Aquaspersions

Development of aqueous based EAA and biopolymer barrier coatings for food packaging

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Agenda

- Drivers and Requirements for Paper Packaging
- Aquaspersions Barrier Coatings:
  - AQUAREZ EAA
  - AQUAREZ Bio
- Summary

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Introduction to Aquaspersions

- Aquaspersions is a global supplier of aqueous dispersions and emulsions.
  - Strong innovation culture
  - Private equity owned, independent company.
  - Global Presence
    - Manufacturing facilities and sales offices in UK, Malaysia and North America.
    - Strong regional distributor network
    - R&D facilities in UK and Malaysia.
- Quality compliance
  - ISO 9001
  - ISO 14001

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Markets and Applications

Gloves

Aquanox Antioxidants

Accelerators & Vulcanising Agents

Composite packages

Polymers

Aquanox Antioxidants

Chain stoppers

Packaging

Aquarez Bio

Aquarez EAA

Adhesives

Aqualink

Aquarez PVB

Aquarez EAA

Coatings

Aqualink

Aquarez PVB

Aquarez EAA

Aquarez Bio

Rubber

Aquanox Antioxidants

Accelerators & Vulcanising Agents

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Drivers and Requirements for Paper Packaging

Regulatory and compliance

- Single use plastic directive (SUPD)
- EU Plastics strategy
- PFAs bans

Consumer pressure

- ESG goals of brand owners
- Positive perception of paper

Barrier and heat seal requirements

- Water resistance
- Grease resistance
- Heat seal properties
- Oxygen barrier

Commercial realities

- Costs effective solutions required
- Coated paper is the right solution for the right applications

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AQUAREZ EAA: Barrier and Heat Seal Coatings

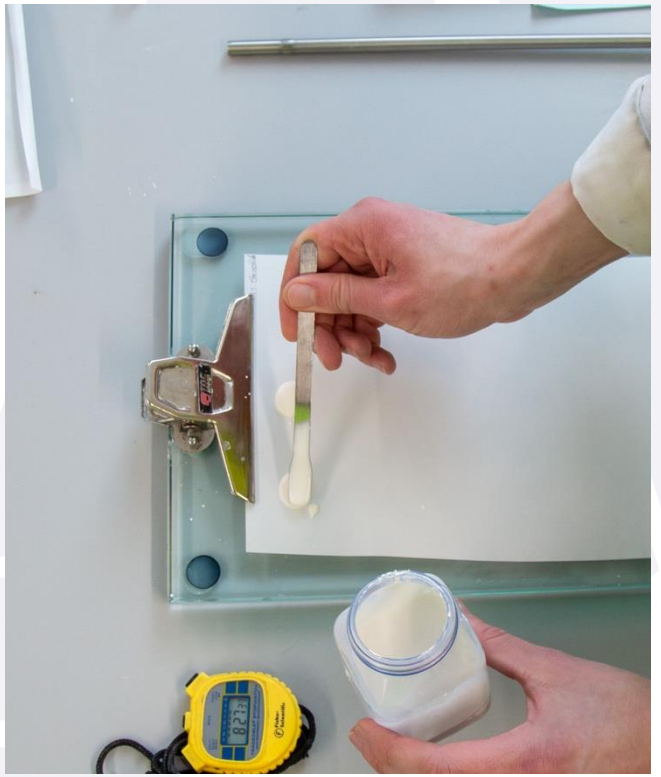
Water-based emulsions of ethylene acrylic acid copolymers

Key Features

- Excellent Adhesion:
  - Suitable for use on paper and Al foil.
- Barrier Properties:
  - Low water uptake.
  - Low moisture vapour transmission rates (MVTR).
  - Excellent grease resistance.

Applications

- Ready to use:
  - Apply using flexo and gravure coating lines.
- Formulation Base:
  - Can be further formulated to meet a specific need.



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AQUAREZ EAA Properties

Water-based emulsions of ethylene acrylic acid copolymers

Typical Properties	AQUAREZ DP696-36	AQUAREZ DP696-37
Solids content	36%	36%
Viscosity	250cPs	20cPs
pH	8	8
Particle size (laser)	(d95%) <5µm	(d95%) <5µm
Over-coatable	Paper dependent	Yes
Heat seal temp (°C)	>90	>80

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Barrier Performance on Paper

Functional barrier properties

- A single coat was applied by k-bar at two different coat weights on to 70gsm base paper*.

Product	Coat weight (gsm)	COBB 1800 (gsm)	Grease resistance (KIT value)	MVTR at 23°C, 50% RH ($g/m^2/day$)
AQUAREZ EAA DP696-37	4.8	2.26	9	14.69
AQUAREZ EAA DP696-37	8.5	0.37	12	13.81

*SAPPI Algro Finess base paper

- Good performance achieved from a 4.8gsm coating.
- Increased barrier properties achievable with heavier coat weights.

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Double Coat Barrier Performance on Paper

Reducing pinholes with a double coat

- Two coats were applied by k-bar on to 70gsm base paper.
- The overall coat weight applied is shown in the table below.

Product	Overall coat weight (gsm)	Grease resistance (KIT value)	MVTR at 23°C, 85% RH ($g/m^2/day$)
AQUAREZ EAA DP696-37	3.12	10	44.65
AQUAREZ EAA DP696-37	5.60	12	28.46

- Applying a double coat increased barrier performance at low coat weights.
- Good MVTR measured in high relative humidity.

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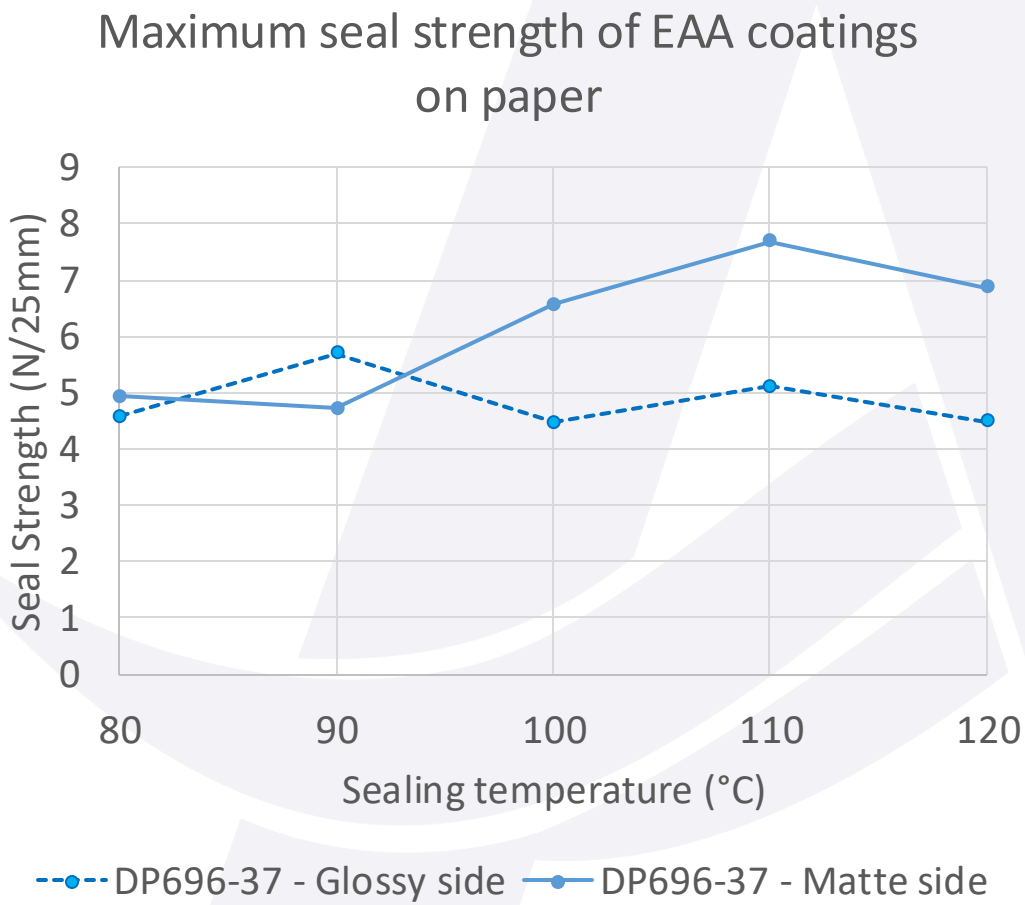
Heat Seal Performance on Paper

Heat seal parameters	
Paper	70gsm
Coat weight	8gsm
Heat seal conditions	A to A, 2 bar, 1 sec. dwell time

- Full fibre tear achieved
- Consistent seal strength observed when using AQUAREZ EAA DP696-37 from 80°C
- Seal strength influenced by paper surface



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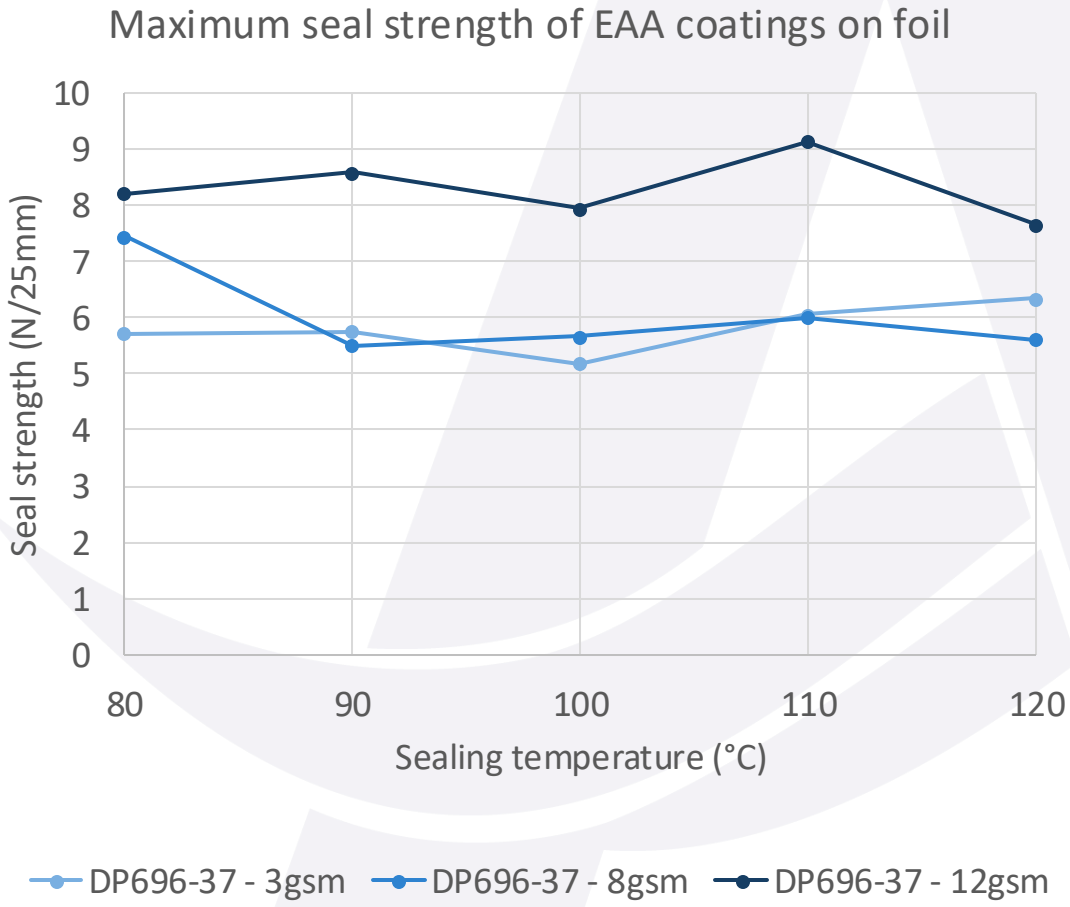
Heat Seal Performance on Aluminium Foil

Heat seal parameters	
Aluminium foil	15 microns
Heat seal conditions	A to A, 2 bar, 1 sec. dwell time

AQUAREZ EAA DP696-37

- Consistent seal strength at sealing temperature ≥80°C
- Higher coat weights can increase the maximum seal strength



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AQUAREZ Bio

Biopolymer dispersion coatings

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AQUAREZ Bio: Toolbox

Water-based biopolymer barrier and heat seal coatings

The AQUAREZ Bio range contains biopolymers that are certified compostable and biodegradable. They provide functional barrier and heat seal properties when coated on paper. The barrier results in low water uptake, grease resistance and an MVTR barrier.

They are designed to replace traditional PE coatings.

Product	Appearance	Solid content (%w/w)	Viscosity (cPs)	PSD (d95)	pH	High bio-content
AQUAREZ Bio DP678-65	White liquid	48	600	<5µm	4	✓
AQUAREZ Bio DP678-140	White liquid	52	400	<5µm	4	
AQUAREZ Bio DP678-36	White liquid	52	400	<5µm	4	

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AQUAREZ Bio DP678-65

Features

- Water-based biopolymer dispersion
- Fine particle dispersion
- Polymers are certified compostable and biodegradable
- Provides water and grease resistance
- Good heat seal adhesion

Typical Physical Properties	
Total solids content,	48%
Active solids content	46%
Viscosity	600cPs
pH	4.0
Particle size (d95)	<5µm

Typical Film Properties*	
Coat weight	2 x 5gsm
MFFT	70°C
COBB 1800	8 g/m^2
KIT	12
MVTR at 23°C, 50% RH	37 g/m^2/day
Heat seal failure	95°C

* 70gsm Algro Finess paper

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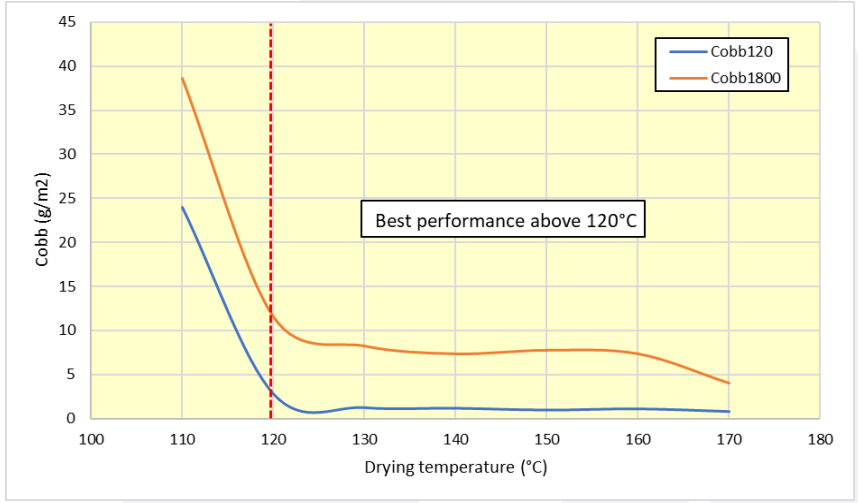
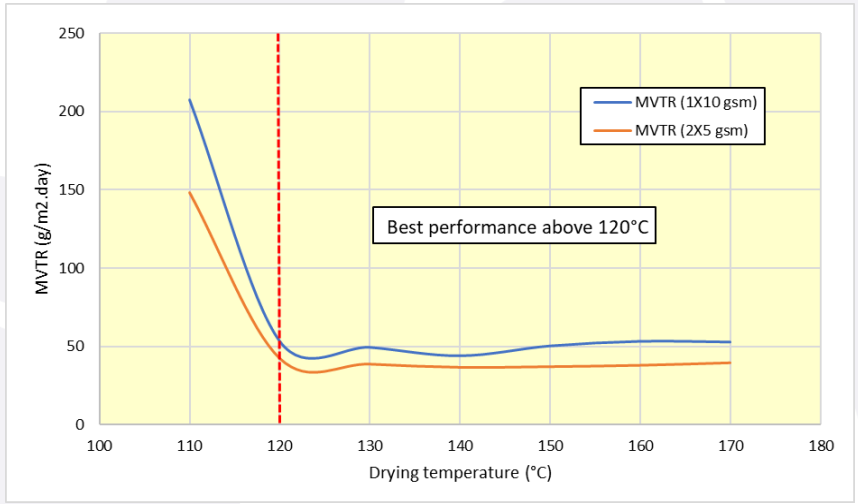
AQUAREZ Bio DP678-65 applied at lab scale

- AQUAREZ Bio DP678-65 applied to 70gsm base paper
- Coat weight applied, 10gsm and 2 x 5gsm.
- Paper samples dried at various temperatures.
- Web temperature must be >127°C for full film formation.

Drying temp °C (1 min)	Sheet temp °C (1min)	KIT	Heat-seal (°C)
110	106.5	0	105
120	117.0	10.5	105
130	127.5	12	100
140	138.0	12	95
150	147.0	12	95
160	158.0	12	95
170	167.0	12	105





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Production parameters and film properties

AQUAREZ Bio DP678-65 applied at industrial scale

Coating trial parameters	
Application method	Direct (forward) gravure
Line speed	60 - 100m/min
Dryer temperature	150°C
Drying system	Forced Air
Oven length	9m
Multiple coats	Yes
Chiller roll	Yes

Film properties	
Substrate	70gsm base paper
Substrate surface	Smooth and closed
Coat weight	1.5 – 5.0 gsm (measured)
KIT	12
Vegetable oil test	Pass
Heat sealable	From 95°C – A/A
Avg. seal strength	3.25N/25mm – Full fibre tear
Blocking	No
COBB 1800	30gsm
Ambient MVTR	75 $g/m^2/day$

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AQUAREZ Bio DP678-65 performance

- AQUAREZ Bio DP678-65 successfully coated on food grade paper at line speeds between 60 and 100m/min.
- Full film formation achieved leading to good grease resistance as shown by the KIT assessment method.
- The coating heat seals resulting in full fibre tear.
- Water and moisture barrier in line with expectations based on coat weight.

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Summary

- Aquaspersions have developed aqueous dispersions based on both EAA and biopolymers for paper packaging.
- Formulations are scaled and available for commercial trials.
- We have applied both formulations types at pilot scale.
- We are looking forward to collaborating with you on specific projects and applications.

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Questions?

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