

# LIGNIN-PHENOL-FORMALDEHYDE RESIN IN PLYWOOD

## WELCOME TO THE FUTURE OF RESIN

Lignin phenol formaldehyde (LPF) resin based on UPM BioPiva™ lignin in combination with our proprietary resin technology sets the standard for a new era of plywood resin. It can be tailored to any need, manufacturing condition and product range.

## ENJOY INDUSTRIALLY PROVEN PERFORMANCE

- With a replacement level of phenol by lignin at up to 80%, LPF resin can be tailored for any customer purpose.
- The performance of LPF resin has been industrially proven. It meets the requirements of Bonding Class 3 (non-covered exterior) of veneer plywood specified by EN 314-2 standard.
- LPF resin-based adhesives can be formulated and applied without major changes in a manufacturing process or conditions. An LPF resin-based adhesive system can be implemented without compromising the panel performance nor plant productivity.

## DISCOVER A WORLD OF OPPORTUNITIES WITH LPF RESIN

LPF resins are robust, and their properties can be tailored according to customer needs, local manufacturing conditions and the width of a product range. The resins function well with a broad range of wood species (including spruce, yellow pine, birch, beech, larch and cypress), plywood panel structures, including combi and mirror structures, and veneer thicknesses.

## EASE, VERSATILITY AND DURABILITY

- A darker colour of LPF resin that improves visual quality control by providing more contrast during gluing.
- All industrial glue application methods proven — roller gluing, curtain gluing, extruder and foam can all be applied without changing glue factors.

- Excellent performance with a different range of viscosities and glue formulations
  - Dry solids content adjustable to any desired level
  - Great performance with both commercial, ready-made hardeners and tailor-made solutions
  - Glue storage stability is better than with PF glues, thus providing flexibility in production
  - Easy operation with glues: less spills, a woody and mild odour, and an easier washing of the lines
- Hot pressing temperatures range from 125-145°C with a possible hot-pressing time of upwards of 0.25mm/min. Pre-pressing is recommended to prevent the drying of glue lines and for optimizing strength.
  - It is recommended to avoid long open times to ensure a perfect cold tack, although the flowing feature of LPF resins in a hot press is good even with a poor cold tack
  - Further processing of panels can be done as with panels with a PF resin-based glue system
  - UPM's LPF resins-based glue system has been proven to meet the stringent requirements of liquid natural gas tank application
- Using LPF resins-based glue systems enable low panel emissions in different end uses of plywood, for example in construction and in building interiors. For example, formaldehyde emissions (EN 717-2) for 12mm spruce panels 0.230mg/m<sup>2</sup>/h, or for 12mm birch panels 0.148mg/m<sup>2</sup>/h, or 12mm combi panels 0.170mg/m<sup>2</sup>/h.

**BIOPIVA LIGNIN  
MAKES A  
MEASURABLE  
DIFFERENCE**

The difference that UPM BioPiva™ lignin makes is tangible and measurable. For instance, by replacing 65% of phenol with UPM BioPiva™ lignin and using UPM's resin technology the cost savings potential is up to 10% in a raw material basis, compared to a comparable PF resin system during the time period from 2010 to 2020. For a plywood mill with a resin consumption of 10 000 tn/a, this would mean a significant annual cost-saving potential; up to 390 000 EUR.

**COST SAVINGS POTENTIAL IN RAW MATERIALS BASIS**

	Assumption	Cost savings potential
LPF Resin, in raw material basis	Average Phenol price in 2010-20, 1000 EUR/tn	10%
Annual cost savings potential over time period of 2010-20	Annual resin consumption of plywood mill, 10000 tn	390000 EUR/a

Cost savings potential in raw materials basis calculated by using average chemical prices in 2010-2020. In 2010-2020, the price of benzene (ICIS Benzene CIF NWE Contract) has varied from 180 to 1150 EUR/tn, averaging at around 760 EUR/tn. This corresponds to an average phenol price of 1000 EUR/tn. Used reference prices: Phenol 100% 1000€/tn, benzene 100% 760€/tn, formaldehyde 100% 300€/tn, NaOH 100% 500€/tn.

**DISCLAIMER**

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