



Validation Report: PROFOL



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

Date: August 7,
2020

(Supplier & Product) PROFOL CPP-ZO2866 - 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
ZO2866	CPP	EVA	54 μm	750	YES	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-014	28 μm BOPP	REVERSE	54 μm PROFOL CPP	SECOND	82 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-014	130	50	2.5	2.5	15	6	12	6.5	14	2.0/2.0	55

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. #	Composition	AVG. LBS [N/in] (Failure mode*)						Visual appearance			
		Left side of hot drum			Right side of hot drum						
			OS			GS		Curling	Wrinkles	Pinching	
		Patch 22	Patch 16	Patch 11	Patch 22	Patch 16	Patch 11				
RS-014	BOPP/ INK/ CPP	t=0	4.0	3.8	6.5	4.0	3.8	8.7	N/A	N/A	N/A
		t=24	4.6	4.5	6.1	4.5	4.4	6.6			

* 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-014	BOPP / INK / CPP	CPP 55 µm	0.5	33.2	33.4	N/A	N/A	N/A
			1	31.5	32.5	N/A	N/A	N/A



4. Sealed are appearance:

Exp. #	Composition	Sealable ply	Dwell time [sec]	SBS [N/in]				
				170C	180C	190C	200C	210C
RS-014	BOPP / INK / CPP	CPP	0.5					
			1					

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-014		IN / IN (SEAL)	OUT / OUT (PRINT)
		KINETIC COF	KINETIC COF
LAMINATED CONSTRUCTION	# 1	0.13	0.39
	#2	0.14	0.37
	#3	0.25	0.46
	#4	0.19	0.35
	AVG	0.18	0.39
	STD	0.06	0.05
TEST ON NON-LAMINATED FILM WILL BE DONE ON EMPTY SIDE			
NON-LAMINATED THERMAL FILM	#1	0.12	
	#2	0.11	
	#3	0.13	
	#4	0.13	
	AVG	0.12	
	STD	0.01	



Summary:

Results show that the adhesion performance between the digitally reverse printed BOPP and the Profol CPP Thermal Film meet the acceptance criteria as per the HP Validation Protocol - *See Table #3 for best working conditions / process parameters.*

- Lower tensions resulted in pinching and wrinkles.
- Lower nip pressure than 2.0 bar resulted in low LBS.
- Lower speeds and higher temperature resulted in curling in TD (50M/min. - recommended).
- Lower temperatures than 120C resulted in lack of adhesion.

Based on the SBS test results and appearance the suggested sealing temperature should be 160C - 170C and 0.5 second dwell time which will allow the pouch machine to run at faster speeds. Any temperature above 180C and 1.0 sec dwell time resulted in poor visual appearance, ink discoloration and bad wrinkles.

The lamination of Profol CPP to the reverse printed BOPP resulted in acceptable bond strength results, clear and glossy appearance and no finished curl therefore it has passed the lamination validation process.



Material TDS.pdf



LBS T=0 AND
T=24.pdf

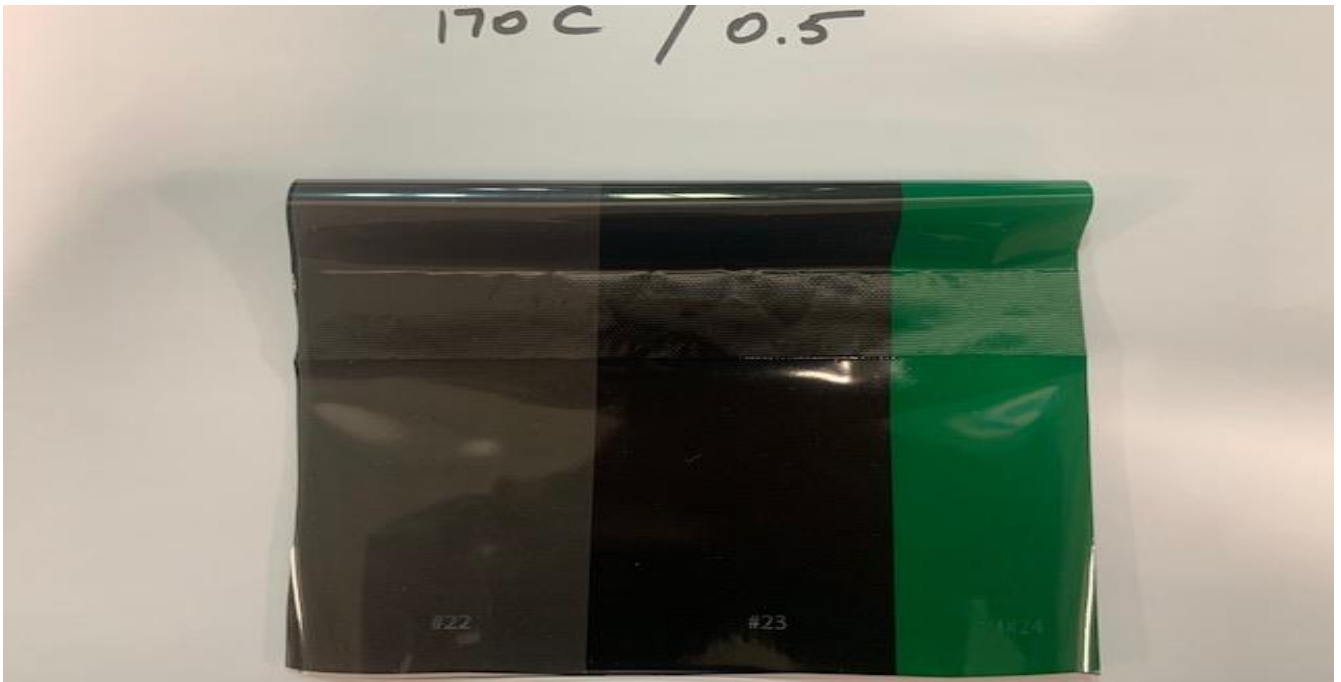


SBS.pdf



COF.pdf











Pack Ready
Lamination

