Advantage EP-925

Advantage EP-925 is a two-component, low foaming emulsion polymer isocyanate (EPI) adhesive recommended for applications requiring exceptional water, heat and solvent resistance. The product can be utilized with conventional cold press or hot press equipment and has been enhanced to provide superior performance with radio frequency press equipment. Advantage EP-925 allows for reduction in conditioning time before surfacing which improves productivity. It is also characterized by good spreader stability when compared with traditional EPI adhesives.

PHYSICAL PROPERTIES

Advantage EP-925
Chemical family description*: polyvinyl acetate emulsion adhesive*
Appearance: *White colored liquid*
Specific gravity: *1.28*
Weight solids (%): *55.0 - 59.0*
pH: *6.5 - 8.0*
Suggested minimum use temperature: *46°F/ 8°C*
Typical viscosity (cps): *8000 - 11000*
Mixed viscosity (cps): *10000 - 16000 when mixed; 17000 - 30000 at one hour*

Hardener 200
Chemical family description: *Polymeric MDI*
Appearance: *Brown colored liquid*
Typical viscosity (cps): *170 - 230*
Specific gravity: *1.23*

KEY PRODUCT FEATURES

- Recommended for applications requiring water, heat and solvent resistance
- Excellent for hot and cold pressing and radio frequency pressing
- Low film formation temperature allowing it to be used over a wide range of plant temperatures
- Low foaming EPI adhesive
- Good spreader stability
- Meets European E-1 formaldehyde emission standard
- Meets CARB requirements when tested in various wood constructions
- Passes CDPH/EHLB/Standard Method Version 1.2, 2017 for VOC emissions
- Meets LEED v4 Low emitting materials criteria
- Meets the definition of NAF for CARB and TSCA Title VI
- Tested according to reference method EN 16516 and meets German formaldehyde emission requirements for wood-based materials

POT LIFE

The pot life of Advantage EP-925 is in excess of one hour at 77 degrees Fahrenheit (twenty five degrees Celsius). However the viscosity of the mix will increase as it ages. Wood glued with older material will have less water

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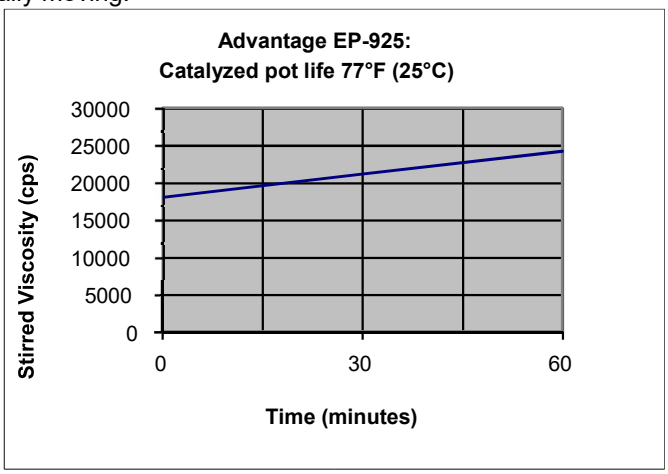
resistance, a characteristic common to most EPI adhesives. Therefore, it is recommended that fresh adhesive be mixed only when it is to be immediately used. EPI adhesives also generate foam during the reaction process; so it is best to have the material continually moving.



MIXING INSTRUCTIONS

Advantage EP-925 resin is mixed with Hardener 200 at a ratio of 100 parts resin to 15 parts Hardener by weight or 6.45 parts resin to one part Hardener by volume. Avoid mixing for long periods of time or with excessive agitation as pot life is affected by mixing time and speed. While this product can be easily mixed by hand, it is usually more convenient to mix the components in a meter mix unit. Your Franklin representative can work with you to supply the appropriate mixing equipment.

PERFORMANCE PROPERTIES

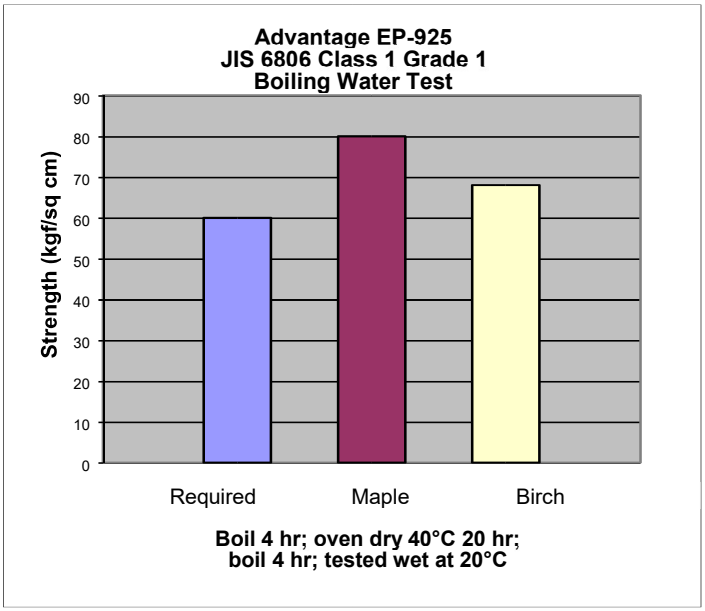
Bond Strength and Radio Frequency Gluing

Performance Advantage EP-925 is formulated to provide higher immediate bond strengths in the radio frequency equipment than conventional EPI adhesives. A positive correlation exists between the adhesive's electrical conductivity and its immediate bond strength upon removal from radio frequency press equipment – with higher conductivity resulting in higher immediate bond strengths.

	Conductivity
Competitive EPI	1.87 (µ Mho)
Advantage EP-925	**4.25 (µ Mho)**

Bonding Strength and Durability

- **Japanese Industrial Standard Class 1, Grade 1:** Pass (refer to chart for boiling water test results)
- **Japanese Agricultural Society (JAS) standard for glued laminated timber for fixture**
  - Cold water soak delamination test: Pass
  - Boiling water soak delamination test softwoods: Pass
- **ANSI/HPVA EF 2009:** PASS



Exceeds ANSI/HPVA HP-1-2004 Type I

	Test results				Requirements			
Exposure	*Strength (psi) Average*	*Strength (psi) Minimum*	*Wood failure (%) Average*	*Wood failure (%) Minimum*	*Strength (psi) Average*	*Strength (psi) Minimum*	*Wood failure (%) Average*	*Wood failure (%) Minimum*
2 cycle boil	*354*	*324*	*30*	*10*	***>350***	***NR***	***15***	***10***

**3-ply rotary cut birch Franklin Laboratory results 16803*

Exceeds DIN EN 204 D4 Classification of thermoplastic wood adhesives for non structural applications: Load group D4 Beech

Storage sequence	Minimum required average value (N/mm^2)	Average value (N/mm^2) on Advantage EP-925
1	≥ 10	12.2
3	≥ 4	6.6
5	≥ 4	5.8

**Rosenheim report 505 36441/9e 3/16/09*

Exceeds DIN EN 14257 (WATT 91)

Average value (N/mm^2) on Advantage EP-925
11.6

**Rosenheim report 505 36441/10e 3/16/09*

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Franklin Adhesives & Polymers™

Exceeds ASTM D-5751-99 wet use for laminate joints in non-structural lumber products

	Test results				Requirements			
Exposure	**Strength (psi) Average**	**Strength (psi) Minimum**	**Wood failure (%) Average**	**Wood failure (%) Minimum**	**Strength (psi) Average**	**Strength (psi) Minimum**	**Wood failure (%) Average**	**Wood failure (%) Minimum**
Dry	*1816*	*1447*	*99*	*90*	***950***	***475***	***60***	***30***
Vacuum Pressure	*961*	*855*	*75*	*35*	***792***	***396***	***50***	***25***
Boil	*831*	*756*	*73*	*60*	***792***	***396***	***50***	***25***
Elevated Temp.	*1350*	*1056*	*88*	*70*	***633***	***317***	***40***	***20***

**Southern yellow pine radio frequency cured - TECO report 05-243A*

Exceeds ASTM D-5751-99 wet use for laminate joints in non-structural lumber products

	Test results				Requirements			
Exposure	**Strength (psi) Average**	**Strength (psi) Minimum**	**Wood failure (%) Average**	**Wood failure (%) Minimum**	**Strength (psi) Average**	**Strength (psi) Minimum**	**Wood failure (%) Average**	**Wood failure (%) Minimum**
Dry	*1779*	*1554*	*98*	*90*	***950***	***475***	***60***	***30***
Vacuum Pressure	*928*	*855*	*50*	*30*	***792***	***396***	***50***	***25***
Boil	*824*	*727*	*73*	*55*	***792***	***396***	***50***	***25***
Elevated Temp.	*1401*	*1034*	*95*	*80*	***633***	***317***	***40***	***20***

**Southern yellow pine cold pressed - TECO report 05-243B*

Exceeds ASTM D-5751-99 wet use for laminate joints in non-structural lumber products

	Test results				Requirements			
Exposure	**Strength (psi) Average**	**Strength (psi) Minimum**	**Wood failure (%) Average**	**Wood failure (%) Minimum**	**Strength (psi) Average**	**Strength (psi) Minimum**	**Wood failure (%) Average**	**Wood failure (%) Minimum**
Dry	*2009*	*1529*	*86*	*50*	***1061***	***530***	***60***	***30***
Vacuum Pressure	*977*	*852*	*58*	*30*	***884***	***442***	***50***	***25***
Boil	*949*	*761*	*81*	*45*	***800***	***400***	***50***	***25***
Elevated Temp.	*1511*	*865*	*55*	*20*	***707***	***354***	***40***	***20***

**Radiata pine radio frequency cured - TECO report 05-243C*

Exceeds ASTM D-5751-99 wet use for laminate joints in non-structural lumber products

	Test results				Requirements			
Exposure	*Strength (psi) Average*	*Strength (psi) Minimum*	*Wood failure (%) Average*	*Wood failure (%) Minimum*	*Strength (psi) Average*	*Strength (psi) Minimum*	*Wood failure (%) Average*	*Wood failure (%) Minimum*
Dry	2,175	*1791*	*88*	*45*	***1061***	***530***	***60***	***30***
Vacuum Pressure	*951*	*837*	*58*	*20*	***884***	***442***	***50***	***25***
Boil	*911*	*703*	*70*	*20*	***800***	***400***	***50***	***25***
Elevated Temp.	*1849*	*1242*	*78*	*15*	***707***	***354***	***40***	***20***

**Radiata pine cold pressed - TECO report 05-243D*

APPLICATION GUIDELINES

Moisture content: Six to ten percent is the recommended moisture content for the gluing stock. Higher moisture content will increase the clamp time needed. Additionally, moisture content should mirror (as closely as possible) that which will be experienced in the end use market for the wood product being manufactured.

Stock preparation: The preparation of the stock to be glued is extremely important. Joints cut from rip saws should be free of saw marks. They should also be straight and square. Moulded or jointed stock should be free of knife marks. Glazed or burnished joints will prevent adhesive penetration and should be avoided. When possible, glue joints should be prepared and glued the same day. Gluing stock should be uniform in thickness. Variation in thickness should not exceed ± 0.005 inches/0.12 mm. Sanding to thickness should be performed using higher than 50 grit abrasives.

Spread rate: The recommended adhesive coating layer is the same as for most PVA products or approximately 0.007 inches/ 0.178 mm in thickness. EPI adhesives have superior gap filling properties due to their higher percent solids content. While Advantage EP-925 has higher percent solids content than most PVA adhesives, it also has a higher specific gravity than PVA. This means that in order to apply the same 0.2 mm thickness layer of wet adhesive as for PVA, a higher gram weight of adhesive should be applied. Generally, 200 g/m² / 41 #/MSGL of glue line is adequate.

Conveyorized spreaders are commonly used in edge-gluing applications. Adjust the applicator to ensure complete coverage on the staves. One side application is adequate in most situations. Verify that adequate coverage exists by monitoring squeeze-out along the glue lines when the panels are under pressure.

Assembly time: The assembly time is influenced by many factors some of which include glue spread, moisture content of the stock, porosity of the stock, environmental conditions and adhesive choice. Assembly times of five to ten minutes are approximate. It is desirable to see a bead of adhesive squeeze out around the perimeter of the bottom panel of the stack.

At 70ºF and 50% relative humidity, approximately 6 wet mils:
Open Assembly Time – 5 minutes
Total Assembly Time – 10 minutes

Clamping pressure: Pressure is dependent upon the species or material to be glued and joint preparation. Direct contact of the gluing surfaces must be made to obtain maximum strength. Suggested clamp locations for various wood densities are eight to fifteen inches (20-38 cm) apart and two inches (5 cm) from the end of the panel to evenly distribute pressure along the entire length of the glue line.

Recommended clamping pressures:

Species	*Clamping pressure*	*Example*
Low density wood species	*100-150 psi or 7-10 kg/cm²*	*Pine, Poplar*
Medium density species	*125-175 psi or 9-13 kg/cm²*	*Rubberwood, Cherry*
High density species	*175-250 psi or 13-18 kg/cm²*	*Oak, Maple*

Press/clamp time: A minimum press time of 30 minutes is recommended under ideal conditions when using soft wood species at moisture content less than eight to ten percent and factory temperatures of 68 degrees Fahrenheit/ twenty degrees Celsius. Longer press times will be required for higher density species, higher moisture contents and colder factory temperatures. It is recommended that optimum press times be determined in actual plant conditions recognizing that seasonal changes may lead to variable requirements.

Working pauses: The spreader should be kept running during pauses in production for lunch breaks, etc. to help extend the working life of the adhesive.

Machining: Post-gluing conditioning is not unlike PVA products, although shorter curing times are frequently possible. We recommend that panels be allowed to condition at least six hours prior to additional processing.

RF cure time: Radio frequency cure times will vary from machine to machine. Machine manufacturers suggest that machines will cure between 75 and 100 square inches of glue line per minute per kilowatt. Glue joints should feel warm immediately after the cure cycle. Cure times should be determined through plant trials.

Hot Press time: Press time is dependent on the adhesive used, gluing stock type, moisture content of the stock and environmental conditions. This hot press schedule is provided as a recommended starting point. In plant testing is recommended especially for temperatures and substrate thicknesses beyond this chart.

Platen Temperature °F

Distance to Deepest Glue	160	170	180	190	200	210	220	230	240	250
1/32”	1' 31"	1' 25"	1' 19"	1' 14"	1' 09"	1' 05"	1' 01"	0' 57"	0' 53"	0' 50"
1/16”	1' 53"	1' 46"	1' 39"	1' 33"	1' 27"	1' 21"	1' 16"	1' 11"	1' 07"	1' 02"
3/32”	2' 22"	2' 13"	2' 04"	1' 56"	1' 49"	1' 42"	1' 35"	1' 29"	1' 24"	1' 18"
1/8”	2' 58"	2' 46"	2' 36"	2' 26"	2' 16"	2' 08"	1' 59"	1' 52"	1' 45"	1' 38"
5/32”	3' 42"	3' 28"	3' 15"	3' 02"	2' 51"	2' 40"	2' 29"	2' 20"	2' 11"	2' 03"
3/16”	4' 38"	4' 20"	4' 03"	3' 48"	3' 33"	3' 20"	3' 07"	2' 55"	2' 44"	2' 33"
7/32”	5' 47"	5' 25"	5' 05"	4' 45"	4' 27"	4' 10"	3' 54"	3' 39"	3' 25"	3' 12"
1/4”	7' 15"	6' 47"	6' 21"	5' 57"	5' 34"	5' 13"	4' 53"	4' 34"	4' 17"	4' 00"

Clean-up: The foaming and cross-linking characteristics of EPI may cause blockages in the wastewater plumbing. Furthermore, there may be disposal concerns with the mixed product. It is recommended that the excess glue from the spreader and mixing containers be poured into a container and disposed of. Avoid sealing the container for at least 24 hours to permit EPI components to finish reacting. Glue pans and rollers may then be washed in warm water.

HANDLING AND STORAGE

Shelf life: Best if used within six months of date of manufacture. Mix before use. Product is freeze-thaw stable. If it becomes frozen, allow to warm to ambient temperature and thoroughly mix until a homogenous, smooth mixture is obtained.

Storage of Hardener: Hardener 200 is very susceptible to moisture. We recommend that it be kept in a sealed container. A desiccant or nitrogen blanket is recommended.

Safety and disposal: Hardener 200 is a polymeric isocyanate. Use of nitrile gloves and local exhaust ventilation are required. Consult SDS before use for additional information.

For additional questions, Franklin’s technical service team is available at 1.800.877.4583. **24/7** technical service is available online at www.franklinadhesivesandpolymers.com.

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