

Thermoplastic vs. Thermoset

UD MAX TAPES - THERMOPLASTIC COMPOSITES

THERMOPLASTIC ADVANTAGE
REUSE. RESHAPE. RECYCLE.

THERMOPLASTIC

Resin softens or melts with heat and hardens on cooling. It can be reshaped within its processing window.

HEAT → FORM → COOL



Separate chains
Resin only - schematic

THERMOSET

Resin chemically cures into a permanent cross-linked network. Once cured, it cannot be remelted to reshape.

SHAPE → CURE → SET



Cross-linked network
Resin only - schematic

UD Max Tapes = continuous glass fibres + thermoplastic resin (PP, HDPE, PA6 or PET).

COMPARE	THERMOPLASTIC UD MAX TAPES	THERMOSET
 Production speed Process examples	<2 min cycle Toray / Harper glass/PEI latch cover example. 1 Complete forming cycle; no resin cure step.	Minutes to hours Fast epoxy: 2 min at 150°C (cure time only). 2 Wet lay-up: several hours or overnight. 3
 Resins / raw materials	PP - polypropylene; HDPE - high-density polyethylene. PA6 - polyamide 6; PET - polyethylene terephthalate. Typical supply forms: pellets, films or impregnated tapes. 4,13	Epoxy · Unsaturated polyester · Vinyl ester · Phenolic. Typically liquid resin systems or pre-impregnated fibres (pregreg). Curing chemistry varies by resin family. 4
 Additional inputs	No curing hardener for standard, fully polymerized tapes. Heat, pressure and cooling form the part. Optional additives include UV stabilizers, pigments and flame retardants. 4,13	Curing agents are required , sometimes already in prepreg. Examples: epoxy + amine hardener; polyester + peroxide initiator. Many polyester systems also contain styrene. 5,6,10
 Recycling	Recyclable by remelting and remoulding. Sorted, compatible offcuts can become feedstock for new parts, helping reduce waste and virgin-material demand. 7,13	No remelting after cure. Recovery uses grinding, specialist fibre recovery or selected co-processing routes. The cured resin cannot be melt-reprocessed. 7
 Reuse & reshaping	Reshape with heat; weld compatible parts. This supports rework and scrap reuse, and can reduce adhesive use in suitable designs. 7,13	No heat-based reshaping of the cured resin. Conventional thermoset matrices cannot be fusion-welded; repair and joining require other methods. 4
 Environment & health	Potential for lower waste and virgin-material use. Standard tape forming needs no curing hardener. Heating uses energy; processing fumes and waste still require appropriate controls. 7,9,13	Styrenated resins can emit volatile organic compounds (VOCs); uncured epoxy systems can sensitise skin. Heating, emissions and waste require controls. Risks depend on the resin and curing system. 10,11

Timing: independent process examples, not UD Max specifications. Cure time is not total part cycle time; fast epoxy assumes a thin, evenly heated part. Tape line speed (m/min) is a different measure.

Environment: benefits depend on collection, recycling and the full life cycle; recycling can shorten fibres. Recyclable does not mean biodegradable. 2,7,8,12

Sources (click): [1] Toray forming example · [2] Hexcel M77 cure guide · [3] Forming processes · [4] Resin families · [5] Epoxy hardener · [6] Polyester inputs · [7] Recycling routes · [8] Life-cycle assessment · [9] Plastics fumes · [10] Styrene · [11] Epoxy exposure · [12] Biodegradability · [13] Thermoplastic processing