Prowaxx™

Why paraffin wax purity and pliability win

Prowaxx fully refined (FR) paraffin waxes are compositionally engineered to work well in rheological applications including hot melt adhesives. Crystalline when solid and a low-viscosity liquid when molten, their purity and flexibility in formulation at low temperatures make them ideal for adhesives used in flexible food-grade packaging.

Exceptional performance in certain hot melt adhesive applications

Prowaxx FR paraffin waxes can be used in any hot melt adhesives (HMA) formulations and demonstrate exceptional performance in adhesives used for flexible cardboard food containers. These waxes comply with the FDA regulatory requirements applicable to HMA used in food application* and have been proven to enhance fiber tear at lower temperatures, which relates to improved adhesive performance at refrigerator and freezer temperatures. Furthermore, their clarity in HMA formulations does not interfere with package designs.

Properties				Prowaxx 1471 FR	Prowaxx 1531 FR	Prowaxx 1551 FR	Prowaxx 1601 FR
Characteristics	ASTM	unit	limit				
Melting point	D87	°C	Min/Max	62.8-65.0	66.1-68.3	67.2-69.4	68.9-73.3
		°F	Min/Max	145-149	151-155	153-157	156-164
		°F	Typical†	147	152	155	159
Oil content	D721	wt%	Max	0.5	0.8	0.8	0.75
Kinematic visc. @100°C	D445	mm2/s	Typical†	5.2	6.3	6.6	7.5
Needle pen. @25°C	D1321	0.1mm	Typical†	15	16	13	15
Needle pen. @40°C	D1321	0.1mm	Typical†	33	34	34	36
Saybolt color	D156	-	Min	+28	+26	+26	+26
Flash point c.o.c.	D92	°C (°F)	Min	210 (410)	220 (428)	220 (428)	220 (428)

* Comply with FDA 21 CFR 178.3710, therefore an approved component in HMA, meeting FDA 21 CFR 175.105

† Typical values, provided for reference only, are not specifications and are not guaranteed.

Key benefits in HMA formulations

- FDA compliant for use in food-grade HMA
- Crystalline in solid state, clear in liquid state
- Strong adhesion to cardboard
- Excellent fiber tear
- Outstanding low-temperature performance in formulation
- Biodegradable under composting conditions‡

‡ According to ASTM D12-6400 using ASTM D11-5338

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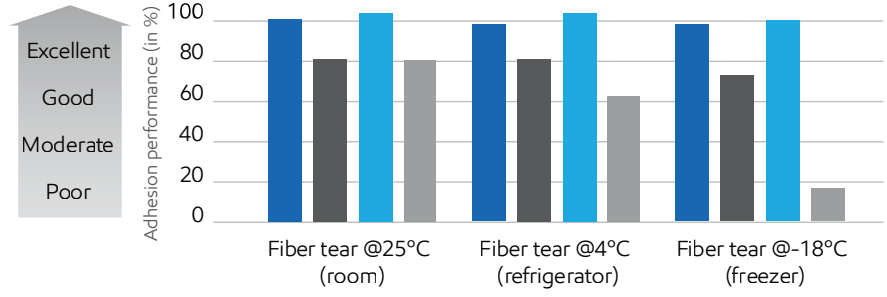
Hot melt adhesive sticking performance

Fiber tear is a visual measurement of the amount of paper substrate fibers still attached to a bond after the substrates are torn apart. For example, 100 percent fiber tear indicates that all of the adhesive is covered by substrate fibers (cohesive failure), while 0 percent fiber tear indicates that the adhesive does not bond at all and simply pops off the substrate (adhesive failure). Prowaxx™ fully refined wax formulated adhesives showed improved adhesion performance in fiber tear test at lower temperatures compared to Fischer-Tropsch (FT) wax. Once solidified, Prowaxx-based adhesive was more flexible and rubbery, performing better at refrigerator/freezer temperatures.

Fiber tear as a measure of adhesion performance



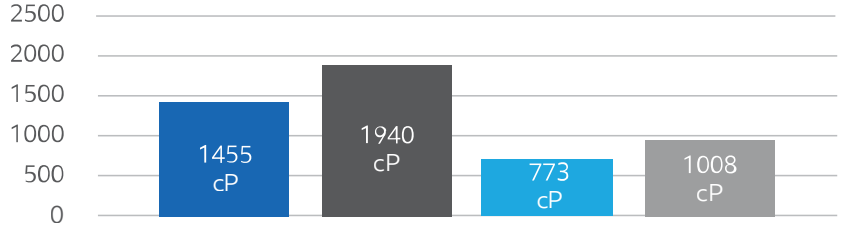
- Prowaxx/EVA formulation
- FT wax/EVA formulation
- Prowaxx/metallocene PO formulation
- FT wax/metallocene PO formulation

ExxonMobil in-house performance testing using typical commercial HMA formulations

Hot melt adhesive flow performance

Prowaxx formulated adhesives exhibit a low viscosity when molten that enhances flow onto the substrate and improves surface wetting in all tested temperatures. Imparting lower viscosity to the adhesive, Prowaxx allows better coverage and substrate penetration. In laboratory testing comparing Prowaxx to FT wax, Prowaxx improved product flow and substrate coverage for metallocene polyolefin and EVA (ethylene-vinyl acetate) formulations. The Prowaxx-based adhesives showed better flow when molten and better flexibility when set, representing dual advantages over alternatives wax.

Viscosity as a measure of flow properties in molten adhesive*



*Apparent viscosity of hot melt adhesives at 177°C according to ASTM D-3236

- Prowaxx/EVA formulation
- FT wax/EVA formulation
- Prowaxx/metallocene PO formulation
- FT wax/metallocene PO formulation

ExxonMobil in-house performance testing using typical commercial HMA formulations

About ExxonMobil Waxes and Prowaxx

Prowaxx family of waxes is a wide-ranging paraffin portfolio from ExxonMobil Waxes. Our fully refined waxes offer the highest-level quality of refinement and are biodegradable under composting conditions.* Prowaxx semi-refined waxes are used in a broad range of formulas for perfectly balanced versatility. For economic flexibility and high production value, our slack waxes are available in a full range of melt points.

Our wax solutions are used across most industry applications, including candles, rheology, emulsions, crayons and boardsizing. To learn more about Prowaxx and our full range of wax products, please visit **exxonmobil.com/wax.**

- Over 125 years of experience as a wax supplier
- Expertise in thought leadership and innovation
- Versatility and flexibility to meet changing needs
- Regional commitment to reliable supply

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*According to ASTM D6400-12 using ASTM D5339-11