



Subject: PET clear 2.4mil laminate test report

Supplier: CHARTER; Tested @ HP INDIGO

Date: Jul 04, 2018

1. Charter Products/Roll details:

Received in IL: The XCF-17147NT-2 (2 rolls) and XCF-17147NT-3 (1 roll) arrived to IL. Charter roll XCF-17147NT-2 PE clear (not treated): 1 roll had major blocking and was impossible to use for lamination. The second roll having less blocking was used for lamination evaluation.

XCF-17147NT-2 PE clear 2.4mil (60 micron, not treated) – lotryl version

XCF-17147NT-3 PE clear 2.4mil (60 micron, not treated) – EVA

2. Lamination results:

LBS results roll XCF-17147NT-2 PE clear 2.4mil (60 micron)

Lamination conditions and laminations bond strength (LBS) results immediately after lamination are presented in following table:

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch
						On print	On tap	On RW	On infeed		
#1	135	40	2	2	60	10	5	BP	15	5	4.0 (NT)
#2	140	40	2	2	60	10	5	BP	15	5	4.1 (NT)
#3	150	40	2	2	60	10	5	BP	15	5	4.8 (NT)

- All laminated films exhibited curling in machine direction when cut, as well as some fine strips appeared
- LBS was measured immediately after lamination

Legend:

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

NT – No Transfer of ink from the printed substrate

TT – Total ink Transfer

PT – Partial Transfer of ink from the printed substrate (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

BP – by pass (the infeed)

LBS results within 24hr roll XCF-17147NT-2 PE clear 2.4mil (60 micron)

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch @16*	LBS N/inch @22**
						On print	On tap	On RW	On infeed			
#1	150	40	2	2	60	5	5	5	5	5	3.1	3.1

* Patch 16 – 340% coverage (YMCK)

** Patch 22 – 360% coverage (YMCKW)

LBS results after 5 days roll XCF-17147NT-2 2.4mil (60 micron)

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch @16*	LBS N/inch @22**
						On print	On tap	On RW	On infeed			
#1	150	40	2	2	60	5	5	5	5	5	2.9	3.0



Roll XCF-17147NT-3 PE clear (not treated) 2.4mil (60 micron)

Lamination conditions and laminations bond strength (LBS) results immediately after lamination are presented in following table:

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch
						On print	On tap	On RW	On infeed		
#1	150	40	2	2	60	10	5	BP	15	5	3.6

- All laminated films exhibited curling in machine direction when cut, as well as some fine strips appeared
- LBS was measured immediately after lamination

LBS results within 24hr - roll XCF-17147NT-3 PE clear 2.4mil (60 micron)

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch @16*	LBS N/inch @22**
						On print	On tap	On RW	On infeed			
#1	150	40	2	2	60	5	5	5	5	5	3.4	3.6

LBS results after 5 days - roll XCF-17147NT-3 PE clear 2.4mil (60 micron)

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch @16*	LBS N/inch @22**
						On print	On tap	On RW	On infeed			
#1	150	40	2	2	60	5	5	5	5	5	3.0	3.7



LBS results after 21 days - Roll XCF-17147NT-3 PE clear 2.4mil (60 micron)

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	LBS N/inch @16*	LBS N/inch @22**
						On print	On tap	On RW	On infeed			
#1	150	40	2	2	60	5	5	5	5	5	3.6 ± 0.5 * (NT)	4.0 ± 0.5 * (NT)

LBS values from two different areas of the laminated film resulted in 3.3N/inch to 4.5N/inch.

Lamination bond strength of printed patches with lower ink coverage 100-200% were also measured. LBS values resulted in 4.0 ± 0.7N/inch (5 repetitions 3.2-4.9N/inch) at different areas on the laminated film.

LBS values presented quit a high variations indication non-uniformity of the TAP layer.

3. Summary:

- Lamination with Charter roll ID: XCF-17147NT-2 PE clear (not treated. Lotryl version) resulted in moderate laminated films. Films resulted in good appearance but low LBS. There is some decrease in LBS values one day and 5 days after lamination. There was some amount of curling visible in MD when cut. Strips were visible on laminate as usually seen with PE lamination.
- Lamination with Charter roll ID: XCF-17147NT-3 PE clear (not treated. EVA version) resulted in good laminated films. Films resulted in good appearance but acceptable LBS values. There is some decrease in LBS values 5 days after lamination yet some measurements are in accepted range values (>3.5N/inch). Repeating LBS measurements 21 days after lamination resulted in high LBS values within the accepted range.

There was some amount of curling visible in MD when cut. Strips were visible on laminate as usually seen with PE lamination.

- The laminate films with TAP EVA version resulted in better lamination bond strength compered to Lotryl TAP version.
- LBS values presented quit a high variations indication non-uniformity of the TAP layer. Although the laminate films with TAP EVA version resulted in good lamination bond strength and there is good indication to fit for use on Karlville laminator the next batch has to be also tested in order to have a conclusive deduction.



Roll CX-455.21W WHITE PE (treated) 2.4mil (60 micron)

Lamination conditions and laminations bond strength (LBS) results **immediately** after lamination are presented in following table:

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	Pre-Heat [°C]	LBS [N/inch] 07.06.18	Note
						On print	On tap	On RW	On infeed				
#1	120	60	2	2	75	15	5	15	3	2.5	75	1.7 NT	Same conditions as used at Karlville
#2	120	60	2	2	75	15	5	15	3	5	75	3.8 NT	
#3	140	60	2	2	0	15	5	15	BP	5	NA	5.0 NT	
#4	150	40	2	2	0	15	5	15	BP	5	NA	2.9 TT	

- All laminated films exhibited curling in machine direction when cut, as well as some fine strips appeared
- LBS was measured immediately after lamination

Legend:

LBS – lamination bond strength

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

NT – No Transfer of ink from the printed substrate

TT – Total ink Transfer

PT – Partial Transfer of ink from the printed substrate (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

BP – by pass (the infeed)

All laminated films resulted in visible strips on laminate as usually seen with PE lamination.



LBS results after 3 days after lamination Roll CX-455.21W WHITE PE (treated) 2.4mil (60 micron)

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	Pre-Heat [°C]	LBS 07.06.18 [N/inch]	LBS 10.06.17 [N/inch]
						On print	On tap	On RW	On infeed				
#2*	120	60	2	2	75	15	5	15	3	5	75	3.8 NT	Right: #11= tear, #16 = 2.5, #22=1.9 Left: #11= tear, #16 = 3.0, #22=2.8 PT (20-70%)**
#3	140	60	2	2	0	15	5	15	BP	5	NA	5.0 NT	Right: #11= tear, #16 = 1.6, #22=1.3 Left: #11= tear, #16 = 1.5, #22=1.1 TT

**As percentage of ink remaining on the printed substrate is higher, it means that more ink remains on the printed substrate, and it results in higher LBS values

LBS results lamination Roll CX-455.21W WHITE PE (treated) 2.4mil (60 micron) - Laminated film sample received from Karlville Miami

EXP. #	Nip temperature [°C]	Lamination speed [m/min]	Corona on TAP [KW]	Corona on print [KW]	Wrapping angle [deg.]	Tension [Kg]				Nip Pressure [Bar]	Pre-Heat [°C]	Measured @ Miami		Measured @ NZ
						On print	On tap	On RW	On infeed			LBS [N/inch]	LBS 16 hours [N/inch]	LBS 10.06.17 [N/inch]
#1	120	60	2	2	75	15	5	15	3	2.5	75	3.8 TT	3.4-3.8 TT	Right: #11= 6, #16 = 1.6, #22=1.5 Left: #11= tear, #16 = 1.2, #22=1.6 TT

Seal test (* of sample #2):

Test parameters: 1” flat jaws, lower Jaw room temperature, upper jaw 200°C, dwell time 1 sec, pressure 450N
Seal test result: 37N/inch seal strength



Summary:

- Lamination with Charter roll ID: CX-455.21W WHITE PE (treated) resulted in acceptable LBS measured immediately after lamination. Films resulted in good appearance. There, was some amount of curling visible in MD when cut. Strips were visible on laminate as usually seen with PE lamination.
- LBS value measured was 3.8 N/inch at similar lamination conditions as were used at Karlville (at higher nip pressure). With the same nip pressure (2.5Bar), as used at Karlville, we achieved LBS of 1.7N/inch.
- Higher LBS values were achieved at 140°C at the same lamination speed. At 150°C there was total ink transfer to the laminate film and LBS resulted in lower values (2.9 N/inch).
- LBS measurement few days after lamination decrease significantly and resulted in low and not accepted lamination bond strength <3.5N/inch
- Sealing bond strength measurement resulted in low sealing bond strength <50N/inch.

Conclusion:

Roll XCF-17147NT-3 PE clear

- All laminated films resulted in visible strips on laminate as usually seen with PE lamination.
- PE clear film_with TAP EVA version resulted in good and acceptable (mostly >3.5N/inch) lamination bond strength.
- Concern: LBS values presented quit a high variations indication non-uniformity of the TAP layer.
- Next step: Although the laminate films with TAP EVA version resulted in good lamination bond strength and there is good indication to fit for use on Karlville laminator the next batch has to be also tested in order to have a conclusive deduction.

Roll CX-455.21W WHITE PE

- LBS measurement few days after lamination decrease significantly and resulted in low and not accepted lamination bond strength <3.5N/inch
- Charter film PE white 60micron does not meet the minimum requirements thus cannot be approved/released in the current configuration.