.
Extrusion curing methods	Heat transfer fluid (salt bath): The bath must be totally inert to the elastomeric composite over the entire operating range of temperatures of the process. It is used in continuous vulcanization processes more commonly but not exclusively. It is non-pressurized and provides reasonably rapid temperature rise and moderate vulcanization speeds.
Extrusion curing methods - continued	<p>Hot air oven: Ovens can be used to vulcanize thin articles that have been pre-shaped. The system is not too efficient due to the poor heat transfer of hot air and requires longer cure times at lower temperatures.</p> <p>Lead press: This process uses molten lead to cover soft, large extruded sections with a protective cover for vulcanization in steam. The process is used for garden and other hoses.</p>
Bloom	A liquid or solid material that has migrated to the surface of the elastomer and changes its appearance.

Radiation: Systems using either gamma radiation from cobalt 60 or electron beams have been used for vulcanization. The electron beam method has been used to cure both polyethylene and silicone rubber. This is generally accomplished by passing the materials through the beam on a conveyor.

Ultrahigh frequency (UHF): UHF fields are developed by alternating electromagnetic circuits to warm up or vulcanize articles with large or uneven cross-sections. The process requires polar rubber or additives within the mixture to absorb electromagnetic energy and vibrates rapidly, thereby producing a very localized temperature rise.

Extruder types

Barwell extruder: A short barrel ram extruder used to convert stripped form elastomers into what is referred to as “shots” for molding.

Cold feed: This extruder is generally fed rubber compound at room temperature in the form of strips or pellets. The screw must transmit sufficient mechanical energy to plasticize the compound to near minimum viscosity and to overcome the head restriction.

Hot feed: An extruder that is fed rubber compound at a temperature above ambient temperature. A hot feed extruder receives rubber compound at near minimum viscosity and must overcome the head restriction with a minimum temperature rise and hold time.

Exudation

A delayed phase separation of incompatible material. Also called bleeding, spewing or sweating. See Bloom.

Fluid aging

A procedure to compare the ability of rubber and rubber-like compositions to withstand the effect of liquids.

Gehman values

T2, T5, T10, T100 - Temperature for which the relative modulus is 2, 5, 10, 100. The relative modulus at any temperature is the ratio of the modulus at that temperature to the modulus at 23°C.

Green strength

The resistance to deformation of a rubber stock in the uncured state.

Hardness	The resistance to indentation as measured under specified conditions.
Internal mixer	A machine with a closed cavity in which a specially shaped rotor (or rotors) masticates the rubber to incorporate and disperse compounding materials into the rubber.
Liquid curing medium (LCM)	Molten phase that is used as a heating medium for the continuous vulcanization of a rubber mix, usually following extrusion. A commonly used material is a mixture of sodium nitrite and potassium nitrate.
ML, MH	The minimum torque reported when doing Rheometer testing is ML. MH is the highest torque obtained during a specified period of time. Both are measure in dN*M (lbf*in) - dynes per meter or pounds force per inch.
Modulus	(or tensile stress at a given elongation) The stress required to stretch the uniform cross-section of a test specimen to a given elongation. Represents functional strength of compound. Plasticizers reduce modulus.
Molding presses	<p>Compression: A molding process in which the material is placed directly in a mold cavity and compressed to shape by closure of the mold.</p> <p>Injection: The process of forming a material by forcing it from an external heated chamber through a runner system and gate into the cavity of a closed mold by means of a pressure gradient that is independent of the mold clamping force.</p> <p>Transfer: The process of forming a material by forcing it from an auxiliary heated chamber through a sprew and gate into the cavity of a closed mold by means of a pressure gradient that is dependent upon the mold clamping force.</p>
Monomer	A low molecular weight substance consisting of molecules capable of reacting with like or unlike molecules to form a polymer.

Mooney values

Minimum viscosity: The minimum value during the test interval
 t5: The time required for an increase above the minimum viscosity.
 t35: The time required for a 35 unit increase above the minimum viscosity.

Mooney values

A measure of the viscosity of a rubber or rubber compound determined in a Mooney shearing disc viscometer.

Moriyama

An internal mixer that does not employ ram pressure and that is used primarily for low viscosity polymers such as silicone rubber compounds and adhesives. See Internal Mixer.

Polymer

A substance consisting of molecules characterized by the repetition of one or more types of monomeric units.

Post cure

Because of the elastomer characteristics, the article size or its shape, some products may require a post cure. That is, additional heat and energy must be applied after the press cure. The post cure might occur in a hot air oven or in a liquid heat bath.

Rate of cure

The rate at which crosslinking and the development of the stiffness of the compound occur after the scorch point.

Reversion

A phenomenon whereby a vulcanized product is exposed to conditions that result in devulcanization. Natural rubber reverts if over cured.

Rheometer value

ML: Minimum torque
 MH: Highest torque attained during specified time. For C. P. Hall, this specified time is at the central point of one lbf in rise with five min ts2:
 Time to two lbf in rise above ML
 t'c(90): Time to 90 percent of torque increase
 Cure rate index: $100 / (t_c(90) - t_{52})$

Saturated elastomers

An elastomer with no unsaturation and thus not susceptible to ozone attack. Some elastomers have saturated backbones with pendant unsaturated cure sites.

Scorch	Premature (and usually unwanted) vulcanization of a rubber compound.
State of cure	A term used to indicate the development of a property of the rubber as curing progresses. Frequently, a good state of cure is thought of as being representative of good compression set.
T2, T5, T10, T100	See Gehman.
t5, t35	See Mooney values.
ts2, t'c(90)	See Rheometer value.
Tear strength	The maximum force required to tear a specified specimen, the force acting substantially parallel to the major axis of the test specimen.
Tensile strength	The maximum tensile stress applied during stretching a specimen to rupture. Plasticizers reduce tensile strength.
Tensile ultimate	The maximum tensile stress applied during stretching a specimen to rupture. Also known as tensile strength.
Unsaturated elastomers	Compounds with the ability to unite directly with certain other substances, such as iodine, bromine, hydro-bromic acid and ozone, to form saturated addition products. Sulfur cure systems require unsaturated elastomers (double bonds) to achieve crosslinking. The ability to add iodine or bromine and the amount added is nearly always used as the test and measure of unsaturation.
Vulcanization	An irreversible process during which a rubber compound through a change in its chemical structure (i.e., crosslinking) becomes less plastic and more resistant to swelling by organic liquids, while elastic properties are conferred, improved or extended over a greater range of temperature.