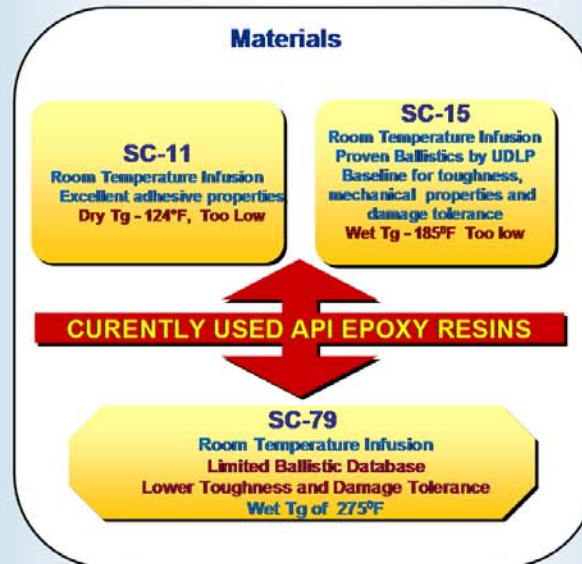
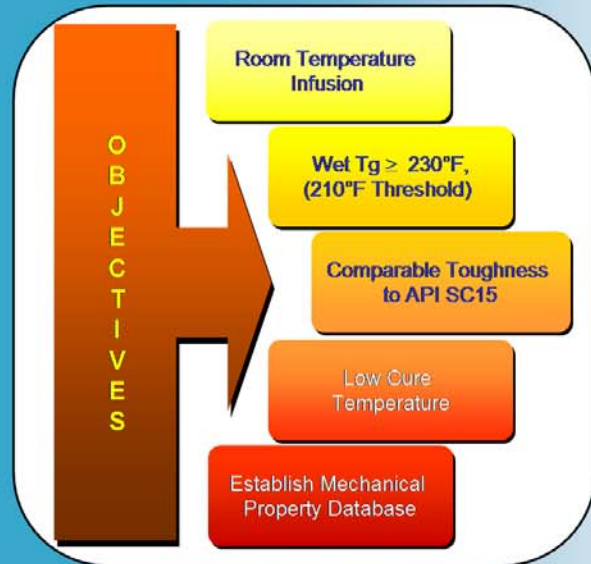


FORMULATION OF NEW VARTM RESINS FOR FCS APPLICATIONS

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Approach
Formulation of new resin systems using SC15 and SC79

RESULTS
DMA Analysis Cure Cycle: 110F/16 Hrs , 250F/4 Hrs
Dual Cantilever mode, Specimen Size: 50mm X 15mm X 5mm

Resin Type	Storage Modulus for Dry Sample (MPa)		Stiffness Retention at 180°F (nos. x mm ² -sec)	Dry Tg (°F)	Wet Tg (°F)	Toughness
	85°F	180°F				
SC15	1980	1190	60	205	183	A
SC79	2800	1850	94	311	284	E
SC79SC15 (1:1)	2510	1640	83	260	235	B4
SC79SC15 (2:1)	2520	1735	88	271	242	C
SC79SC15 (4:1)	2610	1750	87	280	251	D
SC79SC15 (1:3)	2410	1640	83	230	204	B3
SC79SC15(1A:1A) + SC79B	2527	1693	86	266	245	B2
SC79SC15 (1:3)+79B	2240	1662	84	246	TBD	B1

Saturated with water at 160°F for 400 hrs.
Toughness increases from A to D and 1 to 4
At-least five of the new formulation quality to FCS Specifications

DMA Testing for Low Temperature Cure Specimen
Dual Cantilever mode, Specimen Size: 50mm X 15mm X 5mm

Resin	Dry Tg(°F)	Wet Tg(°F)
SC79 (200°F)	255	246
SC15/SC79 1:1 (200°F)	237	TBD
SC15/SC79 Part A 1:1, Part B 100% (200°F)	251	235

Low Temperature Cure Cycle: 28 hrs/ RT; 8 hrs/200°F

Low Temperature Cure Cycle Meet FCS Requirements

Thermal/Environmental Stability: Stiffness Retention for Low Temperature Cure Cycle

Resin	E' (Mpa) 85°F	E' (Mpa) 180°F	Stiffness Retention at 180°F (%)	Stiffness ret. rel. to SC15 at 85°F (%)
SC15 (250°F)	1980	1190	60	60
SC79 (200°F)	2460	1570	64	79
SC15/SC79 1:1 (200°F)	2500	1700	68	84
SC15/SC79 Part A 1:1, Part B 100% (200°F)	2420	1550	64	78

All formulations show higher stiffness with respect to SC15

Viscosity Measurement

> Blends Viscosity is within the VARTM Range
> Viscosity does not change with Time

Conclusions

- > 5 New VARTM resins have been formulated based on SC15 and SC79
- > High and low temperature cure cycles were established
- > Formulated resins show stiffness retention higher than baseline SC15
- > Mixed viscosity is in RT-VARTM range

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