Technical Data Sheet
SUPER SAP® CLR Epoxy System– Clear, General Purpose Liquid Epoxy Resin

Product Overview

SUPER SAP® CLR SYSTEM is composed of Super Sap® CLR Epoxy, a modified, clear liquid epoxy resin, with three hardener speeds, Super Sap® CLF (FAST) Hardener and Super Sap® CLS (SLOW) Hardener and our new surfboard specific laminating system Super Sap® CLX (EXTRA FAST) Hardener. As opposed to traditional epoxies that are composed primarily of petroleum-based materials, Super Sap® formulations contain biobased renewable materials sourced as co-products or from waste streams of other industrial processes, such as wood pulp and bio-fuels production. These natural components have excellent elongation and exceptionally high adhesion properties.

Applications

SUPER SAP® CLR System is a water clear, UV stabilized epoxy system for applications that require a low color, low yellowing epoxy resin, such as for surfboard lamination and coating. It has an ideal viscosity for a wide range of applications that use hand layup techniques with fast room temperature cures.

WHY CHOOSE SUPER SAP

Performance Grade:

- Improved mechanical performance
- Formulas catering a wide range of processes and applications

Reduced Environmental Impact:

- 50% minimum reduction in CO and greenhouse gas emissions[1]
- Green chemistry eliminates harmful by-products
- Reduced power and water consumption

Considerations for the Environment & User Safety:

- Agricultural land use
- Reduced harmful by-products such as chlorinated hydrocarbons
- Reduced power and water consumption during processing
- Lowered sensitizing components for increased user safety

SUSTAINABLE TECHNOLOGY

Waste and Non-Food Grade Vegetable Oils

By-products of bio-fuels production provide a green chemistry route to one of the main components in our epoxy production. This renewable feedstock replaces additional petrochemical components in our resins with a rapidly renewable resource.

[1] As compared to 100% petroleum derived epoxies, depends on final system bio-content, LCA measurement using ISO 14040:2006.

Product Combo (Epoxy/Hardener)	CLR/CLX	CLR/CLF	CLR/CLS
Key Features	Best in class clarity, UV stability, Yellowing resistance	Excellent clarity, UV stability, Low yellowing	Excellent clarity, UV stability, Low yellowing, Long room temp working time
Applications	'Professional laminating, coating system, Hand layup	General laminating, Adhesive, Coating system, Hand layup, Vacuum molding	General laminating, Adhesive, Coating system, Hand layup, Vacuum molding
Potential Use	Clear coatings, Marine, Surfboards	Clear coatings, Tooling, Marine, Surfboards	Clear coatings, Tooling, Marine, Surfboards
Performance Data[2]			
Tensile Modulus (psi)[3]	445,880	440,000	468,000
Tensile Strength (psi)[2]	8,510	9,500	9,800
Elongation (%)[2]	4.1	5	5
Flexural Modulus (psi)[4]	423,720	440,000	430,000
Flexural Strength (psi)[3]	12,830	13,500	14,580
Compression Strength (psi)[5]	12,460	11,330	12,520
Onset Tg by DSC (°C)[6]	44	40	44
Ultimate Tg by DSC (°C)[5]	56	65	73
HDT (°C)[7]	-	48	56
Hardness (Shore D)[8]	70-80	70-80	70-80
Biobased Carbon Content[9]	17	17	21
Processing Data			
Mix Ratio (by volume)	2:1	2:1	2:1
Mix Ratio (by weight)	100:48	100:47	100:47
Mixed Specific Density (@ 25°C)	-	1.12	1.09
Viscosity (A/B/Mixed, cPs, @ 25°C)	1850/100/580	1850/265/725	1850/500/1300
Pot Life (mins, @ 25°C)	15	25	40
Tack Free Time (hrs, @ 25°C)	2	4	8
Recommended Full Cure	7 days @ 25C	7 days @ 25C	7 days @ 25C, Post cure recommended

[2] All performance data was taken from neat resin samples that underwent an initial cure at room temperatures for 24 hrs and a post cure at 50°C for 2 hrs
[3] ASTM D638
[4] ASTM D790
[5] ASTM D695
[6] ASTM D3418
[7] ASTM D648
[8] ASTM D2240
[9] ASTM D6866

Recommended Cure Cycles

Cure characteristics for room temperature cures will depend greatly on the ambient conditions of your working area, namely temperature and humidity. To achieve optimal mechanical characteristics all room temperature cure systems should be allowed the recommend cure cycle before being placed into service. We recommend building sample coupons using proposed materials and processes to fully understand curing characteristics of the resins in your working environment.

All **SLOW** cure hardener systems will cure to a brittle B stage in the allotted tack free time. To achieve full cure we recommend an elevated temperature post cure of 38˚C – 82˚C to reach optimal mechanical properties.

Safety and Handling

Please refer to the MSDS for the most up to date Safety and Handling information. MSDS downloads are available on the web at http://www.entropyresins.com/products.

Despite their natural derivation, exposure to these materials represents hazards typical to all epoxy resins. Exposure should be minimized and avoided through the use of proper protective clothing and equipment and appropriate manufacturing controls. All persons who use, store, or transport these materials should properly understand the handling precautions and recommendations as stated in the MSDS.

Shelf life should be no less than 24 months when stored in closed containers, in a dry place, out of direct sunlight, and at stable temperatures between 15 - 35°C.

Sales Packages

	IBC	Drum	Small Drum	Jerrican
Epoxy Resin	1000 Kg	200 Kg	50 Kg	20 Kg
Hardener	-	200 Kg	50 Kg	20 Kg
Weights are approximates and will vary depending upon product and mix ratio				

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Addendum A
Technical Data Sheet
INH Hardener with Super Sap® CLR System – Clear, UV Stable Infusion/RTM System

Product Overview
Super Sap® INH Hardener is used as a viscosity and pot life modifier to the Super Sap® CLR System. The INH Hardener is added as a third component to the two-part CLR system and is compatible with both the CLS and CLX Hardener packages. Increasing the percentage of INH added to the system, extends the pot life while simultaneously lowering the viscosity of the overall system and can be customized to meet the specific needs of a resin infusion processes.

Applications
The Super Sap® INH Hardener enables SUPER SAP® CLR System to be used in resin infusion or RTM processes. Use of INH Hardener retains the water clear, UV stabilized characteristics of the CLR system for applications that require a low color, low yellowing epoxy resin.

Choosing Percentage INH Usage
Identify the ideal pot life and viscosity resin characteristics for your process. Select which hardener package (CLX or CLS) best meets your needs by correlating those numbers to the approximate percentage of INH in Figures 1 and 2. In general CLX allows for lower viscosity, faster curing systems while CLS allows for higher viscosity and slower curing systems. Chart 1 gives commonly used INH percentages for both CLX and CLS and their corresponding processing parameters.

Calculating PHR Mix Ratio
To calculate the PHR mix ratio of each hardener component you must first select a percentage of INH (%INH) you would like to use, then use the following equation:

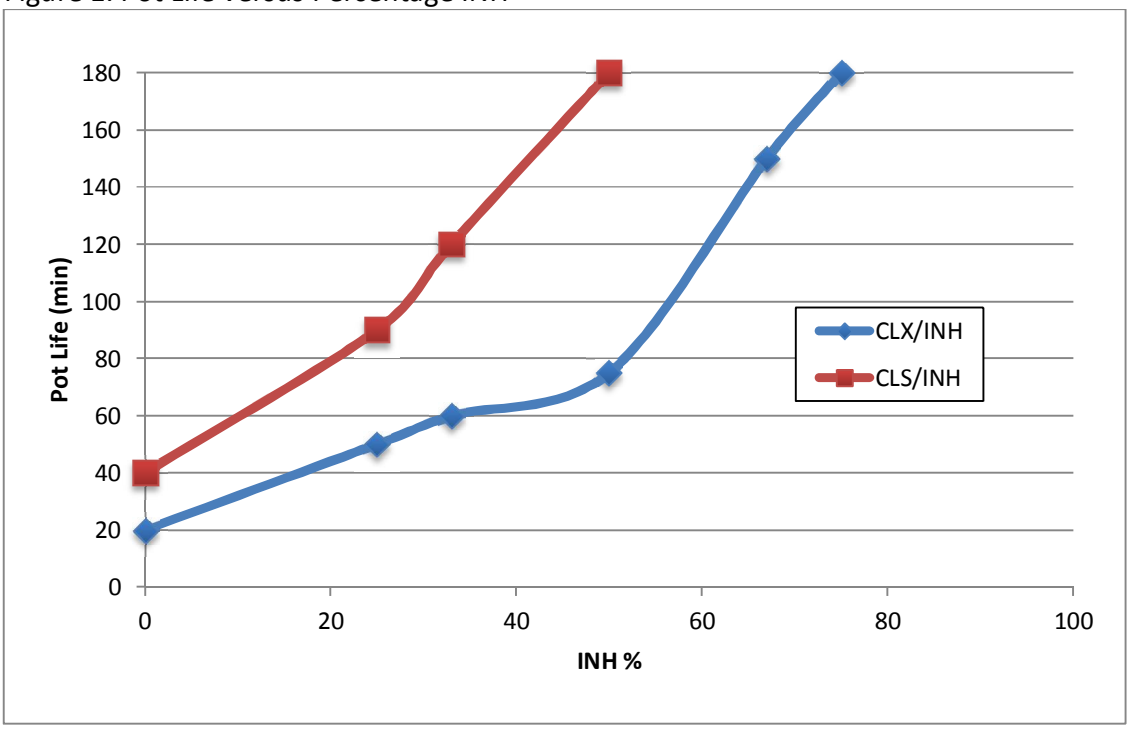
1) Total Hardener PHR = 0.5056 x (93 x (1 – %INH) + 60 x %INH)
2) CLX(S) PHR = (1 - %INH) x Total Hardener PHR
3) INH PHR = %INH x Total Hardener PHR

Chart 1. Commonly used Mix Ratios

%INH	25%	33%	50%	67%	75%
Mix Ratio (PHR)					
CLR Epoxy	100	100	100	100	100
CLX(S)	32	28	19	12	9
INH	11	15	19	24	26
Processing Data CLX/INH					
Pot Life (min, 150g @ 24°F)	48	60	75	180	>180
Viscosity (cPs @ 24°F)	500	460	360	320	280
Processing Data CLS/INH					
Pot Life (min, 150g @ 24°F)	90	120	180	>180	>180
Viscosity (cPs @ 24°F)	770	630	475	390	340

Note: Beyond 180 min, pot life measurements becomes function of viscosity increase not exothermic cure and are therefore are not supplied

Figure 1. Pot Life versus Percentage INH



Note: Beyond 180 min, pot life measurements becomes function of viscosity increase not exothermic cure and are therefore are not supplied

Figure 2. Viscosity versus Percentage INH