

## Glossary: Terms being used in the SMC/BMC-Industry

**ATH.** Aluminium Trihydrate  $Al_2(OH)_3$  a filler being used for fire retardant, low smoke emission SMC/BMC.

**Blisters.** Raised area on the SMC laminate surface caused by the presence of gases under pressure within the substrate.

**BMC.** Bulk Moulding Compound. A ready to mould fibre reinforced polyester material primarily used in injection moulding. Variants: CIC, TMC

**Body-in-White.** A term used to describe all of the parts in the car body assembly as seen just before the application of primer.

**Bond Read Through.** A visible surface imperfection caused on Class "A" surface by shrinkage of adhesive used to bond the inner panels.

**Carrier Film.** A nylon or polyethylene film used for the manufacture of SMC. The carrier film is removed prior to moulding.

**Catalyst.** A chemical additive that causes a cross-linking reaction that turns a liquid polyester resin into a solid.

**Cavity.** The female portion of a two-piece matched mould.

**Charge Pattern.** A pre-weighed number of SMC plies cut from the SMC sheet, to be placed on the mould.

**Chrome Plating.** Chrome plating of press moulds being used for the moulding of LP-SMC/BMC is highly recommended.

**Class "A" Surface.** Definition of the highest-quality surface technically achievable on exterior automotive body panels.

**CLTE.** Coefficient of linear thermal expansion. SMC: same as steel, making hybrid SMC-steel structures feasible.

**Cobwebbing.** White threadlike strands of thermoplastic that become airborne during removal of carrier film from SMC sheet and eventually cover almost everything in the moulding area. This symptom indicates thermoplastic/polyester incompatibility and means that scumming, streaking, or phasing may occur during moulding.

**Composites.** See FRP.

**Contamination.** Presence of foreign material in the moulded SMC laminates.

**Crack, Fracture.** Structural failure in the SMC part extending completely through the substrate.

**Crack, Surface.** Crack located on the surface of the SMC laminate that does not extend completely through the substrate.

**Cracks, Ejector.** Crack located on the SMC surface over or near an ejector pin.

**Crazing.** Hairline cracks in the part or on the part surface as a result of stress.

**Creel.** A storage rack that holds spools of glass roving for the manufacture of SMC.

**Cross-linking.** Chemical reaction of the unsaturated molecules that creates a network, which is the reason for advantageous mechanical, dimensional and thermal end-properties.

**Cure.** See Cross-linking and Catalyst.

**Cycle Time.** The amount of time required to complete a full moulding cycle from mould preparation to part removal, “from button to button”.

**Dieseling.** Burned spot on the SMC laminate, often accompanied by non fills. Dieseling is normally associated with air and styrene vapour entrapped in the tool, which ignites when under moulding temperatures and pressures.

**Draft.** The degree of taper allowed on the sides of a mould so the part can be removed.

**Dull surface** Loss of gloss on the overall SMC part surface.

**E-Coat.** Electrophoretic coating used for corrosion protection for metals.

**Edge Chips and Fibre Pulls.** Small, irregularly shaped laminate tears located near the edge of the part.

**Ejector Pins.** A series of telescoping pins hidden in the (male) side of a mould that move in unison to lift a cured part from the mould.

**Exotherm.** The heat given off when resin cures by chemical reaction.

**FEA.** Finite Element Analysis. Computer analysis used to theoretically predict the structural integrity of a part using mathematical geometry and load simulation.

**Fibre Orientation.** The aligning of fibre reinforcements within the part that affect mechanical properties. The properties usually increase in the direction of alignment, but are reduced perpendicular to alignment.

**Flash.** A thin membrane of scrap plastic formed on the edge of a moulded part. It is usually trimmed off as a secondary operation.

**Flow Marks.** Visual orientation of fibreglass strands on the moulded SMC part surface. Often, flow marks, phasing, and streaking appear similar and must be properly identified.

**FRP.** Fibre Reinforced Plastic. Generic term for all fibre reinforced plastics. Also called “Composites”.

**General Purpose.** The standard class of SMC and BMC. See LP, LS.

**Ghosting.** The phenomenon where the outline of an inner panel can be seen on the surface of the outer panel.

**HDT.** Heat Deflection Temperature. The temperature at which a material specimen deflects a given distance under a given load using ASTM test procedures.

**HLU.** Hand Lay Up. A moulding technique in which the glass mat and resin are laid into an open cavity mould by hand. For small volume production, sampling, big components like boats etc.

**In-Mould-Coating. IMC.** A process in which a resin is introduced into the mould cavity after the SMC is cured. Prevents porosity in a Class “A” part.

**Knife Edge.** A term used to describe a projection from the mould surface that has narrow included angle. Knife edges are considered undesirable for moulding SMC and BMC. See Shear Edge.

**Knit Lines, Flow Fronts.** Extremely weak areas in the moulded SMC part resulting from convergence of flow fronts. Reinforcement orientation and minimal bridging of reinforcement across knit lines can significantly reduce laminate strength. Knit lines, to one degree or another, occur whenever two flow fronts meet, even when a single flow front is forced to flow around an obstruction such as a core pin.

**Laking.** Isolated dull areas on the surface of the moulded SMC part.

**LP.** Low Profile. A class of SMC or BMC with superior Class “A” surface characteristics. Usually not pigmentable.

**LS.** Low Shrink. A class of SMC and BMC with improved surface properties when compared to General Purpose. Usually pigmentable.

**Maturation.** A time period in the manufacture of SMC in which the viscosity of the resin matrix increases from liquid (sticky) to leather-like (almost non-sticky), being then ready for moulding.

**Mould Release.** A substance used to prevent sticking of a part to the mould, which is included into the SMC/BMC formulation. Also known as release agent.

**Nonfill.** Severe void in the SMC laminate resulting in an incomplete part.

**OEM.** Original Equipment Manufacturer, usually the car maker.

**Orange Peel.** An effect that appears on painted parts like the surface of an orange.

**Overflow.** Machined pocket in the old steel located just outside the shear edge. During moulding, material with trapped air is allowed to vent to this area from the old cavity through a machined clearance in the shear edge. This results in a moulded part with less porosity and improved knit lines.

**Phasing.** Part sticking, localised areas of high thermoplastic content in the moulded SMC part, and non uniformity of colour can result. Separation of the thermoplastic shrink control additive(s) or B-side carrier resin from the polyester during SMC material flow.

**Polyester Resin.** UP-Resin. The term generally used for unsaturated (means containing chemical double bonds) resins formed by the reaction of dibasic organic acids and polyhydric alcohols, basic component of SMC/BMC.

**Porosity.** Relatively small voids (1 mm or less) that appear individually or in clusters on the SMC laminate surface.

**Pregel.** Localised area of deceleration on the moulded SMC part that is dull and rough and normally contains porosity. This is caused by material starting to cure prior to completion of flow.

**Press Parallelism.** The ability of a hydraulic press to maintain the moulding surfaces in parallel to each other. Poor parallelism may cause uneven pressure distribution in the mould cavity and parts being thin at one edge, and thick at the opposite edge.

**Resin-Rich Area.** A section in the moulded SMC laminate where the reinforcement levels (glass content) is excessively low.

**Rib Read-Out (Sink Marks).** Surface depression caused by SMC material shrinkage and located over ribs, bosses, or thick sections of the SMC part. This usually appears as a lighter colour than the surrounding substrate.

**Scumming.** Dull streaks or spots on the moulded SMC part that transfer residue to the tool surface. This normally results from non-function of the internal old release at moulding temperature and/or incompatibility of resin additives.

**Shear Edge.** A telescoping feature around the perimeter of the cavity of a compression mould where two mould halves are able to seal by bypassing each other. A shear edge is capable of allowing air to escape from the cavity, while keeping the SMC from passing through. Recommended for SMC/BMC. See Flash.

**Shelf-Life Stability.** The length of time a material will retain its moulding properties while stored in accordance with manufacturer's recommendations. Recommended storing temperatures: <20C.

**SMC.** Sheet Moulding Compound (also: Sheet Moulding Composite). A ready to mould fibre reinforced polyester material primarily used in compression moulding. The sheet is being provided in rolls up to 400kg.

**SPC.** Statistical Process Control: A method by which a production process can be monitored and control plans can be initiated to keep quality within acceptable limits.

**Sticking.** Physical adhesion of the moulded SMC part to the old, resulting in poor release and potential cracking during part removal. Do not confuse with difficult part release due to LP-effect and inadequate draft angle. LP-SMC/BMC requires chrome plated press moulds.

**Streaking (Abrasion).** Dark areas, directional, in the line of flow, found most commonly in pigmented SMC parts, generally located over reinforcement strands.

**Styrene.** A liquid monomer which is part of the UP-Resin, that reacts during the cure to become part of the solid cross-linked thermoset plastic matrix.

**Surface Waviness (Ripples).** Surface irregularity usually seen at the termination of flow on flat moulded SMC surfaces.

**Thermoplastic (TP).** A plastic material which can be repeatedly softened and reformed by heating, and rehardened by cooling.

**Thermoset.** A plastic material that undergoes a chemical cross-linking reaction before it becomes solid. Once it becomes solid, it cannot be reformed. Thermosets do not melt when heated.

**Undercure.** Incomplete polymerisation while under moulding pressure, usually accompanied by a dull surface, styrene odour, catalyst odour, blisters, blown bosses, and/or delimitation of the SMC part.

**Undercut.** A negative or reverse draft in a mould that does not allow part removal without a special moveable section in the mould construction.

**UP-GF-25, UP-GF-30.** Terms used to indicate percentage by weight of glass fibres in the moulded SMC parts.

**UP-Resin.** See Polyester-Resin. UP-Resin keeps its name even in the cured, saturated stage.

**Vacuum Assist.** Vacuum assisted moulding lead to better SMC flow, easy mould fill, better air escape from the cavity, less porosity and is recommended for Class "A" parts.

**Viscosity.** A measure of resistance of a liquid to flow. Unit: mPas.

**Warpage.** SMC part distortion, shrinkage, or undue stress in the finished moulding (part does not duplicate the tool after moulding).

**Wetout:** The ability of a resin or resin-filler-mix to impregnate a fibre reinforcement.

**Whitening.** General light or whitened appearance in the SMC moulded part's pigmented surface. Whitening is more evident in dark-coloured applications not using polystyrene thermoplastic additive.