

Doresco® VMS Engineered Polymers

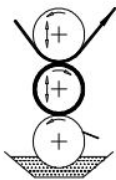
For High Vacuum Metallization on Paper Applications

Doresco® VMS Engineered Polymers enhance the performance of paper coatings used in the labels business for returnable bottles mainly for the beer industry. They are part of a comprehensive line of products developed by Lubrizol for the Metalized Paper Label industry.

- Process Controlled glass transition temperatures (Tg) impart thermal stability and maintain adhesion over time.
- High Metal adhesion
- High gloss
- High Solids
- High Ink Retention levels
- Low wash off and penetration times
- Good offset and solvent based gravure ink overprintability.

Description

Metalized paper production is a three stage process involving coating and high vacuum metalization. Coating operations are mostly done by typical gravure cylinder coatings although some of the converters/producers sometimes use double roll systems and even offset gravure.



GRAVURE OFFSET

Normal speeds vary depending customers but the assumption can be made that in Western Europe and US the typical coating speed may vary between 600 mts/min and 1000 mts/min. Typical coating weights on the prelacquer vary depending the final end use of the metalized products, it is estimated that typically for a wet glue label application prelacquer coating weights vary between 0.8 and 1.2 gsm, meanwhile for tobacco innerliners these coating weights could be reduced. Technologies used can also vary depending on the end use of the metalized product. Generally speaking these can be grouped as follows:

- Wet Glue Label Market for Returnable bottles: Mostly solvent based coatings specifically designed and customised. Most of those coatings are compounded acrylic in nature.
- Wet Glue Label Market for non-Returnable Bottles: There is diversity and many options in this applications as some converters moved to water based coatings and others kept in the traditional solvent based coatings. Water based coatings are formulated acrylic compounds.
- Self-Adhesive Labels: Again both water based and solvent based coatings coexist in the applications and the choice is always on the converter's choice.
- Tobacco Innerliners: Water based acrylic compounds are predominant in this market space. There are tight regulations in terms of product compliance and residual levels that need to be met by suppliers, also approvals for the biggest tobacco manufacturers like BAT and PM.

Vacuum coating of aluminium occurs after prelacquering the base paper during what we call Metalization Process.

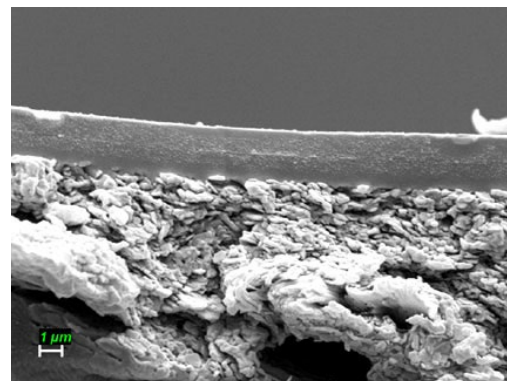
Background

Coating Technologies for HVM

The nature of the technology used depends most of the times in two critical factors, performance and logistics. In those applications where performance targets must be met (especially in Wet Glue labels for Returnable Beer Bottles) converters could decide which is the priority in order to reduce their raw materials inventory and meet the performance targets that are required.

There is no difference in technology between the pre and postlacquers used in the production of metalized papers, but the function of each one of the layers is different. Prelacquers are used for two basic properties:

- Reduce or minimize substrate porosity in order to achieve the highest possible gloss. This can be achieved by either fast drying (in solvent based systems and hence the use of ethyl acetate in those systems) or multiple layers in case of water based systems to prevent water dive in the substrate.
- Aluminium adhesion. This is normally achieved by compounding the resins used with adhesion promoters.



The postlacquer has two basic functions in the metalized paper structure:

- Maximise the gloss of the already metalized paper
- Protect the aluminium from oxidation
- Provide the desired COF performance

Other specific properties are specified for each one of the different applications where metalized papers are used. Typical performance targets are related to the end use checklist in place

Wet Glue Labels for Returnable Beer Bottles.

End Use Properties	CODE	performance
Gloss	GE	Gloss of either the Premet and Post met lacquers
Adhesion	AH	Adhesion of Al on the premet lacquer and the post lacquer to Al
Scratch	SC	On the post lacquer
Slip	DV	Of the post lacquer. 0.22 – 0.26
Print Residual Odour	PO	Of the metalized paper

Solvent retention	GC	Of the metalized paper. PH levels
Blocking	BB	15 T, 24 hrs, RT of the metalized paper
Ink Adhesion (Gravure)	AI	On the metalized paper
Ink Adhesion (Offset)	AO	On the metalized paper
Ink Retention	IR	According to German DIN 16524-7
Quick Release	QR	According to German DIN 16524-6
Drying Speed	DV	Of the overprinted offset ink
Hardness Persoz	HP	Of the printed metalized paper and the resins

Current Lubrizol products portfolio comprises both solvent based and water based technology. For Wet Glue labels for returnable bottles the available technology is all solvent based. The table below shows the current product portfolio along with their main physical properties.

	Visc	%	AN	Tg	Persoz (10 d)	Mw	Pdi	RF CF4 15"	Surface Tension
Doresco VMS 7321 7521	200-1500	47,5%	35	76	166	86000	4,3	57%	34
Doresco VMS 7230	120	42,0%	37	52	306	78000	2,8	52%	36
Doresco VMS 7336 7536	360	47,0%	58	85	357	55000	3,7	57%	46
Doresco VMS 7339	1000	47%	50	77	350	57000	2,5	57%	46

Technical Performance

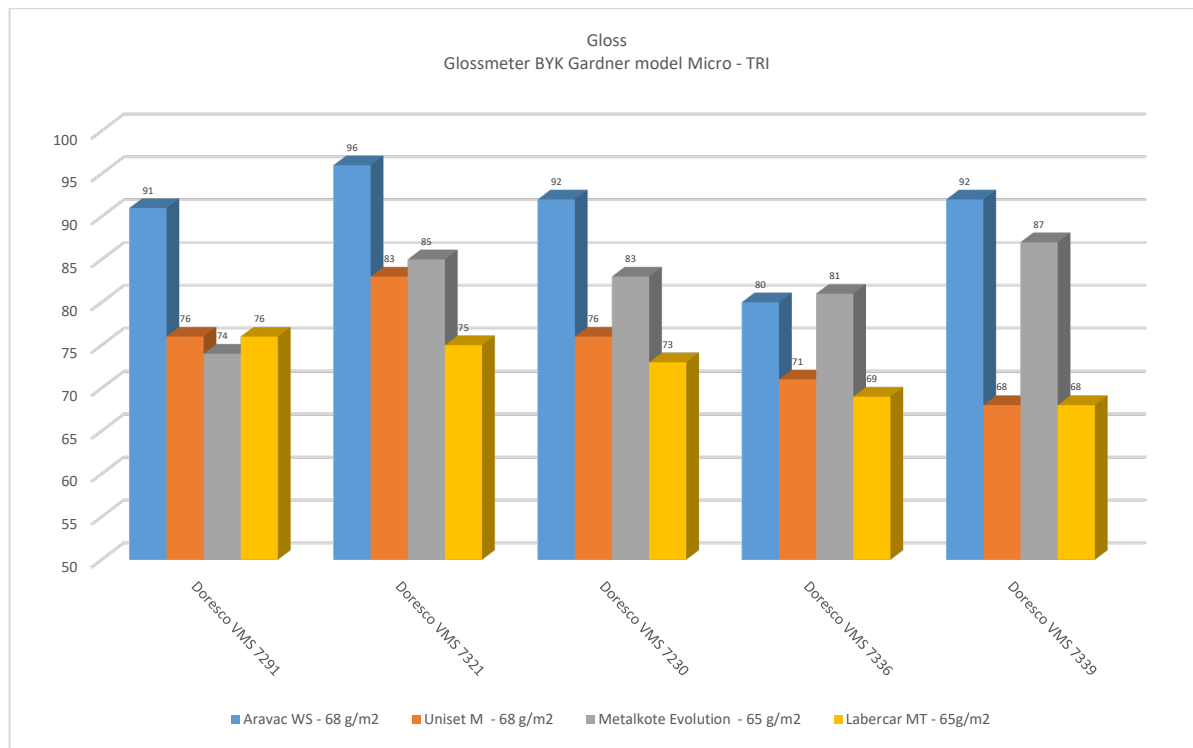
These products have been thoroughly tested in our labs for the key properties that are demanded by the main customers and the results are shown in the table below:

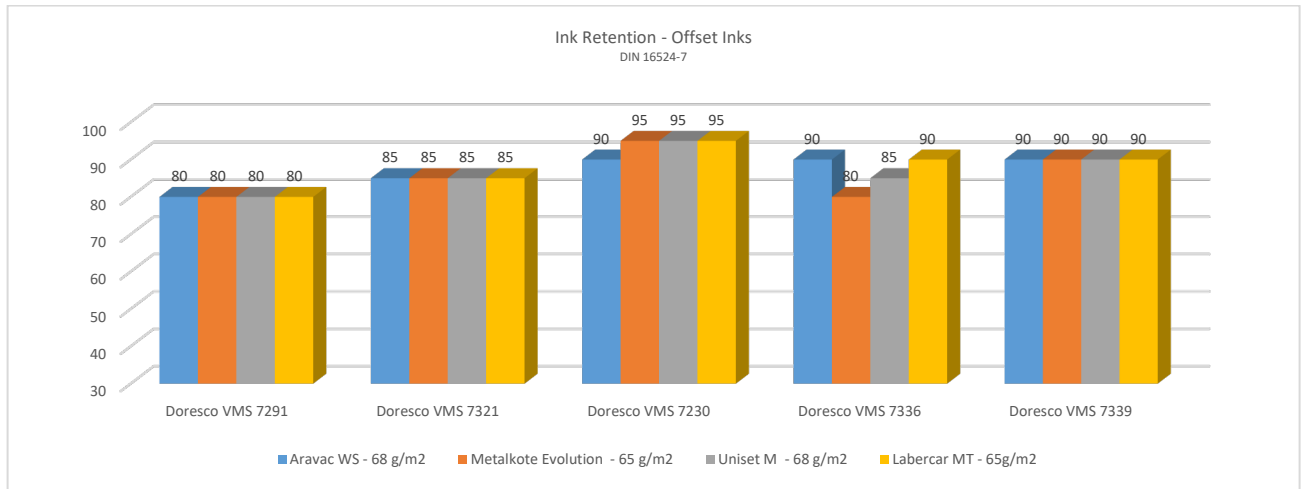
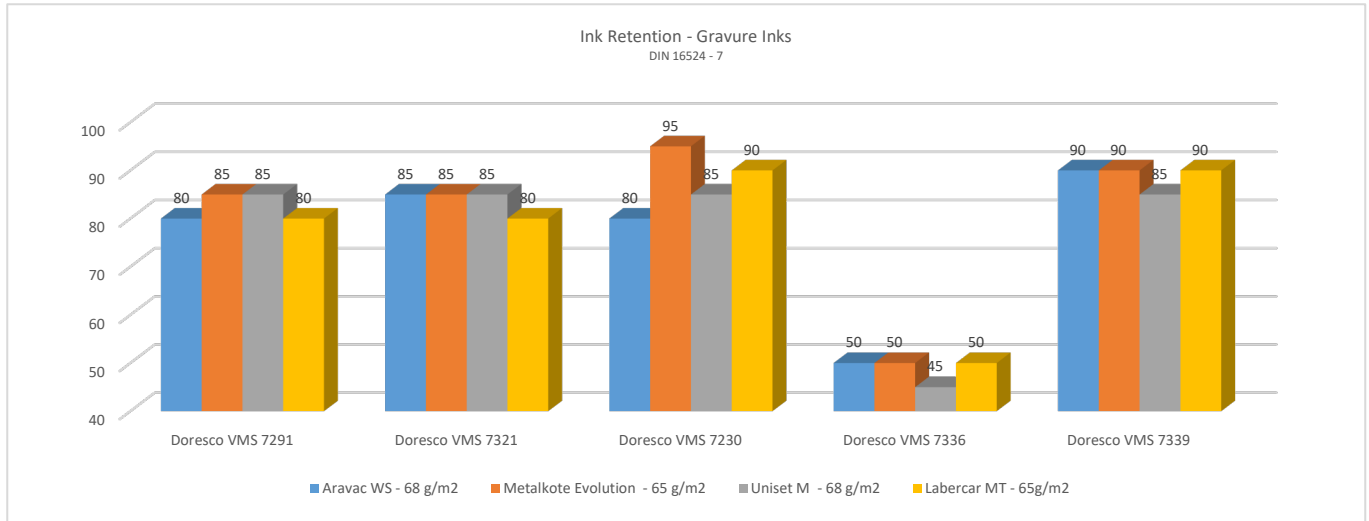
	IR Gravure/Offset	QR Met Paper	Gloss			Adhesion	Blocking	Gravure Ink Adhesion	Offset Ink Adhesion
			20°	60°	85°				
Doresco VMS 7321 7521	85/85	75	130	308	83	OK	OK-	OK	OK
Doresco VMS 7230	95/95	350	90	264	76	OK	OK	OK	OK
Doresco VMS 7336 7536	50/80	50	130	279	71	OK	OK	OK	OK
Doresco VMS 7339	90/90	110	103	206	68	OK	OK	OK	OK

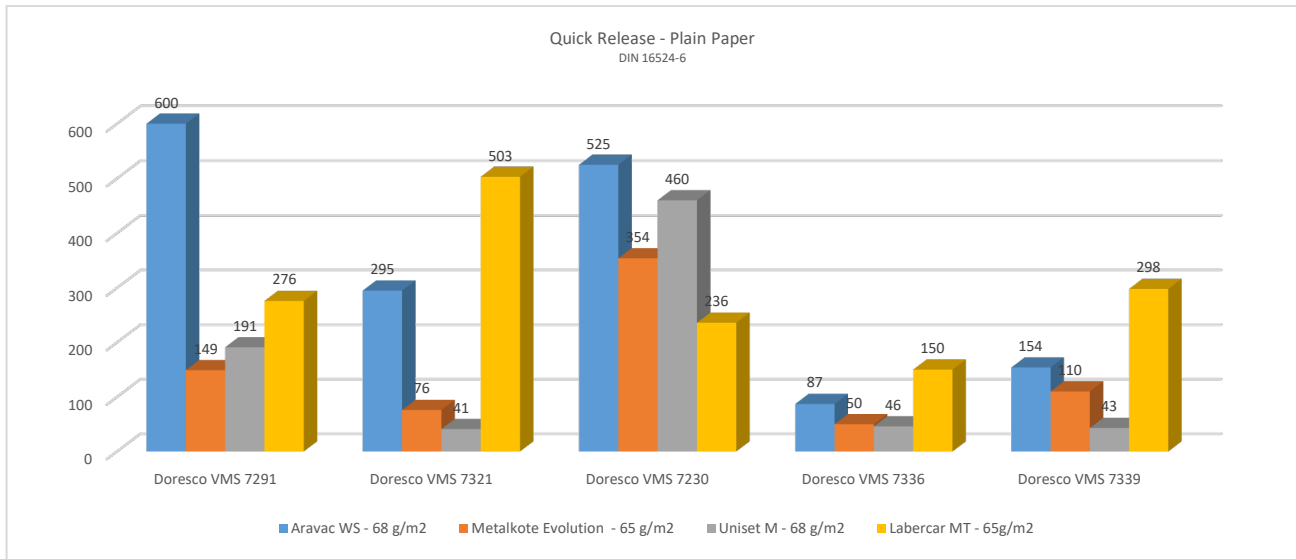
Testing above has been done using Metalkote Evolution base Paper from Munksjö LabelPack. Inks used for the Ink Retention testing are solvent based gravure inks from Siegwirk NC 386 Cyan base FE and Offset Cyan Suntec Foils – FOP25 from Sun Chemical. There is a huge variety of inks supplied in this market, both solvent based and offset and also a number of different base papers that can be used, so the results above refers only to the testing under these conditions and results can vary depending on the supply and nature of the inks and the base papers used in the evaluation.

Lubrizol has conducted extensive testing using different base papers from different suppliers and normally tailors products to the base paper customers normally would use to allow our customers to get out the best of their current supplier. The results below show the comparison with the main supplier currently of wet strength paper for the wet glue label beer market.

The testing below shows the results using four types of base paper coming from four different suppliers, Aralar (Aravac WS), Munksjö LabelPack (Metalkote Evolution), Cham Paper Group (Labelcar MT) and Stora Enso (Uniset M) The inks used in this testing are the same as the ones mentioned above, namely, Siegwerk NC 386 Cyan base FE and Offset Cyan Suntec Foils – FOP25 from Sun Chemical. Testing has been conducted applying the lacquer at coating viscosity reduced with Ethyl Acetate at a solid content of 20% using standard K-Bars of 12 microns wet (for the pre-lacquer) and 6 micron wet (for the post-lacquer) Properties were tested using internal LZ Test Methods.







As it is shown from the test results there is a wide variety of variables that prevents the use of one particular lacquer for all the working conditions in the market and Lubrizol strongly recommends to conduct screening tests and use these data in order to select the right lacquers depending on application conditions and consumables use as the results may differ significantly depending on the base paper and inks used to conduct the testing. Lubrizol facilitates this testing and offers its state of art equipment in its Centre of Excellence to conduct that testing. Facilities include gravure coating equipment and also the latest lab metalizer from Oerlikon – Leybold Univex 250.