

Carboset® GA Engineered Polymers

For Paper Coatings Applications

Carboset® GA Engineered Polymers are specially designed for the manufacture of paper and board applications for the food service market. Following the Single Use Plastic Directive, plastic lined papers and board need to be modified in order to comply with the Directive. They are part of a comprehensive line of products developed by Lubrizol for the packaging industry that includes different products designed to meet different needs of the industry.



Description

Following the Single use Plastic Directive several paper-based products which are based on lined PE or Lined PLA need to be replaced by dispersion coated papers and boards in order not to be classified as plastic based materials. Lubrizol has developed several products for some of the SUP applications to replace plastic lined paper and board to comply with the SUP Directive requirements.

Several products from our current product portfolio have been selected in order to evaluate its suitability in each one of the applications the customer requires, mainly:



- Ready meals cartons and wrappers
- Ice cream cups
- Carton trays for frozen food
- Paper Cups (cold and hot)

Critical properties have been tested for three products in each one of the applications. The substrate used was 215 g/m² paperboard from Metsa. Testing regime and target values are shown in the table below.

	Ready Meals	Ice Cream Cups	Carton Trays	Paper Cups
Cobb 300 (ISO 535:2014, TAPPI T441) (g/m ²)	20 – 30	0 - 5	0 - 15	0 - 3
Cobb 1800 (ISO 535:2014, TAPPI T441) (g/m ²)	30 – 40	0 - 10	25 - 35	0 - 10
Grease Resistance (ISO 16532)	10 - 12	12	6 - 8	5
Vegetable Grease Resistance	4 – 5	4 - 5	3 - 4	3 - 4
Animal Grease Resistance	4 - 5	4 - 5	3 - 4	3 - 4
Heat Sealability	NO	YES	NO	YES

Vegetable and animal grease resistance was tested using a Lubrizol internal test method as follows:

Grease Resistance test



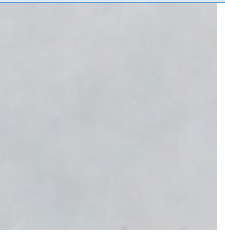
- 1) Olive oil for 14 hours with a weight of one kilogram at room temperature
- 2) Butter resistance for 14 hours with a weight of one kilogram at room temperature.

Three products were selected for evaluation. They were applied on the selected paperboard at 5 gsm dry coating weight. Products are:

Basic properties of the three products were tested against the testing regime specified by customers and market. Also included in the testing the folded oil resistance of the coated paper. The testing has been done at two different coating weights and the results are summarized in the table below:

	Carboset GA 7424		Carboset GA 7513		Carboset GR9024	
	5 gsm	10 gsm	5 gsm	10 gsm	5 gsm	10 gsm
Cobb 300 (ISO535:2014, TAPPI T441)	1.35	1.6	0.74	0.83	2.30	1.6
Cobb 1800 (ISO535:2014, TAPPI T441)	7.01	7.2	3.07	4.32	12.5	7.2
Grease Resistance (ISO 16532)	12		12		12	
Vegetable Grease Resistance	5		3		5	
Animal Grease Resistance	5		3		5	
Heat Sealability	YES		YES		NO	

Grease resistance (both vegetal and animal) were tested on a food grade grease resistant paper from Aralar (70 grs Aracrack)

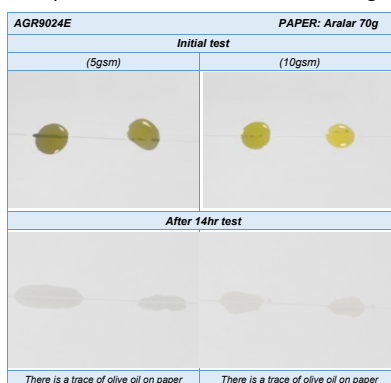
LUBRIZOL GR9024		PAPER: PET FOOD 70g	
<i>Olive Oil</i>	<i>Butter</i>	<i>Coconut Oil</i>	
			
<i>It leaves no trace of oil on the paper</i>	<i>It leaves no trace of butter on the paper</i>	<i>It leaves no trace of coconut oil on the paper</i>	

Also tested oil resistance on the folded paper.

The above products have been tested on then different applications including double coating of the combination of two of the products and were successfully applied on several base papers used in single use product for the food catering market. Extensive testing on ice cream and yogurt are being conducted to check long time resistance.

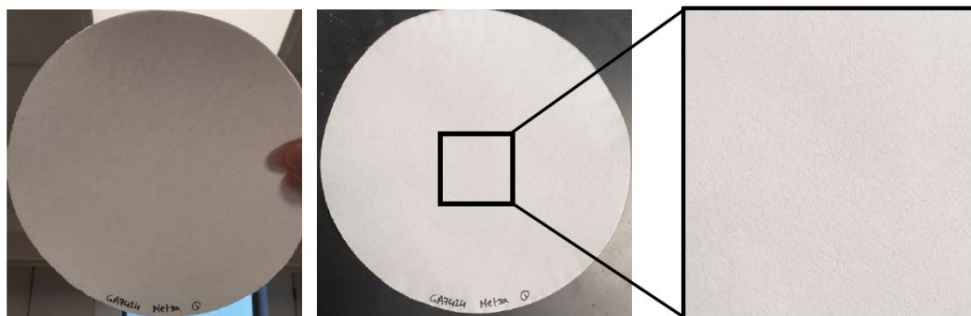
REPULPABILITY

Repulpability testing was conducted on Carboset® GA7424 and AGR9024 using different paper stocks and following the testing regime TAPPI Method T205 (British disintegrator). Paper stock selected were 205 grs board from Metsa, Lecta, International Paper stock and CHAM 65 grs paper

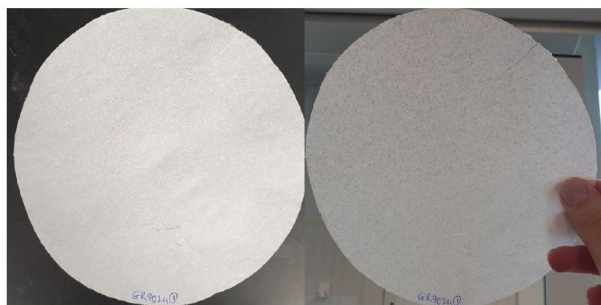


Stock was disintegrated and sheets formed in accordance to the TAPPI T205 procedure. In this process, 24g of dry sample was torn into approx. 30 mm squares and soaked in 2000 mL deionised water for at least four hours at room temperature. This was then disintegrated using a TLS blender at 3000 rpm with either 30,000 or 50,000 revolutions as stated in the results table. The pulp was diluted to a total of 8000 mL by the addition of tap water, and 400 mL stock was used to form each sheet in a FORMAX Standard Sheet Mold with Actuated Valve. After removal of the sheet from the wire using two blotting papers and a standard couch roll, the sheets were dried on a hotplate at 90 °C for 3 minutes per side. They were then stored in a humidity cabinet at 23 °C and 50 % RH prior to weighing and testing.

Dry tensile strength was measured from 1.5 cm width sheets cut across the centre of the circular handsheets, using an Instron® 3366 tensile tester with a 25 mm/min extension. Flat jaws were used to clamp the sample at a testing distance of 100 mm.



Carboset GA7424 respulpability testing



Carboset AGR9024 respulpability testing

Substrate Type & Coating → Physical Properties ↓	Uncoated 180L Paper	Rotary Coater 180L Paper with RDBCN099407N
Revolutions in Disintegration Step	50 000	50 000
Average Sheet Mass (gsm)	60.9 ± 3	59.3 ± 3
Dry Tensile Strength (N/15mm)	29.9 ± 0.9	30.1 ± 0.5
Dry Burst Strength (kPa)	150.3 ± 7.4	165.5 ± 5.9
Dry Stiffness (Taber units)	1.5 ± 0.1	1.39 ± 0.21
Air Permeability (mm/s)	5.0 ± 0.7	5.5 ± 0.5

Taber stiffness was tested in range 2 with a sample size of 3.75 x 3.75cm. Mullen burst measurements were performed on a Regmed BT-21 with a flow rate of 95 mL/min, a clamping pressure of 430 kPa and a rupture condition of 90%. A TEXTEST instrument, Lab Air FX3300 IV, was used to measure the air permeability in mm/s at a test pressure of 100 Pa. A test head area of 20 cm² was used, following the standard EN ISO 9237.