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## GRADE B BALE COMPOSITION ANALYSIS

### INTRODUCTION

Plastic Recycling Corp. of California (PRCC) is committed to ensuring California PET bales meet or exceed PRCC quality standards. Our goal is to add value to quality loads, increase yield, and encourage Material Recovery Facilities (MRFs) to separate PET thermoforms from the PET bottles.

This study was undertaken to determine what—if any—clear differences there are between Grade B bales from auto-sort facilities and hand-sort facilities. The results of this study clearly reveal that there are two types of Grade B PET bales in California: those that include PET thermoforms along with PET bottles, and those which do not. Bales with thermoforms have a significantly lower percentage of clear/light-blue PET bottles averaging 62% (versus 84% in bales that do not include thermoforms), and average twice as much contamination. Even more importantly, in bales with thermoforms, CRV PET comprised only 44% of the bale compared to 77% CRV PET in bales without thermoforms.

PRCC has added a new bale specification: (*italics added for emphasis*) *Grade B with Thermoforms*. More accurate bale pricing—in combination with modernizing the CA Beverage Container Recycling program—will encourage MRFs to keep thermoforms separate from PET bottles. This will improve quality and increase recovery for both PET bottles and PET thermoforms.

### PROCEDURE

PRCC staff sorted over 3,600 pounds of Grade B PET from eighteen MRFs throughout CA. Eleven of the samples (total 2,279 lbs) were from facilities with auto-sort technology, and six samples (total 1,206 lbs) were from facilities that use positive hand sort, the last sample (200 lbs) was from a facility that instructs its employees to pull thermoforms along with the PET bottles.

PRCC used the Association of Plastic Recyclers' [Protocol for Assessing PET Truckload Bale Grade](#). PRCC has tested this methodology and determined that it accurately reflects the composition of bales.

For each bale, PRCC staff noted the grade and type of sortation (auto or positive sort), recorded the source location, daily throughput, and collection public messaging (did the collection program—specifically or by default—ask for PET thermoforms).

Next, PRCC staff pulled sample of at least 200 pounds from random locations within the bale to get a representative sample. The sample material was then sorted by category, weighed, and the results were recorded.

FIRST SORT	SECOND SORT
CRV PET [Weigh and Count Samples]	Clear & Light Blue
	Green
	Other Colors
	Full Wrap
	Barrier
	With Metal
Non-CRV PET Bottles [Weigh and Count Samples]	Clear & Light Blue
	Green
	Other Colors
	Full Wrap
	Barrier
	With Metal
PET-like Thermoform	Clear PET
	Colored PET
	Non-PET
Non-PET Plastics	
Aluminum/ Metal	
Other Contaminants/Trash	

**FINDINGS**

The results of the bale sort inarguably reveal that MRFs with auto-sort technology have a significant amount of PET thermoforms in the bales: unless they pull the thermoforms to create a separate thermoform bale. MRFs that positive sort PET bottles by hand, have very few PET thermoforms: unless they instruct their employees to put thermoforms in with the PET.

In bales with thermoforms, CRV PET comprised only 44% of the bale compared to 77% CRV PET in bales without thermoforms.

We saw no pattern in the location, size of the MRF, level of residue nor what they accepted. Ironically, facilities that do not accept PET thermoforms had the highest percentage of thermoforms in both auto-sort MRFs (32% thermoforms) and positive-sort MRFs (0.8% thermoforms).

**AUTO-SORT MRFS**

Auto-Sort MRFs averaged 19% PET thermoforms. There was also twice as much trash as compared to the hand sort MRFs (4.6% vs 2.3%). PET bottles averaged 74% of the bale, and clear/light blue PET bottles averaged only 63% of the bale. Other averages were: green bottles—3.5%, other color—1.5%, full-wrap labels—4.5%, barrier bottles—0.6%, and bottles with metal components—0.8%.

Total Auto Sort			
	Pounds	Percent	Spread
<b>Total Sorted</b>	2279		
<b>CRV PET</b>	1017	44.6%	36% - 58%
<b>Non-CRV PET</b>	662	29.1%	21% - 38%
<b>PET Thermo</b>	428	18.8%	11% - 32%
<b>Other plastic</b>	36	1.6%	0% - 3%
<b>Trash</b>	104	4.6%	1% - 13%
<b>Metal</b>	32	1.4%	0% - 3%

Total Auto Sort						
	CRV Bottles			Non-CRV Bottles		
	Pounds	Percent	Spread	Pounds	Percent	Spread
<b>Clear/Lt Blue</b>	1017	44.6%	36% - 58%	514	22.5%	15% -30%
<b>Green</b>	662	29.1%	21% - 38%	14	0.6%	.1% - 1.2%
<b>Other Color</b>	428	18.8%	11% - 32%	31	1.4%	.7% - 2.8%
<b>Full Wrap</b>	36	1.6%	0% - 3%	75	3.3%	1.2% - 6.3%
<b>Barrier</b>	104	4.6%	1% - 13%	12	0.5%	.1% - .7%
<b>Metal</b>	32	1.4%	0% - 3%	17	0.7%	0% - 1.5%



**POSITIVE-SORT MRFs**

Positive-Sort MRFs averaged less than one percent PET thermoforms. The bales were generally very low in trash and other contaminants; PET bottles comprised an average of 97% of the bale and clear/light blue PET bottles averaged 84% of the bale. Other averages were: green bottles—6.7%, other color—0.4%, full-wrap labels—5.3%, barrier bottles—0.3%, and bottles with metal components—0.5%.

Total Positive Sort			
	Pounds	Percent	Spread
<b>Total Sorted</b>	1206		
<b>CRV PET</b>	927	76.9%	54% - 98%
<b>Non-CRV PET</b>	241	20.0%	1% - 42%
<b>PET Thermoform</b>	3	0.3%	0% - .8%
<b>Other plastic</b>	3	0.3%	0% - 1%
<b>Trash</b>	28	2.3%	1% - 4%
<b>Metal</b>	3	0.3%	0% - 1%

Total Positive Sort						
	CRV Bottles			Non-CRV Bottles		
	Pounds	Percent	Spread	Pounds	Percent	Spread
<b>Clear/Lt Blue</b>	834	69%	56% - 82%	175	14%	0% - 1%
<b>Green</b>	60	5%	4% - 8%	21	1.7%	1% - 7%
<b>Other Color</b>	1	0.1%	0% - .3%	4	0.3%	0% - 1%
<b>Full Wrap</b>	31	2.5%	2% - 4%	34	2.8%	1% - 7%
<b>Barrior</b>	0	0.0%	0%	4	0.3%	0% - 1%
<b>Metal</b>	2	0.1%	0% - .2%	4	0.4%	1% - 7%

**POSITIVE-SORT MRF INCLUDING THERMOFORMS**

The positive-sort facility pulling thermoforms had just under 25% thermoforms. The bales had a significant amount of trash (7.5%) and other plastic (4%) most of which was PET thermoform look-alikes. The bales had only 64% PET bottles and only 54% of them were Clear/ Light-blue.

Total Positive Sort With Thermoforms		
	Pounds	Percent
<b>Total Sorted</b>	199	
<b>CRV PET</b>	78	39.1%
<b>Non-CRV PET</b>	50	24.9%
<b>PET Thermo</b>	49	24.4%
<b>Other plastic</b>	8	4.0%
<b>Trash</b>	15	7.5%
<b>Metal</b>	0.10	0.1%

Total Positive Sort with Thermoforms				
	CRV Bottles		Non-CRV Bottles	
	Pounds	Percent	Pounds	Percent
<b>Clear/Lt Blue</b>	71	35.8%	37	18.6%
<b>Green</b>	5	2.3%	0.5	0.3%
<b>Other Color</b>	0	0.0%	1	0.5%
<b>Full Wrap</b>	2	1.0%	9	4.3%
<b>Barrior</b>	0	0.0%	1	0.5%
<b>Metal</b>	0	0.0%	2	0.8%

PET-like TF		
	Pounds	Percent
<b>Clear</b>	48.4	24%
<b>Colored</b>	0.2	0.1%
<b>Non-PET**</b>	7.5	3.8%

\*\* Included in Other Plastic

## CONCLUSIONS

The results of this study clearly reveal that there are two types of Grade B PET bales in California: one from those that include PET thermoforms in with PET bottles, and one from those that remove them from the stream to create a separate thermoform grade bale. Not surprisingly, bottle bales with thermoforms have a significantly lower percentage of clear/light-blue PET bottles averaging 62% [with a range from 49% to 76% clear/light-blue PET bottles] compared to PET bottle bales without thermoforms which average 84% clear/light-blue [with a range from 76% to 90% clear/light-blue PET bottles].

PRCC staff determined a new Grade B bale is appropriate. Staff discussed these findings with APR and NAPCOR, both organizations approved the concept of two Grade B bale specifications. We also discussed the new specification with all of the California B-Grade reclaimers and all of the PRCC's domestic buyers of California Grade B. All parties agree that there is a need for a Grade B bale specification with thermoforms and one without.

PRCC now has four PET bale specifications, all of which can be found on the website: [PRCC.biz](http://PRCC.biz):

- [Grade A](#)
- [Grade B](#)
- [Grade B with Thermoform](#)
- [Thermoform](#)

It is too soon to determine if there will be an increase in value for standard Grade B bales, although it is likely. It is also likely that the *Grade B with Thermoform* bales will have a significantly lower value than standard Grade B. PRCC will make public pricing spreads once a clear pattern in value has emerged.

PRCC strongly encourages MRFs to separate PET thermoforms from the PET bottles. There are several buyers consistently taking PET thermoform loads. Keeping thermoforms separate from PET bottles improves the economics of PET bottle reclamation through improved yields and results in better quality rPET being cycled back into new PET bottles.

**Unfortunately, the current Beverage Container Recycling program is inhibiting this change. The commingled rate allows PET thermoforms to be counted as non-CRV PET. This unfairly enriches programs that combine PET bottles with thermoforms, and creates a disadvantage to programs that separate them.**

PRCC believes that with more accurate bale pricing and modernization of the CA Beverage Deposit program, most MRFs will keep thermoforms separate from PET bottles resulting in improved recycling rates and higher recovery for both materials.

**APPENDIX A: AUTO-SORT DATA**

Key	High residue MRF >30%	Low Residue MRF <15%	Do Not accept PET Thermoforms	Low Volume MRF < 100 TPD	High Volume MRF > 600 TPD
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Sample # Location	1 South		2 South		3 South		4 North		5 North	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Total Sorted	203.55		206.10		204.25		210.50		222.10	
CRV PET	102.90	51%	98.70	48%	94.40	46%	81.10	39%	107.00	48%
Non-CRV PET	68.15	34%	57.50	28%	63.40	31%	78.00	38%	60.80	27%
PET Thermo	28.30	14%	23.00	11%	42.40	21%	24.30	12%*	40.60	18%
Other plastic	1.75	0%	3.00	1%	0.80	0%	3.00	1%	2.80	%
Trash	2.25	1%	17.40	8%	3.00	1%	15.60	8%	8.40	4%
Metal	0.20	0%	6.50	3%	0.25	0%	8.50	4%	2.50	1%

\* Some communities utilizing this MRF accept thermoforms and some do not.

Sample # Location	1 South		2 South		3 South		4 North		5 North	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
PET-like Thermo										
Clear	27.8	14%	22	11%	41.9	21%	23.8	11%	40.3	18%
Colored	0.5	0.2%	1	0.5%	0.5	0.2%	0.5	0.2%	0.3	0.1%
Non-PET**	1.5	0.7%	0	0.0%	0.8	0.4%	0.5	0.2%	0.5	0.2%

\*\* Included in Other Plastic

Sample # Location	6 North		7 North		8 North		9 South		10 North		11 South	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Total Sorted	213.20		205.20		200.55		206.10		202.7		204.60	
CRV PET	81.00	38%	73.00	36%	91.85	46%	118.10	58%	83.0	41%	85.50	42%
Non-CRV PET	74.80	35%	52.70	26%	40.50	21%	68.60	34%	49.3	25%	48.40	24%
PET Thermo	41.00	19%	40.80	20%	63.70	32%	3.50	0%	54.6	27%	65.40	32%
Other plastic	5.00	1%	5.80	2%	1.00	0%	6.80	3%	5.0	2%	1.10	0%
Trash	7.90	4%	26.40	13%	3.00	2%	9.00	4%	7.5	4%	4.00	2%
Metal	3.50	2%	6.50	3%	0.50	0%	0.10	0%	3.3	2%	0.20	0%

Sample # Location	6 North		7 North		8 North		9 South		10 North		11 South	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
PET-like TF												
Clear	39	18%	39.30	19%	63.5	32%	3.5	2%	54.3	27%	64.5	32%
Colored	2	0.9%	1.50	0.7%	0.2	0.1%	0	0.0%	0.25	0.1%	0.9	0.4%
Non-PET**	2	0.9%	0.80	0.4%	1	0.5%	0	0.0%	3.5	1.7%	0.6	0.3%

\*\* Included in Other Plastic



**APPENDIX B: POSITIVE-SORT DATA**

Key	High residue MRF >30%	Low Residue MRF <15%	Do Not accept PET Thermoforms	Low Volume MRF < 100 TPD	High Volume MRF > 600 TPD
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	12 North		13 North		17 North		18 North		19 North		20 South	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
<b>Total Sorted</b>	207.8		201.55		198.25		198.9		200.6		198.7	
<b>CRV PET</b>	147.1	71%	197.40	98%	171.35	87%	124.2	63%	107.8	54%	178.9	90%
<b>Non-CRV PET</b>	56.9	28%	1.60	1%	22.10	11%	65.4	33%	82.8	42%	12.45	6%
<b>PET Thermo</b>	0.5	0%	0.10	0%	0.50	0%	0.5	0%	1.5	0.8%	0.0	0%
<b>Other plastic</b>	0.3	0%	0.25	0%	0.80	0%	1.0	1%	1.0	1%	0.1	0%
<b>Trash</b>	2.5	1%	2.00	1%	3.00	2%	6.5	3%	7.0	4%	7.0	4%
<b>Metal</b>	0.5	0%	0.20	0%	0.50	0%	1.3	1%	0.5	0%	0.25	0%

	12 North		13 North		17 North		18 North		19 North		20 South	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
<b>PET-like TF</b>												
<b>Clear</b>	0.5	0%	0.1	0.0%	0.5	0.3%	0.5	0.3%	1.5	1%	0	0.0%
<b>Colored</b>	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Non-PET**</b>	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.5%	0.1	0.1%

\*\* Included in Other Plastic