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PAPERBOARD / TECHNICAL INFO

WATER-BASED BARRIER COATING (WBBC)

Paperboard does not have a natural barrier against grease, oil, water vapour or water but these barrier properties are sometimes needed to be put in place. For paperboard, the most common barrier is polyethylene (PE), applied with an extrusion process. A water-based barrier coating (WBBC) is a more sustainable way to create a plastic-free barrier on to the paperboard.

WBBC is an aqueous dispersion coating which is applied to the surface of the board to form a solid barrier film. These coatings can be applied to the board on-line or off-line.

Picture 1. Food is a significant application area for WBBC paperboard

WATER-BASED BARRIER COATING COMPOSITION

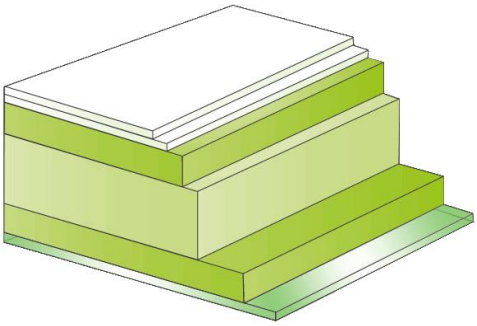
The components of the water-based barrier coating dispersion are water, fillers, binders and additives. The solid content of the coating dispersions varies between 25 to 70%.

The filler is a pigment, or a mixture of pigments, like ground or precipitated calcium carbonate (GCC/PCC), kaolin (clay) or talc. The pigment improves runnability during barrier application and boosts barrier performance, improving product economy.

The binder is typically a water dispersed latex, either synthetic or bio-based. The latex's chemical composition has an essential role in creating barrier properties. The binders used for WBBC are not considered as plastics.

Additives are used in small amounts to ensure compatibility with other dispersion components and to help with the rheological properties of the dispersion coating.

The chemistry of binders and pigments, and their ratio in the water-based barrier coating mix, play an important role for barrier performance. Also, optimised barrier application and drying are essential to ensure a high quality barrier.



Picture 2.
Structure of MetsäBoard Prime FBB EB with a WBBC layer on the reverse side

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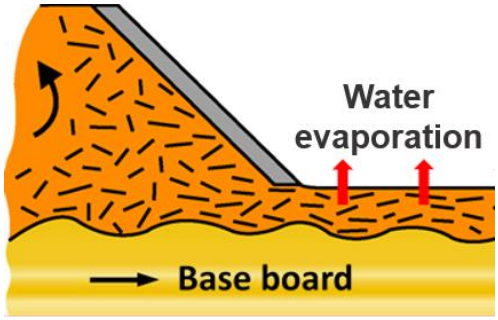


Picture 3. WBBC applied on a board machine's blade coating unit

APPLICATION TECHNOLOGIES

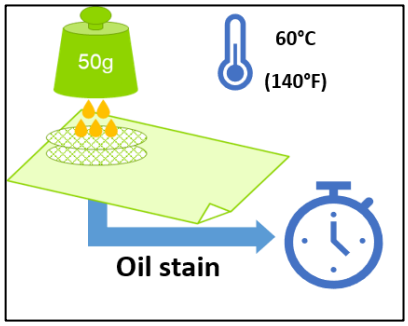
The application of water-based barrier coating can be done with surface sizing, blade or curtain coating units on a board machine (on-line) or an equivalent technology on an off-line coating machine. For advanced performance, it is possible to use many coating units to apply multiple barrier layers, each with dedicated barrier properties.

The application technology and metering parameters affect the water-based barrier coating performance. The final performance is linked to the barrier layer thickness and drying of the barrier. Application by blade coating makes a smooth and consistent coating layer, while curtain coating application results in even and consistent coating thickness.

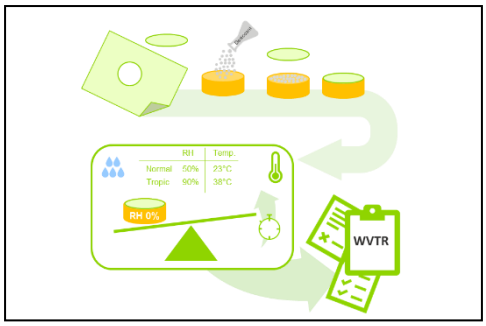
TESTING OF WATER-BASED BARRIER COATING

Oil and grease resistance (OGR) of WBBC board is measured according to the ASTM F119 standard using olive oil at an elevated temperature. The result is measured by the time (minutes, hours or days) after which the olive oil has penetrated through WBBC paperboard. The test includes measurements on flat, flat creased, and both 90º and 180º folded surfaces.

WBBC does not include fluorochemical compounds and the KIT method should not be used to measure grease resistance. The aggressive solvents (n-heptane and toluene) used in KIT testing will dissolve the layer of water-based barrier coating, thus, results are unreliable.



Picture 4.
Oil and grease resistance measurement



Picture 5.
Water vapour transmission rate measurement

Moisture resistance is measured with water vapour transmission rate (WVTR) according to ISO 2528 and ASTM E96 in standard conditions (23ºC and 50% RH). The result is shown by how much water vapour goes through the board in g/m2 per 24 hours.

Water resistance is assessed by a 3 minute Cobb test (ISO 535). This measures how much water (g/m2) barrier coated paperboard absorbs in 3 minutes.

WATER-BASED BARRIER COATING PERFORMANCE

The packaging must protect the packed product, from both outer and inner influences. WBBC will increase the required protection against grease, water vapour and water. It can also improve gas and aroma barrier properties.

The barrier board has to withstand converting without losing its barrier properties. A good barrier layer should be ductile during cutting and creasing, and also glueable or heat sealable when folded and closed to form a carton.

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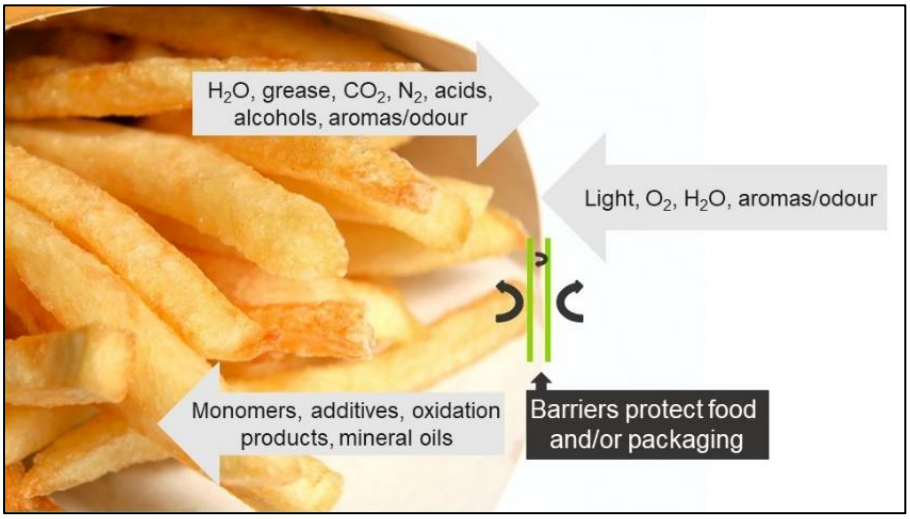

Picture 6. The protection of the barrier between packaging and outer surroundings

RECYCLABILITY

WBBC does not include plastics so it is considered as mono material and for recycling there is therefore no need to separate the barrier layer from the fibres. WBBC can be efficiently re-pulped in the paperboard manufacturing process or incinerated to produce energy.

For more information about Metsä Board's WBBC paperboards please contact Antti Aronen: antti.aronen@metsagroup.com

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