ROYAL VAASSEN

Barrier Paper

Who we are

Why barrier paper

Our development journey

Erik Jan Troelstra

Yoran Konijn

ROYAL VAASSEN

WHO WE ARE

ROYAL VAASSEN

Food

Global supplier of heat seal lacquered, co-extruded or laminated aluminium and polymer-based films.

Industry

Royal Vaassen develops, produces and supplies innovative components for industry purpose, which guarantees customers the highest quality and best performance.

Tobacco

We are the largest European producer and supplier of innerliner for the tobacco industry. In close cooperation with the leading tobacco product manufacturers, we have developed a wide range of innerliner products.

ROYAL VAASSEN

300 employees
in 2021

150th anniversary
Royal status 2017

Single site operation
in The Netherlands

Certifications
BRC; FDA; FSC
ISO9001

Sustainability
is key

550 million m2
produced / yr.

ROYAL VAASSEN

Process capabilities

Lamination

Wet (water based)

Cigarette Innerliner
Composite Can

Dry (Solvent/water Based)

Cigarette Innerliner
Bottle Capping

Extrusion

Lacquering

Water Based

Yoghurt Lidding
Bottle Capping
Pre-met and post-met

Solvent Based

Yoghurt Lidding
Bottle Capping
Composite Cans
Tin can Ends
Insulation foil

Metallization

Direct - Vacuum

Cigarette Innerliner
Barrier paper
Yoghurt Lidding

Extrusion Coating

1 – 2 – 3 layers

Yoghurt Lidding
Tin Can Ends

ROYAL VAASSEN

WHY BARRIER PAPER

ROYAL VAASSEN

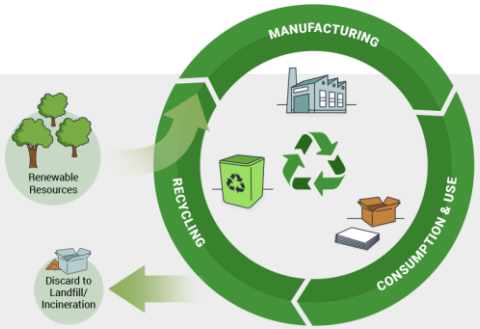
Why barrier paper?

Plastic packaging

- Extends shelf life of food - barrier for oxygen and/or moisture.
- As such, LCA studies do show that plastic packaging can be a sustainable choice.
- Due to littering and poor waste disposal, plastic is an issue for our environment.
- Recycling system for plastics is less developed

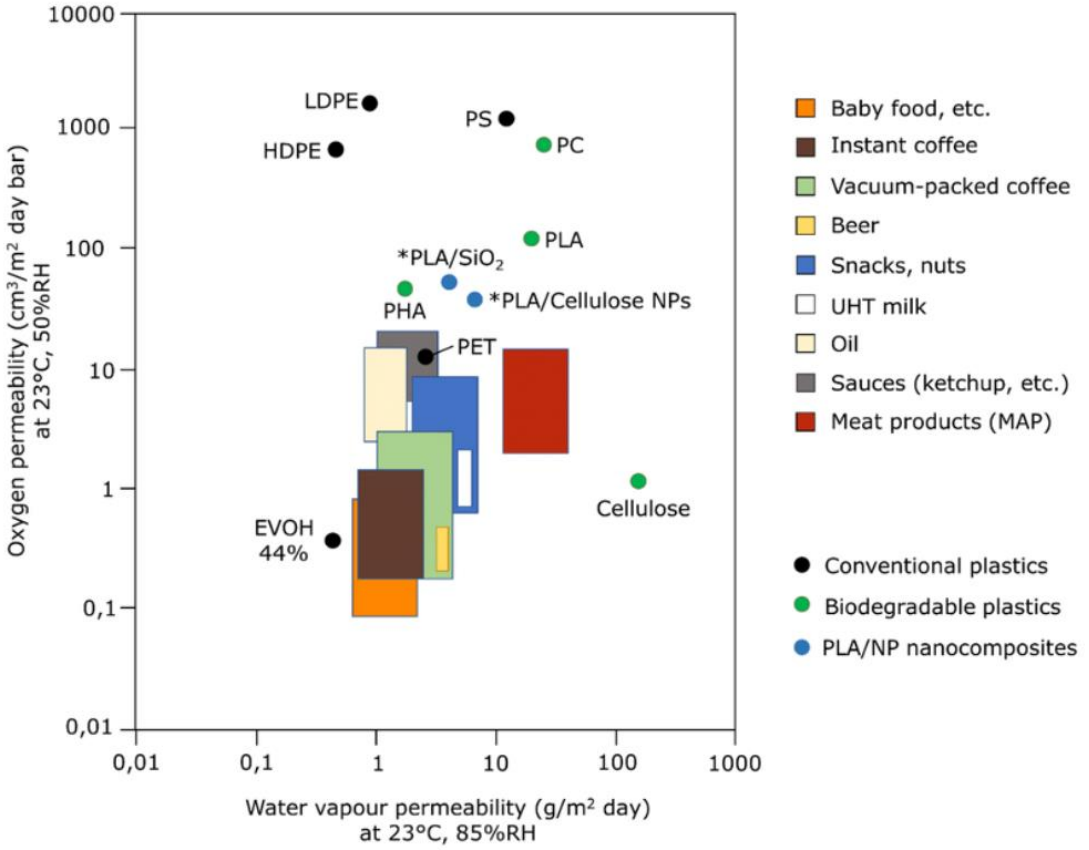
Barrier paper

- Barrier paper can replace plastic packaging.
- renewable resource
- Well-developed recycling available in many countries
- Biodegradability of the packaging is of importance in countries with a less-developed recycling system



ROYAL VAASSEN

Demands for food packaging



Approved for food contact:

- All raw materials suitable for food contact.
- Final product tested by migration testing at external lab.

Karmal Malik et al, **2021**, Organic Farming and Bio-Nanomaterial Conflux: A Way Forward for Sustainable Agriculture, *Journal of Nanoscience and Nanotechnolgy*, Vol. 21, p. 3379-3393

ROYAL VAASSEN

OUR DEVELOPMENT JOURNEY

WAGENINGEN UNIVERSITY & RESEARCH
circular biobased performance materials

Recyclable paper-based food packaging

Topsector Agri& Food

ROYAL VAASSEN

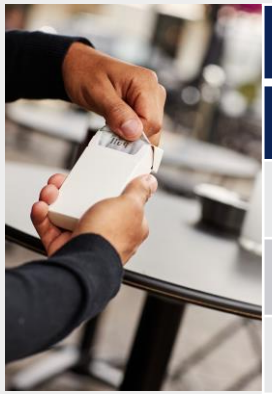
From visual performance to barrier paper

Visual performance

- From visual performance to barrier performance
- Clay coated paper to obtain gloss of metallized paper

Recyclable barrier paper

- High content of paper fibers
- Closed coating layer, no pinholes.
  - Smooth paper needed
  - Clay coating will crack when folded

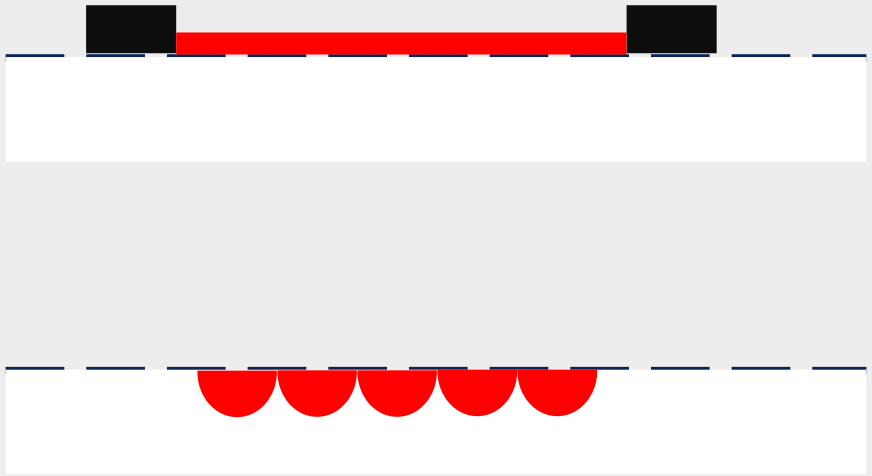


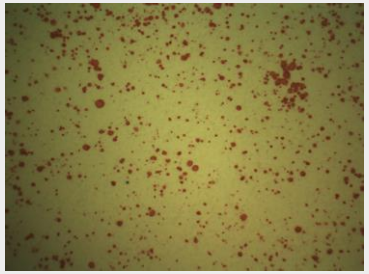
Paper (~35 gsm)
Clay coating (15 gsm)
Pre-met acrylic lacquer (2 gsm)
Metallization layer (~10 nm)
Post-met acrylic lacquer (1 gsm)

Printable paper – smooth paper (50-80 gsm)
Pre-met closed barrier lacquer (4 gsm)
Optional metallization or AlOx (~50 nm)
Functional coating (seal, barrier) (2-5 gsm)

ROYAL VAASSEN

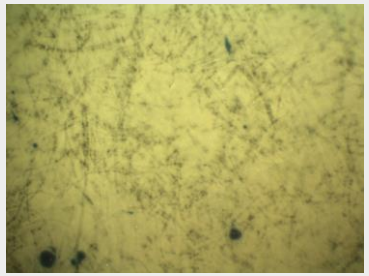
Pin hole / defect detection in pre-met layer





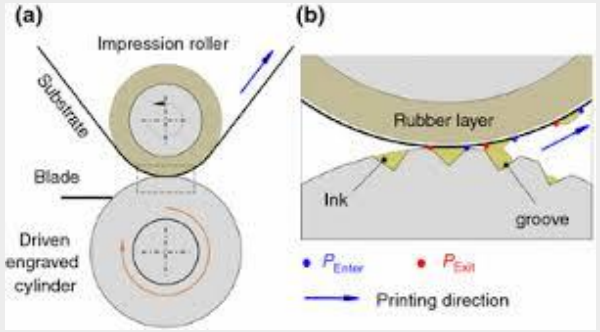
Pin-holes typically caused by:
- Application failure
- De-foaming agent

Folded clay coated paper

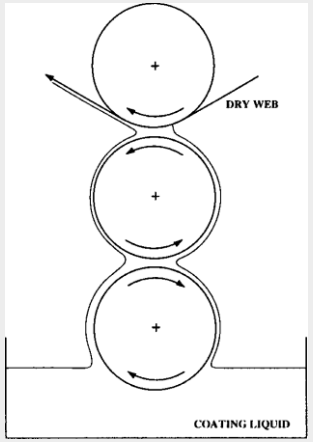


Cracks in case precoat is too brittle.

Application of barrier coating



Gravure roller



Roller coat forward

- Optimized pumping system to avoid foam formation.
- Avoid air inclusion

ROYAL VAASSEN

Influence of metallization layer.

Sample Structure	OTR 23°C / 0% RH (cm³/m².bar)		WVTR 23°C / 85% RH (g/m².day)	
	Coated	Metallized	Coated	Metallized
Paper / Moisture barrier (4 g/m²)	> 1000	> 1000	30	1-5
Paper / Oxygen barrier (4 g/m²)	<0,1	<0,1	630	50* / ~1
Paper/ Oxygen/met/Moisture		<0,1		<2* / ~1

* Measured from 100% to 15% RH. We see condensation of moisture at 100% RH to the sample. In this way the coating might be affected.

ROYAL VAASSEN

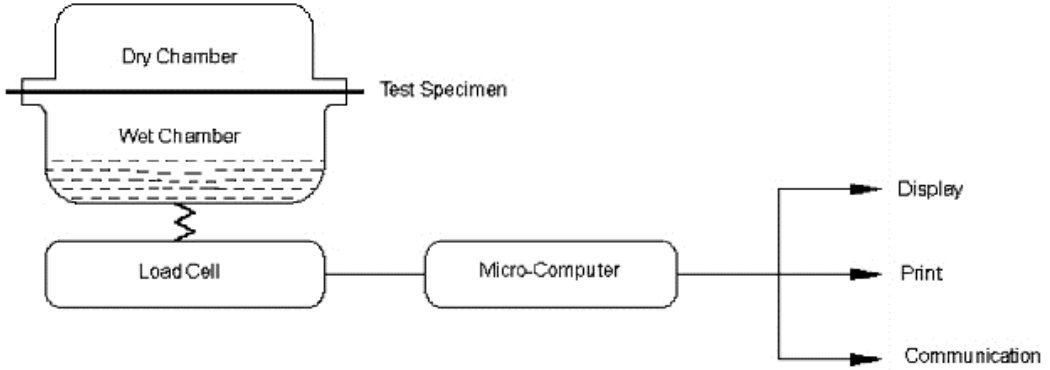
WVTR measurement – the methods

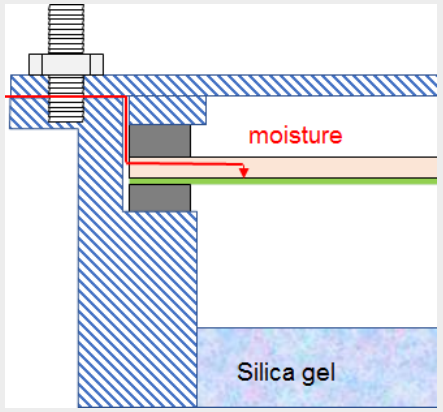
Royal Vaassen

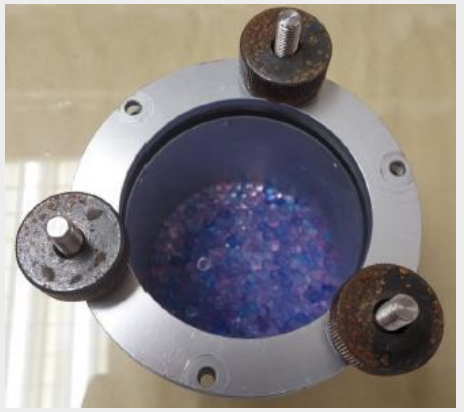
- Device: Labthink W3/030
- Norm: ISO2528 / DIN53122-1
- Conditions:
  - 23°C / RH 100% → 15%
  - Condensation can influence the barrier coating

Supplier from RV

- Device: Manual weighting. Weight is measured at t = 0 and after 1, 2, 3, 4 and 7 days
- Norm: DIN53122
- Conditions:
  - 23°C / RH 0% → 85%: No condensation

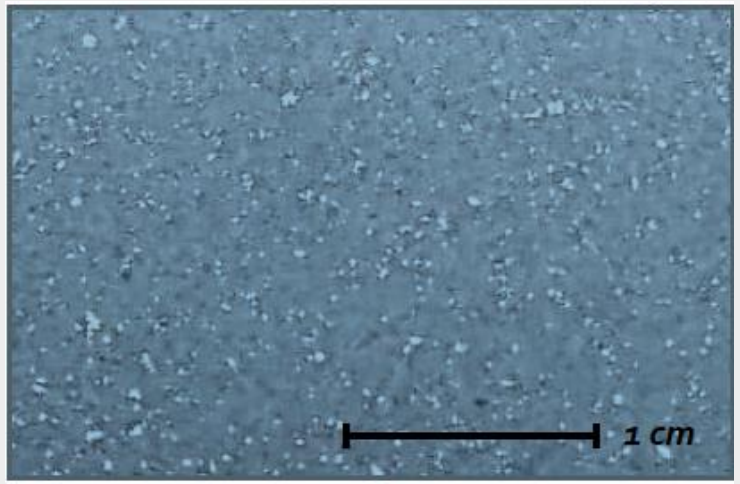






ROYAL VAASSEN

Recycling of metallized paper – tested by “Kennis centrum Papier en Karton - KCPK” (KCPK repulpability method)



Clay coated metalized paper was tested (Tobacco Innerliner Royal Vaassen)

Quality of newly produced paper:

- Fibres were homogeneously distributed throughout the sheet
- The sheet contains shiny particles, originating from the aluminum. Not necessary to remove them in case of production of colored paper, which is the most likely scenario.

ROYAL VAASSEN

Summary

- *With metallization*: a recyclable high barrier paper can be achieved (Moisture and oxygen).
- *Without metallization:* a medium barrier paper can be achieved (Moisture and oxygen)

- Right application of the coatings is key.
- Method of measuring can influence results.

ROYAL VAASSEN

Industrieplein 1
8171 BT Vaassen, The Netherlands
royalvaassen.com