



Validation Report: VERDAFRESH



Subject: Pack Ready validation test report for VERDAFRESH (film supplier) / KARLVILLE trial

Date: FEB 26,
2023

(Supplier & Product) VERDAFRESH VF-MDO90-CN COATED WITH BTX-508 WATER BASED COATING
SUBMITTED FOR EVALUATION

Requirements:

1. Roll Details:

In Table 1 list number of rolls, size of rolls and details of all thermal lamination films including product codes, corona treatment, additives (if applicable) etc...

2. SAMPLES to be sent to Israel:

- a. 70m (230ft.) of laminated material (see test protocol supplied by HP-Indigo R&D)
- b. Pouching: Karlville to send pouches of the laminated film – **N/A**

Procedure:

Roll Details and condition: Each of the produced rolls underwent an incoming inspection and tested for:

- ▶ Visual inspection: Record general condition and/or any defects (coating quality, visual defects) & Curling
- ▶ Constructions: Each construction shall be listed along with all pertinent details captured in Table 2

Production /summary: Run lamination test based on test protocol supplied by HP R&D. fill Table 3 for process parameters.

- ▶ LBS testing: Each construction will be subject to Lamination Bond Strength (LBS) measurements as indicated in the test protocol. LBS measurements will be performed as follows:
 - Immediately after the lamination (to be performed by Karlville)
 - 24 hours after the lamination (to be performed by Karlville)
 - 2-4 weeks after the lamination (to be performed in parallel by Karlville & HP-Indigo R&D @ Israel)



Table 1 – Roll details:

Product code	Material	Resin EMA or EVA	Thickness [μm]	Roll width [mm]	Corona treatment [Y/N]	Additives
PR-2007NT-1	PE	EVA	89 μm	750	NO	N/A

Table 2 - Production summary & experimental details:

EXP. #	Printed substrate	Surface / reverse print	TAP substrate	TAP on top or 2'nd	Total Thickness [μm]
RS-223-1	VF-MDO90-CN MDO PE 24 μm	REVERSE	PR-2007NT-1 CHARTER 89 μm PE-EVA	SECOND	113 μm

Table 3 - Process parameters:

EXP. #	Nip temperatur e[°C]	Laminati onspeed [m/min]	Corona on TAP [W]	Corona on print [W]	Wrappin gangle [deg.]	Tension print [kg]	Tension tap [kg]	Tensio n RW [kg]	Tension infeed [kg]	Pressure [Bar] L/R	Pre- Heat [°C]
RS223-1	105	50-60	3.0	3.0	50	6.0	3.0	14	6.0	0.5/0.5	50

1. Pre-lamination – film inspection remarks:

- ▶ Curling score (in cm TD and MD): NO CURL
- ▶ Thermal active layer coating quality: GOOD
- ▶ Visual defects: N/A
- ▶ Comments: N/A



2. Post lamination results:

Exp. # 25	Composition		AVG. LBS [N/in] (Failure mode*)						Visual appearance		
			Left side of hot drum			Right side of hot drum			Curling	Wrinkles	Pinching
			OS			GS					
Patch	Patch	Patch	Patch	Patch	Patch						
RS223-1	MDO PE COATED/ INK/PE EVA	T=0	3.8				4.0		N/A	N/A	N/A
RS223-1	MDO PE COATED/ INK/PE EVA	T=2 4	3.9				4.0		N/A	N/A	N/A

* The abbreviations of the failure modes stand for the following:

NT – No transfer of ink from the printed substrate to laminated substrate

TT – Total transfer of ink from the printed substrate to laminated substrate

PT – Partial Transfer of ink from the printed substrate (write the percentage of ink remaining on the printed substrate)

PTT – Partial TAP transfer from the Pack Ready film

TTT – Total TAP Transfer from the Pack Ready film to the printed substrate

SBS Test – will be done on strips: 19, 20, 21, 22, 23, 24 – please add Photo of sealing area, for visual appearance:

SBS TESTES CRITERIA

SEAL LAYER	Pass [N/Inch]	Fail [N/Inch]
BOPP	SBS > 4 or <6	SBS <4 or SBS >6

3. Sealing bond strength results:

Exp. #	Composition	Sealable ply	Dwell time [sec]	SBS [N/in]				
				160C	180C	190C	200C	210C
RS223-1	MDO PE COATED/INK/PE EVA	PE	1.0	44N/inch				



4. Sealed are appearance:

Exp. #	Composition	Sealable ply	Dwell time [sec]	SBS [N/in]				
				160C	170C	180C	190C	200C
RS223-1	MDO PE COATED/INK/PE EVA	PE	1.0	X	X	X		

Color code reflects property rating: ■ Red = Bad ■ Yellow=Moderate ■ Green = Good

COF Test will be done for each laminated sample, and comparison to the non-laminated thermal film

- In HFFS (horizontal form fills and seal) systems, too much friction of the sealant side of the film can lead to film dragging or jamming as it passes over metal plates.
- In VFFS (vertical form fills and seal) systems, too much friction of the sealant side of the film can cause poor film feeding over metal forming collars, inconsistent package sizes, and squealing.

COF TESTS CRITERIA

FFS	Pass	Fail
VFFS - In to in (Seal)	0.20 – 0.30	COF <0.20 or >0.31
VFFS - Out to Out (Print)	0.25 – 0.35	COF <0.24 or >0.36
HFFS - In to in (Seal)	0.20 – 0.45	COF <0.20 or >0.46
HFFS - Out to Out (Print)	0.25 – 0.45	COF <0.24 or >0.46



EXP #: RS223-1		IN / IN (SEAL) KINETIC COF	OUT / OUT (PRINT) KINETIC COF
LAMINATED CONSTRUCTION	# 1	N/A	N/A
	#2		
	#3		
	#4		
	AVG		
	STD		
TEST ON NON-LAMINATED FILM WILL BE DONE ON EMPTY SIDE			
NON-LAMINATED THERMAL FILM	#1	N/A	N/A
	#2		
	#3		
	#4		
	AVG		
	STD		



Summary:

Results show that the adhesion performance between the water-based coated and digitally reverse printed VERDAFRESH MDO PE and the Charter Next PE/EVA PR-2007NT1 Thermal Film meets the acceptance criteria as per the HP Validation Protocol.

See Table #3 for best working conditions / process parameters.

- Lower temperatures resulted in low LBS.
- Temperatures of 120C or higher resulted in total ink transfer.
- Material was tested using higher pressure such as 1 bar, 2 bar, 3 bar although it resulted in total ink transfer which is an automatic failure.
- The material could perform the same at higher speeds using higher temperatures and pressure.
- The VERDAFRESH MDO-PE coated with a water-based coating mix has been laminated and converted into pouches at the HP Atlanta demo center.
- Lower speeds, higher temperatures and tensions resulted in curling in TD, MD, shrinking or stretching the image size. (50-60 M/min. – recommended or up to 100M/min using higher temperatures and pressure).
- Based on the SBS test results and clear appearance the suggested sealing temperature should be 160C – 170C and 1.0 sec dwell time divided by the number of cross sealing stations based on pouch machine speed.
- The lamination of Charter PE to the reverse printed water based coated VERDAFRESH MDO PE resulted in good LBS and SBS, great appearance and no finished curl.
- Fast thermal lamination set up, fast speeds, no curl, fast set up on the pouch machine. Very stable at pouching speeds of 105-125cpm.

Conclusion:

Based on the LBS test results of the VERDAFRESH MDO (coated with the water-based BXT-508 coating mix has passed the validation process.



Pack Ready
Lamination

