



Validation Report: Toray Soft Touch PET EVA



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

Date June 26,2020

(Supplier & Product) : TORAY SOFT TOUCH MATTE EVA - 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. 50m 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
CTHL018	SOFT TOUCH MATTE	EVA	30	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-013	12um PET/ 62.5 umPE	SURFACE	30um TORAY SOFT TOUCH MATTE PET EVA	TOP	104.5um

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-013	140	80	2.0	2.0	100	2.0	4.0	6.0	6.0	0.5 / 0.5	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:



LBS TESTS CRITERIA

Construction	Pass	Fail
PET//PE, PET//AI-PE, BOPP//PE BOPP//BOPP, BOPP//Met-BOPP	LBS > 3.5 N/inch + Tear and/or PT failure	LBS < 3.5 N/inch + NT, Zip or TT failure mode

2. Post lamination results:

Exp. #	Composition	AVG. LBS [N/in] (Failure mode*)						Visual ap	pearance (Y/N)			
			Left side of hot drum			Right side of hot drum			Curling	Wrinkles	Pinching	
			OS		GS							
			Patch 22	Patch 16	Patch 11	Patch 22	Patch 16	Patch 11				
RS-013	PE/PET/INK/TORAY SOFT TOUCH PET EVA	t=0	16.3	15.1	18.8	17.2	17.4	22.8	N	N	N	
		t=24	16.2	15.7	17.8	17.5	18.4	14.8				
		t=										
		t=0										
		t=24										
		t=										

* 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 TESTS CRITERIA

Seal layer	Pass [N/Inch]	Fail [N/Inch]
BOPP	SBS > 4 or <6	SBS < 4 or SBS > 6

3. Sealing bond strength results:

	Dwell time [sec]	SBS [N/in]				
		170C	180C	190C	200C	210C
RS-013 PE/PET/INK/TORAY SOFT TOUCH PET EVA PE / FLAT BAR	0.5	DL	DL	DL	DL	DL
	1	DL	31.1	48.1		
	0.5					
	1					
	0.5					
	1					

4. Sealed are appearance:

	Dwell time [sec]	SBS [N/in]				
		170C	180C	190C	200C	210C
RS-011 MET-BOPPHS/INK/BOPP PE	0.5	Green				
	1	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-011		IN / IN (SEAL) KINETIC	OUT / OUT (PRINT) KINETIC
LAMINATED CONSTRUCTION	#1	0.33	0.47
	#2	0.28	0.26
	#3	0.32	0.33
	#4	0.58	0.32
	AVG	0.38	0.35
	STD	0.14	0.09



EXP #: RS-011		IN / IN (SEAL) KINETIC	OUT / OUT (PRINT) KINETIC
TEST ON NON-LAMINATED FILM WILL BE DONE ON EMPTY SIDE			
NON-LAMINATED CONSTRUCTION	#1		0.34
	#2		0.48
	#3		0.44
	#4		0.27
	AVG		0.38
	STD		0.09



TORAY ROLL LABEL





TORAY MATERIAL TDS

Provisional Product Data Sheet

TORAY
Innovation by Chemistry

Lumirror. CTHL018

Applications

- Thermal Lamination



Sealant layer
Core layer
Soft Touch Matte layer

Lumirror CTHL018

PET FILM FOR THERMAL LAMINATION WITH SOFT TOUCH MATTE SIDE

Summary

CTHL018 is a transparent polyester film for seals to most rigid substrates used in today's thermal lamination market.

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MADE IN U.S.A.



Technical Data *

Lumirror CTHL018

Provisional Product Data Sheet

PROPERTIES	METHOD	UNITS	TYPICAL VALUES
Thickness		0.00001"	118
Nominal Yield		in ² /lb	20,900
Tensile Strength at Break	MD	ASTM D882	lb/in ²
	TD		
Young's Modulus	MD	ASTM D882	lb/in ²
	TD		
Elongation at Break	MD	ASTM D882	%
	TD		

Key Features

- Excellent bond strength to most substrates
- Soft touch matte has excellent scuff and rub resistance
- Low gloss on matte side

Winding Direction



* These values do not constitute specific binding specifications

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Lumirror® is a registered trademark of Toray Industries, Inc. for its range of Polyester Films based on Polyethylene Terephthalate (PET).

Lumirror CTHL018

DS-Provisional



3mm CURL IN MD



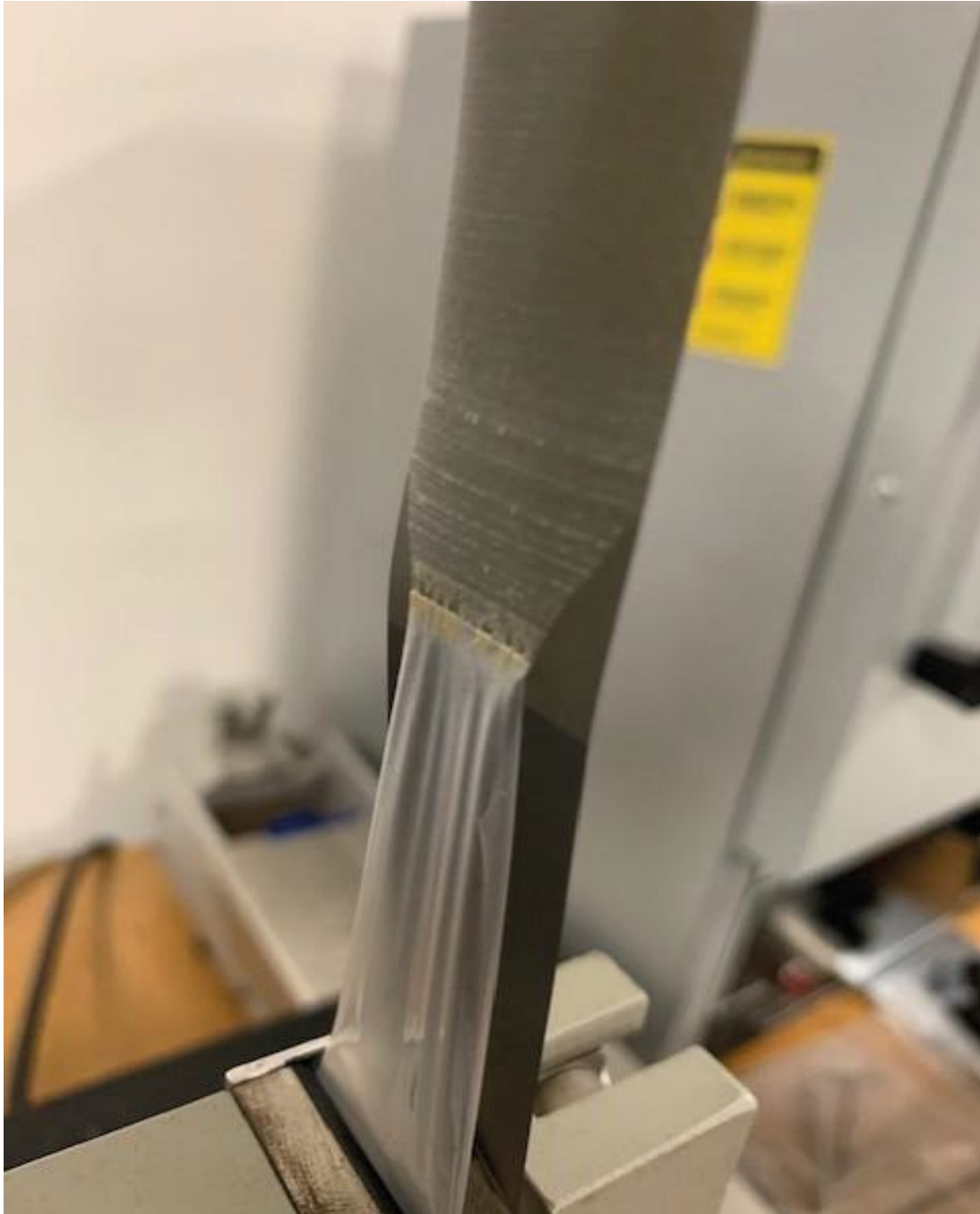


SEAL APPEARANCE @ 185C AND 1.0 SEC DWELL TIME



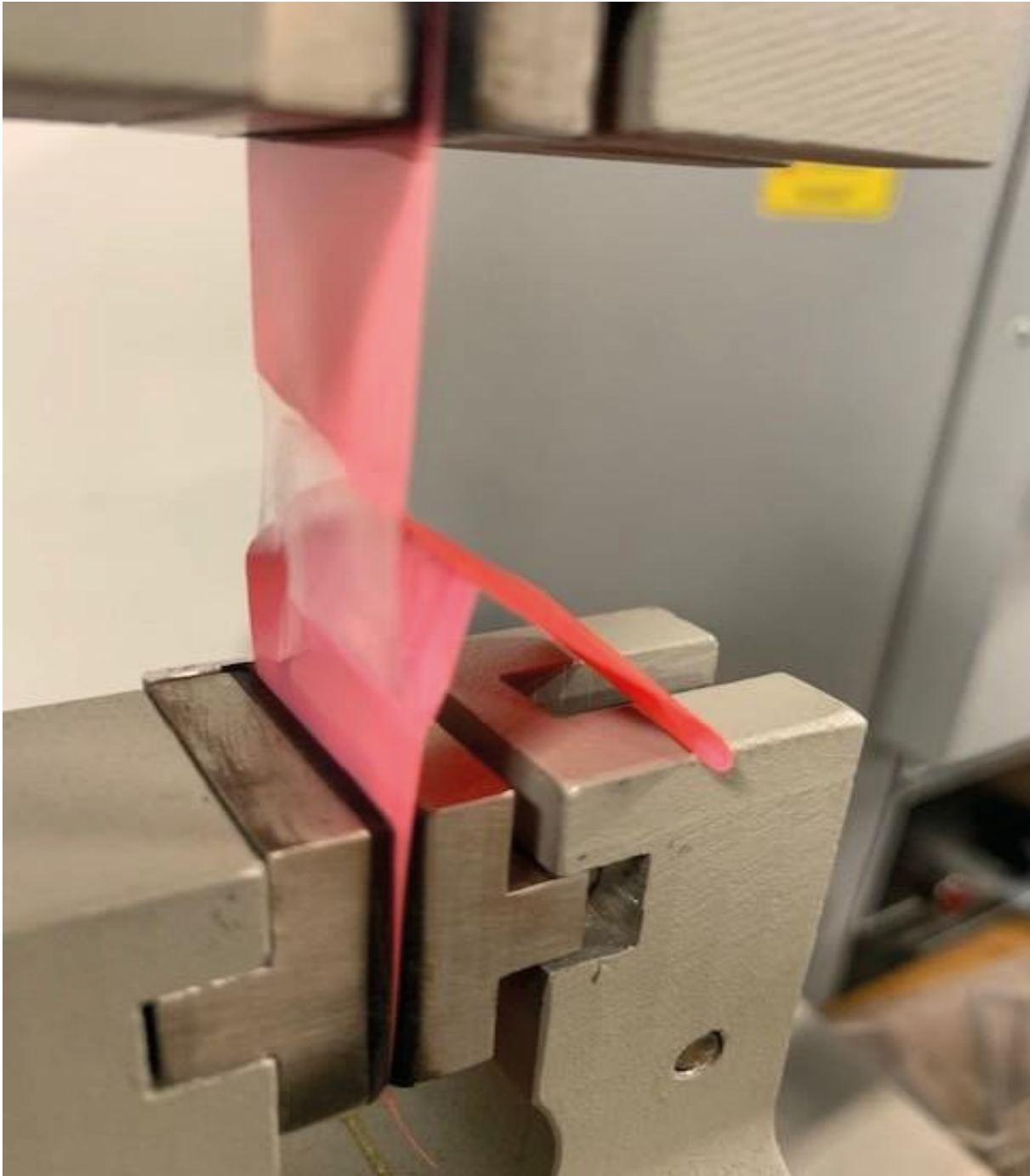


LBS PATCH # 16 @ T=24





SBS PATCH # 19 - 185C / 1.0 sec. DWELL TIME





Summary:

The lamination between the surface printed 74.5 um PET/PE and Toray 30um soft touch thermal laminated PET film resulted in great lamination bond, appearance and high SBS.

The Toray soft touch thermal laminated PET film was tested at different temperatures and lamination speeds although the best results were achieved when tested using the process parameters listed in Table #3.

Lower speed and/or higher NIP roller pressure resulted in total ink transfer, lower temperatures resulted in wrinkles and low LBS.

We recommend sealing at 185C and 1.0 sec dwell time. See pictures above.

Based on the results listed above the Toray soft touch matte thermal lamination PET film exceeded the requirements listed in the validation process.