

Strong performance with lower carbon footprint: **LIGNIN-BASED BINDERS ARE A SUSTAINABLE CHOICE FOR NON-WOVEN RESINS**

Lignin phenol formaldehyde (LPF) resins based on UPM BioPiva™ lignin in combination with our proprietary resin technology is a step towards sustainability. UPM's resin technology makes it possible to replace petro-based phenol and part of formaldehyde in phenolic resins without compromising performance, while drastically reducing their carbon footprint.

VERSATILE LPF RESINS SUIT MULTIPLE APPLICATIONS

LPF resins and corresponding binder formulations are versatile, and their properties can be tailored to the requirements of your existing manufacturing process and equipment. The replacement level of phenol by lignin can be up to 70% in non-woven resins in applications such as in mineral wool for insulation and abrasives used in household and industrial cleaning.

For best performance and to maximize the content of renewable lignin in LPF resins, UPM BioPiva™ lignin is incorporated into the resole type resin structure during synthesis. It's not just a blend! This is where UPM knowhow and solution make the difference. Our Technical Service Team will support you with years of experience to ensure that your transition into more sustainable production is as easy as possible.

Phenolic resins are commonly used binders for glass wool and stone wool used in thermal and acoustical insulation for construction, and in abrasive products. A broad range of LPF resin formulations based on UPM's resin technology is also available for these applications and end uses. Our lignin solution fulfils the requirements of industry and substantially increases the share of renewable raw materials of the resin and the final product.

With UPM BioPiva™ lignin and our resin technology the replacement of phenol by lignin can be up to 70%. We are constantly developing new type of lignin-based resins for different applications and with even higher degree of phenol substitution to meet the specific requirements of our customers

Non-woven LPF resin can be modified for the customer purposes. Our technical team can help you choose the optimal UPM BioPiva™ lignin product for your manufacturing process requirements and performance needs.

**TYPICAL VALUES
OF LPF NON-
WOVEN RESIN**

Dry solid content	%	40–44
pH		9–10
Alkalinity	%	2–4
Free formaldehyde content	%	< 1 without urea < 0.1 with 10% urea
Free phenol	%	0.1 – 1.0
Viscosity, 25°C	mPas	150 - 300
Water tolerance		infinity
Biobased carbon content	%	35–60

**SUSTAINABLE, HIGH
PERFORMANCE
LIGNIN SOLUTION FOR
MINERAL WOOL**

	Commercial PF resin	LPF resin – 50% phenol replacement	
	with urea	10% urea	15% urea
Dry strength – 3 point bending, MPa	8.8	9.6	8.6
Formaldehyde emission, mg/m³h (DIN EN ISO 12460-3)	1.121	0.045	0.035
Colour of board	yellowish	brownish	brownish

Results of the laboratory test. Test specimens (sand bars) were prepared by mixing silica sand and the resin, and the specimens were cured in a mold in an oven.

UPM BioPiva™ lignin incorporated with our resin technology delivers technical properties that are on a par with petro-based phenol formaldehyde resin. LPF resins are designed as a low emission resins providing low process and product emissions.

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