



Validation Report: Charter Next Generation



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

Date: March 25, 2021

(Supplier & Product) CHARTER PR-2005NT PE AND GAP-1501 MDO PE - 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-2005NT	PE	EVA	87.5μm	755	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-018	22μm MDO-PE GAP-1501	REVERSE	87.5 μm PE	SECOND	109.5 μm

Table 3 - Process parameters:

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [W]	Corona on print [W]	Wrapping angle [deg.]	Tension print [kg]	Tension tap [kg]	Tension RW [kg]	Tension infeed [kg]	Pressure [Bar] L/R	Pre- Heat [°C]
RS-018	115	100	3.0	3.0	75	10	3.0	10	6	2.5/2.5	75

1. Pre-lamination – film inspection remarks:

- ▶ Curling score (in cm TD and MD): N/A
- ▶ Thermal active layer coating quality: Good
- ▶ Visual defects: N/A
- ▶ Comments: N/A



2. Post lamination results:

Exp. #	Composition	AVG. LBS [N/in] (Failure mode*)							Visual appearance		
			Left side of hot drum			Right side of hot drum					
			Patch 22	Patch 16	OS	Patch 11	Patch 22	Patch 16	GS	Patch 11	Curling
RS-018	MDO PE / INK / PE EVA	t=0	4.3	5.0	4.8	4.6	4.6	4.3	N/A	N/A	N/A
		t=24	4.0	5.1	5.1	4.6	4.9	5.1			

* 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]				
				170C	180C	190C	200C	210C
RS-018	MDO PE / INK / PE	PE EVA	0.5	DL	DL	DL	DL	DL
			1.0	N/A	28.7	33.3	TEAR	N/A



4. Sealed are appearance:

Exp. #	Composition	Sealable ply	Dwell time [sec]	SBS [N/in]				
				170C	180C	190C	200C	210C
RS-018	MDO PE / INK / PE	PE EVA	0.5	Green	Green	Green	Green	Green
			1.0	Green	Green	Green	Yellow	Red

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 #: RS-018		IN / IN (SEAL) KINETIC COF	OUT / OUT (PRINT) KINETIC COF
LAMINATED CONSTRUCTION	# 1		
	#2		
	#3		
	#4		
	AVG		
	STD		
TEST ON NON-LAMINATED FILM WILL BE DONE ON EMPTY SIDE			
NON-LAMINATED THERMAL FILM	#1		
	#2		
	#3		
	#4		
	AVG		
	STD		











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Summary:

Results show that the adhesion performance between the digitally reverse printed Charter MDO PE and the Charter PE EVA Thermal Film has passed the acceptance criteria as per the HP Validation Protocol - *See Table #3 for best working conditions / process parameters.*

Same as the last trial validation nothing has changed other than the roll unwinding smooth from beginning to end as seen in the pictures above. 3Kg of unwind tension was used from the beginning of the roll all the way to the core which is very low for a 750mm wide roll but very important when laminating PE/PE.

- Lower tensions resulted in wrinkles.
- Lower nip pressure than 2.0 bar resulted in low LBS.
- Higher nip pressures than 2.5 bar resulted in TT (Total Ink Transfer) = Automatic failure
- Lower speeds, higher temperatures and tensions resulted in curling in TD, MD, shrinking or stretching the image size. (100M/min. – recommended or lower temperatures along with lower speeds).

Based on the SBS test results and clear appearance the suggested sealing temperature should be 180C and 1.0 sec dwell time divided by the number of cross sealing stations.

The lamination of Charter PE to the reverse printed Charter MDO PE resulted in good LBS and SBS, great appearance and no finished curl therefore it has passed the lamination validation process.

Conclusion: The Charter Next Generation PE/PE structure is one of the easiest structures I have worked with. Fast thermal lamination set up, fast speeds, no curl, no blocking, fast set up on the pouch machine. Stable at pouching speeds of 125-180PPM or 22.5M/min to 32.5 M/min.



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