VT IN UNSATURATED POLYESTER MOLDING COMPOUNDS

Many applications for automotive and appliance components have been developed for low profile sheet molding (SMC) and bulk molding (BMC) compounds to use the advantage of moderate cost and excellent product quality. Efficient processing of fibre reinforced SMC and BMC materials is essential to meet the stringent requirements for consistent product quality with high volume production rates.

Processing SMC and BMC involves the application of heat and pressure in a mold. The processing characteristics of the molding compound depend upon the thermal and rheological properties of the compound in the mold. The thermal behaviour of the compound is complicated by the exothermic nature of the reaction while curing. *(H. Kobuta, Journal Applied Polymer Science, 19, 2279-2297).*

A typical resin formulation suitable for use as SMC or BMC is shown below:

Material		Quantity	Remarks
Unsaturated Polyester	Propylene Glycol	4 parts	
	Dipropylene Glycol		
	Maleic Anhydride	1 part	Converted to Fumaric Acid Double Bond
	Acid Number	25 mg KOH	
	Molecular Weight	2700 g/mol	
Reactive Diluent	Styrene	50.0 Wt%	Constant Mole Ratio
	VT	53.7 Wt%	
	TBS	60.7 Wt%	
Initiator	Di-tert-Butylperbenzoate	1.2 Wt%	
Low Profile Additive	Cellulose Acetate		
	Cellulose Butyrate		
Filler	Calcium Carbonate		200 Parts by Weight SMC/BMC
	Magnesium Oxide		

The mole ratio of styrene monomer, VT or tert-Butylstyrene (TBS) reactive diluent is held constant for the comparison. Effect of the diluent on curing characteristics was determined by DSC at 4.2 N/mm^2 10 ^oC/min. Kinetic results of study are shown in the figures below:

Effect of Reactive Diluents on Curing Rate

dQ/dt

Temperature ^{o}C

Effect of Reactive Diluents on Curing Conversion

Conversion

Temperature ^{o}C

Use of VT as the reactive diluent results in improved mechanical properties and reduced shrinkage of cured resin compared to styrene monomer. In addition the volatile emissions released during the molding process are significantly reduced.