BYK
Additives & Instruments

Substance for Success.

Technical Information B-TI 1

HORDAMER
Primary Polyethylene Dispersions

A member of ALTANA

What Are HORDAMER Primary Dispersions?

Primary dispersions are produced by the high-pressure, aqueous polymerization of ethylene. An emulsifier stabilizes the final product.

Unlike secondary wax dispersion/emulsion, there is no need for post-oxidation of the PE wax to make it polar enough for it to be emulsified in water. The chain length of the wax becomes shorter as a result of the post-oxidation. This means that primary PE dispersions have a longer chain length and the molecular weight is approximately double the weight of a PE wax dispersion/emulsion.
Even the molecule structure is highly branched in comparison to a PE wax. The melting point is much lower because of the different process used. The particle size distribution is similar to wax emulsions at approx. 200 nm (figure 5).

Manufacturing Process for Primary and Secondary Dispersions

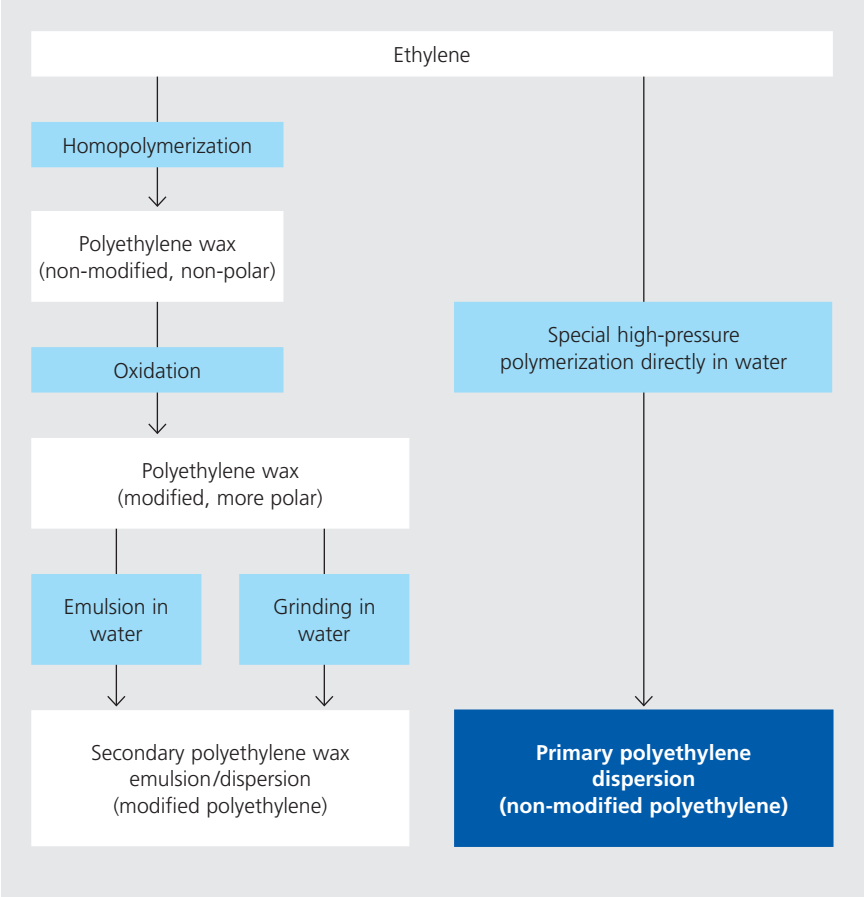
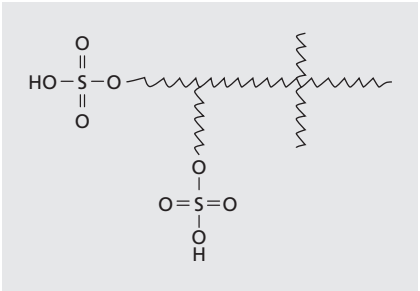


figure 1

Structure of HDPE Waxes

Linear chain (Mw 5000-6000) figure 2
Melting point 110-145 °C/230-293 °F

Structure of HORDAMER



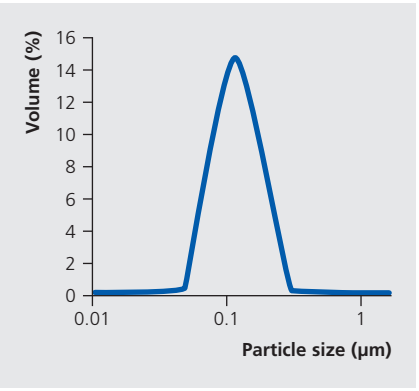
Branched chain (Mw > 15,000) figure 3
Melting point 90 °C/194 °F

HORDAMER Primary Polyethylene Dispersions at a Glance

	HORDAMER PE 02	HORDAMER PE 03
Composition	Primary dispersion of polyethylene with an anionic emulsifier	Primary dispersion of polyethylene with anionic and non-ionic emulsifiers
Melting point in °C/°F	95/203	95/203
Non-volatile matter in %	40	40
pH value	11	9
Viscosity in mPa·s	20	20
Density at 20 °C in g/ml	0.97	0.98
Density in lbs/US gal at 68 °F	8.1	8.2
Molecular weight in g/mol	16,000	16,000
Compliant with 21 CFR § 175.300	Yes	Yes

figure 4

Narrow Particle Size Distribution of HORDAMER



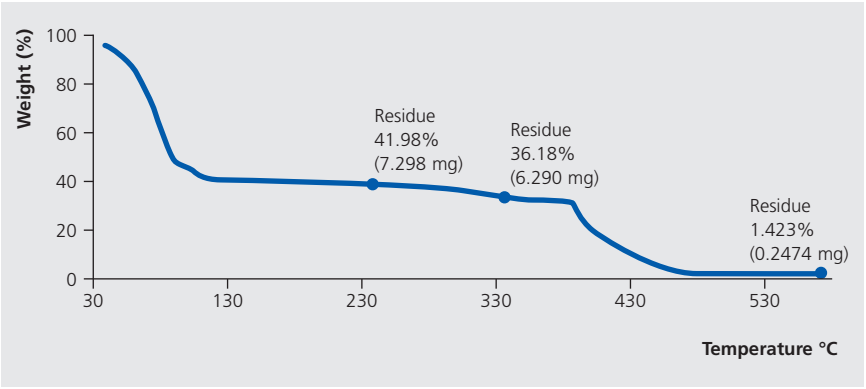
HORDAMER PE 02

figure 5

What Are the Advantages of HORDAMER over Secondary PE Emulsions?

- Shows extremely good surface wetting at high temperature surfaces
- Will not yellow under UV exposure
- As a result of its polar functions in the molecule, the HORDAMER products can improve adhesion to non-polar substrates
- Shows high temperature stability
- Is FDA and BFR approved for direct food contact
- Anti-blocking effects on different surfaces like hot melts, PU, etc.
- Very high melt viscosity

Thermogravimetric Analysis (TGA)
Excellent Heat Resistance of HORDAMER PE 02



HORDAMER PE 02

Sample weight: 17.386 mg

figure 6

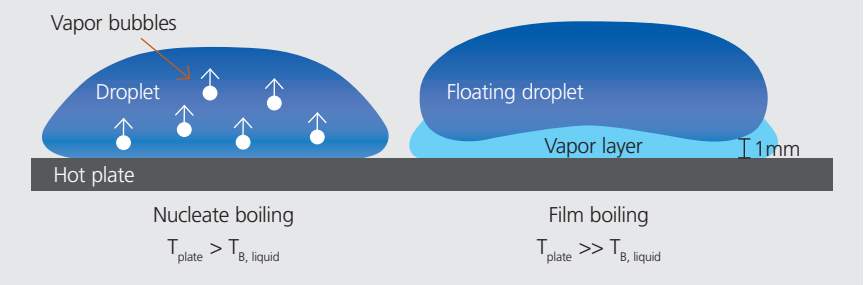
Where Is HORDAMER Used?

- In **aluminum die cast applications** as one component (often used in combination with secondary PE emulsions and/or silicones)
- In **mold release formulations**, it improves substrate wetting at high temperatures and also release properties
- As a **lubricant** at very high temperatures
- In **hot melt adhesives** and **thermoplastic compounds** as an anti-blocking additive in underwater pelletizing processes
- In **water-borne adhesives** to improve adhesion to thermoplastic substrates like polyethylene, polyester film and others
- In **overprint varnishes** to improve the rub resistance
- In **floor care & polishes** to increase scratch and abrasion resistance

Die Cast Applications

Usually, aqueous systems are not easily able to wet metal surfaces at a temperature range of 100-400 °C/212-752 °F because of the fact that a gas cushion (vapor layer) forms under the applied drop of liquid. This phenomenon is known as the Leidenfrost effect. The addition of HORDAMER ensures that perfect substrate wetting is achieved even at temperatures up to 400 °C/752 °F. The good wetting properties of HORDAMER are based on its unique structure and polar functionality. This explains why HORDAMER is successfully used as one component in mold release agents for metal die cast processes.

The Leidenfrost Effect



T_{plate} = surface temperature of hot plate $T_{B, liquid}$ = boiling point of liquid figure 7

Hot Melt Adhesives and Thermoplastic Granulates

Soft thermoplastics such as TPE and TPU as well as hot melt, EVA-based adhesives are used in the form of granules. Under pressure and heat they exhibit caking/blocking effects especially when they are packed in bags, which makes handling and automatic filling difficult.
By using HORDAMER during the underwater pelletizing, the PE film covers the granule's particle surface and prevents blocking. There is no migration into the final parts.

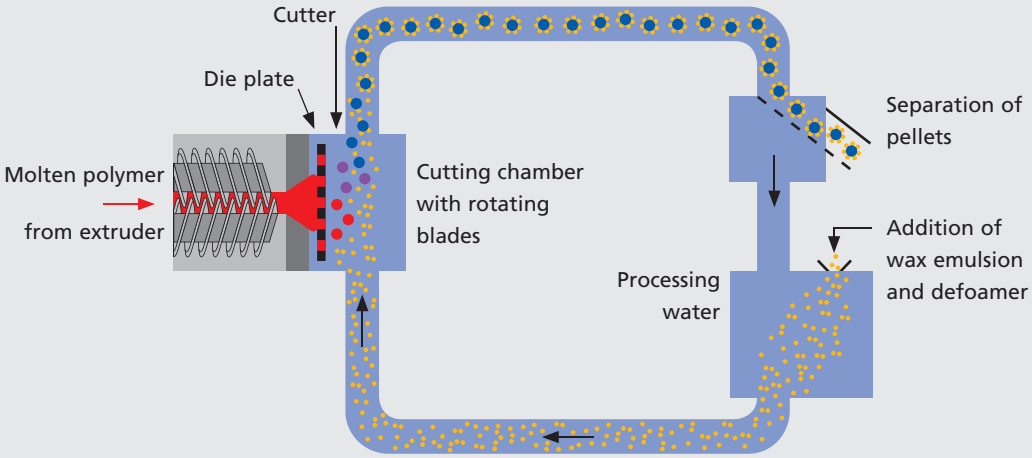
Heat and Pressure Cause Caking

Granules directly after extrusion

Granules after being stored for 1 hr at 70 °C/158 °F in an oven

figure 8

Underwater Pelletizing – Schematic Diagram



● Hot polymer ● Cooled-off polymer ● Wax emulsion and defoamer ● Cold polymer with wax emulsion and defoamer figure 9

Water-borne Adhesives

There is always a demand for raw materials that enhance the adhesion power of adhesives. In aqueous systems based on EVA or acrylics, HORDAMER improves adhesion to polypropylene (OPP and BOPP), and, to a certain degree, to polyethylene. Application fields for HORDAMER are film-laminated paper substrates, which are used for high-quality shopping bags, gift boxes and medicine packaging.
Additionally, HORDAMER products provide better wetting of OPP substrates.

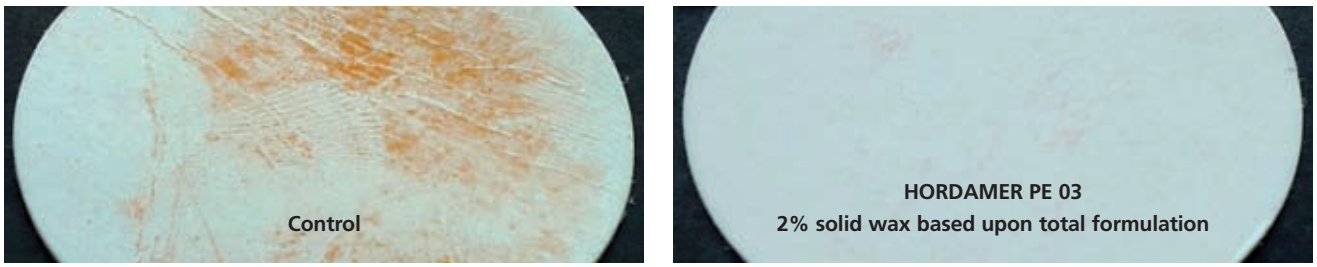
Improved Adhesion Power with HORDAMER

figure 10

Overprint Varnish

HORDAMER improves scratch resistance, abrasion resistance and surface slip in water-borne printing inks and overprint varnishes as well as flexo inks.
As a result of the special processing, the HORDAMER products have direct food contact approval and can even be used in inks for food packaging.

Rub Resistance on Overprint Varnish



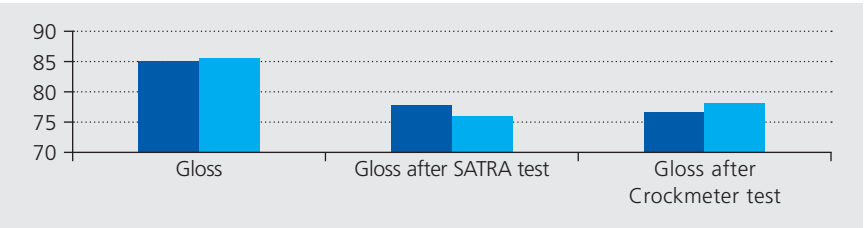
Test system: aqueous, acrylic-based OPV, 24 hr drying time; test equipment: Prüfbau 250 rubs; offset OPV, aqueous

figure 11

Floor Polish

In terms of surface protection, HORDAMER increases the scratch resistance on floorings without an increase in slip.

Surface Protection on Floor Polish



Secondary wax emulsion HORDAMER PE 02

figure 12

8.0% wax solids

Products and Applications

BYK Additives

Product Range Additives:

- Additives to improve surface slip, leveling and substrate wetting
- Adhesion promoters
- Defoamers and air release agents
- Processing additives
- Rheological additives
- UV absorbers
- Viscosity depressants
- Wax additives
- Wetting and dispersing additives for pigments and extenders

Application Areas:

Coatings Industry
- Architectural Coatings
- Automotive Coatings
- Industrial Coatings
- Can Coatings
- Coil Coatings
- Wood & Furniture Coatings
- Powder Coatings
- Leather Finishes
- Protective & Marine Coatings

Plastics Industry
- Ambient Curing Systems
- PVC Plastisols
- SMC/BMC
- Thermoplastics

Printing Ink Industry
- Flexo Inks
- Gravure Inks
- Inkjet Inks
- Silk Screen Inks
- Offset Inks
- Overprint Varnishes

Paper Coatings
- Impregnation
- Coatings

Adhesives & Sealants

Construction Chemicals

Pigment Concentrates

Raw Materials for Manufacturing Release Agents

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11/2011