

# Challenges of Glass Recycling in North America

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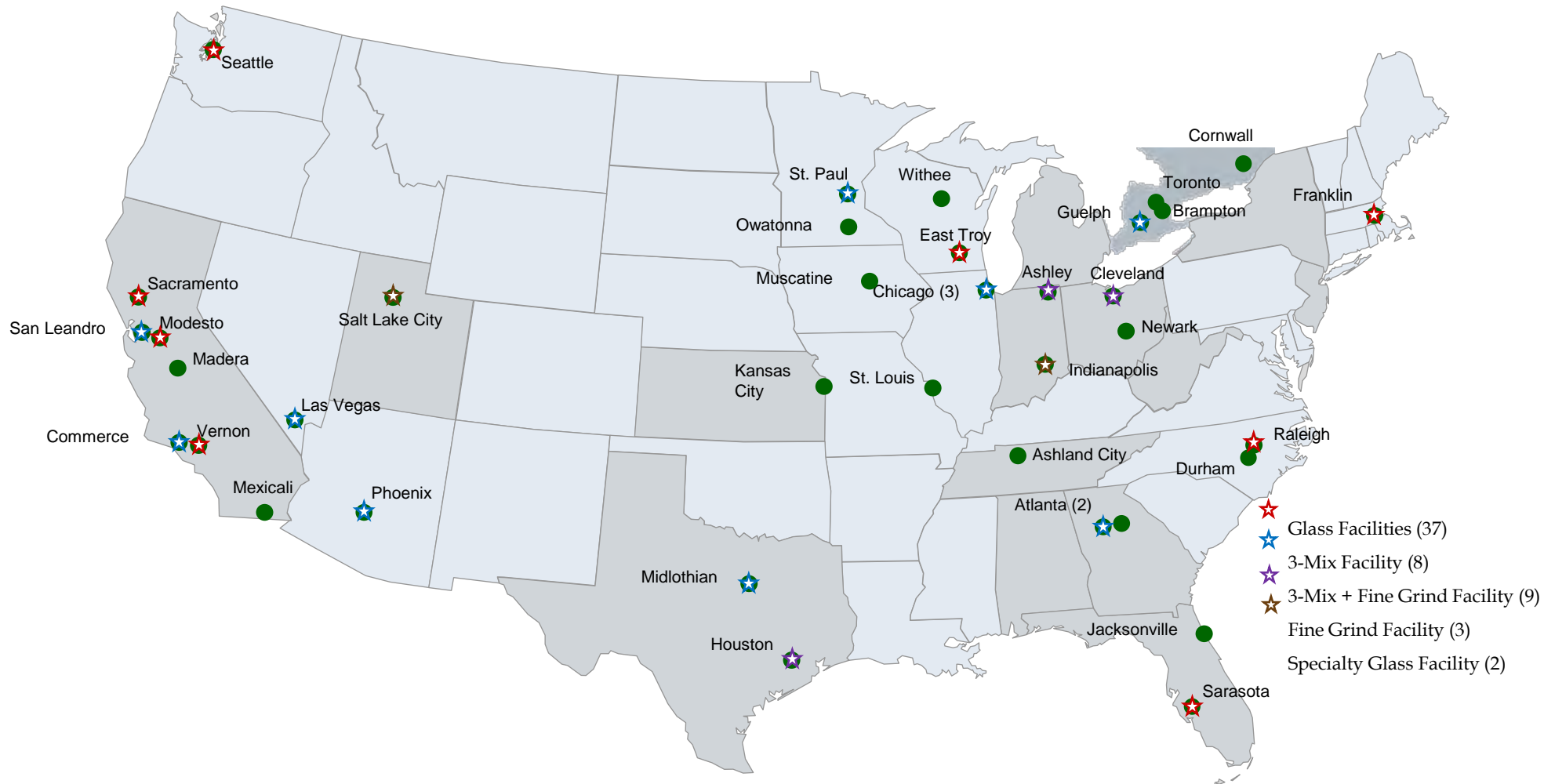


**Curt Bucey, Executive VP**  
**2015 NERC's Glass Forum**

- History
- Market Update
- Glass Quality Overtime
- Impacts on Dirtier Supply
- Specifications
- Alternative shipping methods

# Strategic Materials footprint

- Established in 1896, SMI is the largest glass recycler in the U.S.
- Operates 39 glass recycling plants across North America
- Recycling over 2.75 million inbound tons of glass each year
- A top ten plastics processor





SMI employees 20 FTE at Franklin and recycles almost 100% of MA's glass

# SMI Process

Supply

Container Deposit Material



Plate Glass



Curbside Collection



Source

Inventory

Process

Clean

Sort

Size

SMI Processing Facility



Color Sorter



Container Glass



Fiberglass



Highway Bead



Specialty



Customers

## SMI Final Product



Curbside supply has **up to**

**50% organics,  
30,000 PPM ceramic ,  
and is of mixed color**

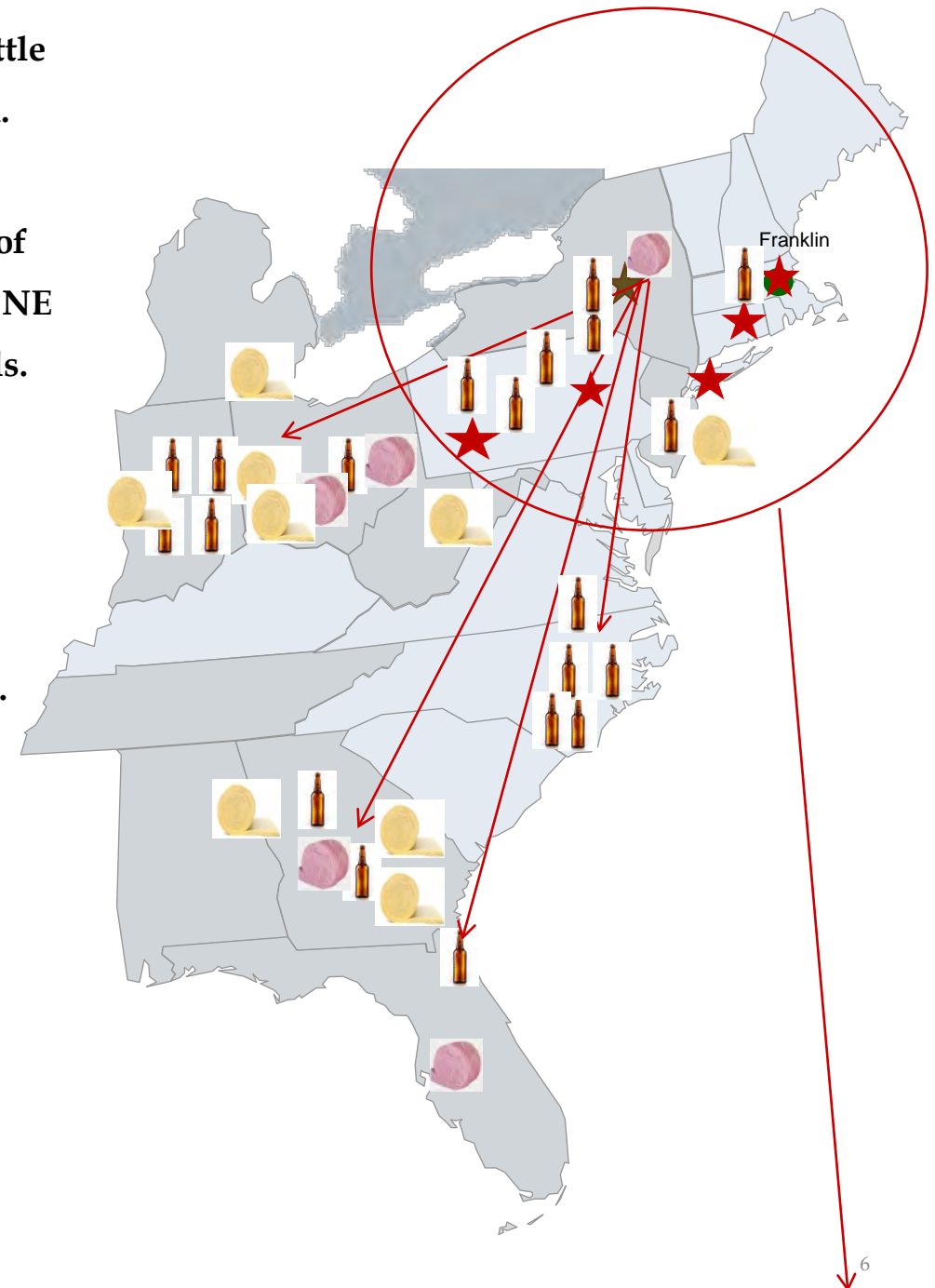


Final product must meet

**.15% -.25% organics,  
< 50 PPM of ceramic,  
and within color specifications**

# NE Market Update

- NE generates approx. 1/4 of nations cullet supply as Bottle Bills drive high quantity of very good quality material.
- Ardagh's Milford MA plant runs at the highest levels of cullet (>90%) of any plant in the nation but remaining NE container plants run at far lower recycled content levels.
- As Fiberglass industry rebounds, they are taking increased share of local cullet.
- Increased demand for supply to be exported out of US. Quantities and frequency increasing.
- Drivers for Mrf's glass output in the region are:
  - Quality of Material (NGR, undersize, and moisture)
  - Landfill Costs
  - Freight to available outlet
  - Mrf consistency



# Growth of single stream recycling





# Container Review



- Demand is off YOY slightly
- Industry currently at 30% and they want to increase to 50-60% min

## Why Use Cullet

- 20% less air
- 50% less water pollution
- Saves approx. 30% energy
- Speeds up production



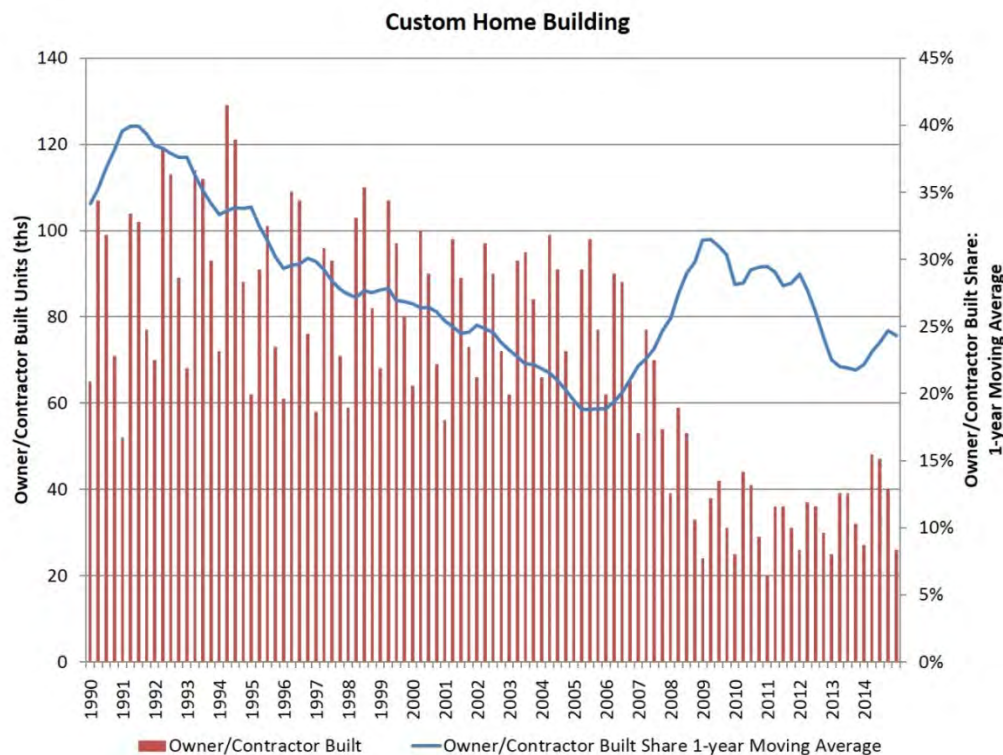
## Closed Loop ...

Glass Containers can be used over and over again endlessly.

Can be used at 95% recycled content. Lots of room for growth.

# Fiberglass Review

- Tied to Housing starts. Still recovering from 2009 housing collapse (2,000,000 starts to 500,000).
- During collapse volumes were relatively stable. Industry decided to support recycling community boosted recycled content levels rather than shut off receipts.



## Why Use Cullet

- 20% less air
- 50% less water pollution
- Saves approx. 30% energy

## Not Closed Loop but Saves energy continuously

- One six pack produces enough fiberglass insulation to fill a standard wall cavity.
- Boosting insulation by R-30 saves approx. \$600 per year every year

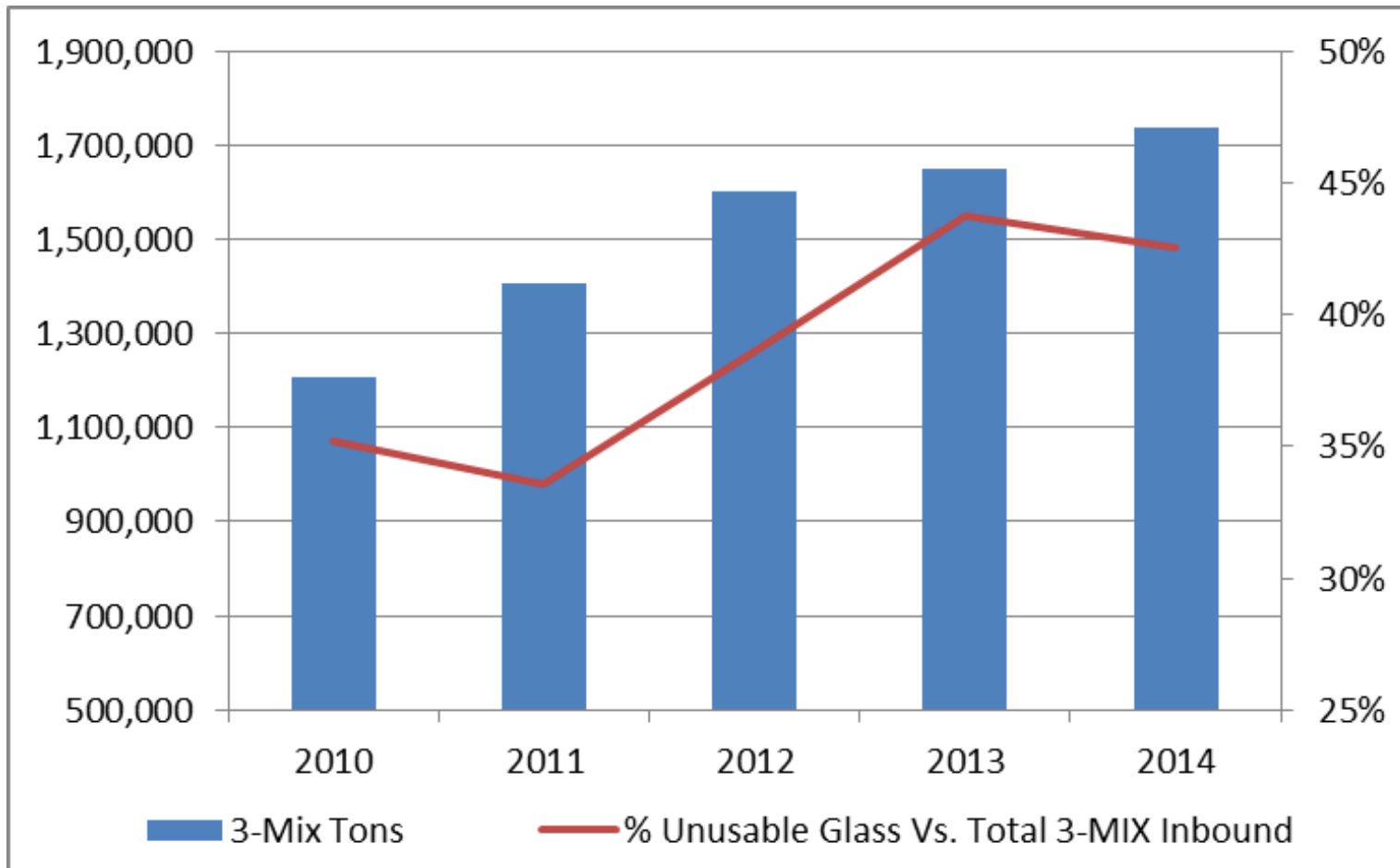
**Before**

**Today**



- **Evolving ton?**
- **Blender**
- **50% at mrf**
- **unprofitable**
- Percentage of 3mix to straight color continues to increase.
- Quality of inbound single-stream supply has deteriorated rapidly.
- Costs have risen steadily to handle the lower quality single-stream glass.

# 3-MIX Quality Trends



3-MIX Quantity is increasing while Quality is Deteriorating

# Economic Impacts of Dirtier Supply

Effects of Dirtier Supply	Cost Impacts					Countermeasures	
	Labor	Utility	Other	R&M	CapEx	Process Improvement	Equipment
More Inbound Testing	↑		↑			Yes, Complete	n/a
Improved Storage	↑		↑	↑	↑	Yes, Ongoing	Upgrade
Increased Loader Activity	↑	↑				n/a	n/a
Increased Labor to Reduce Contamination	↑					Yes, Ongoing	New
→ Slower Line Speeds (throughput)	↑	↑	↑	↑	↑	Yes, Lean Implementation	Upgrade
Decreased Sorter Performance	↑			↑	↑	Yes, Lean Implementation	Upgrade
Decreased Air Efficiency		↑		↑	↑	Yes, Lean Implementation	Upgrade
Lower Yields & Increased Landfill			↑			Yes, Lean & Inspection	n/a
Plant Design Capabilities Eroded	↑	↑	↑	↑	↑	Yes, Ongoing	New
Increased Failures			↑			Yes, Lean Implementation	Upgrade
Increased Re-work	↑	↑	↑	↑	↑	n/a	Upgrade
Shorter Equipment Life				↑	↑	Yes, Mpulse, Lean	Upgrade
Increased Maintenance Frequency	↑			↑		Yes, Mpulse, Lean	n/a
Greater Outbound Testing	↑					Yes, Complete	n/a
Increased EH&S Exposure		↑	↑		↑	Yes, Ongoing	Upgrade

Dirtier supply is having a severe economic impact


# 3-MIX Single Stream Inbound Inspection

## Inspection Table (Tool)



## Quality Reports (Tools)

**DB Report #104**  
Mixed Glass - Summary by Supplier by Plant




Date Range: 2013-06-01 - 2014-05-31

1002 Atlanta-CP 1002

		RATING	%+3/8	%-3/8	%NGR	Load Tons	Usable Tons
	Supplier#1	77	77%	8%	15%	11750.64	9047.99
	Supplier#2	77	77%	17%	6%	2627.90	2023.48
	Supplier#3	77	77%	12%	11%	1615.80	1244.17
MIX3SS	Supplier#4	74	74%	12%	13%	6833.37	5056.69
MIXCOLR	Supplier#5	71	74%	20%	7%	6593.42	4879.13
	Supplier#6	71	72%	19%	9%	5214.85	3754.69
	Supplier#7	72	72%	16%	11%	4446.45	3201.44
	Supplier#8	71	71%	10%	19%	4681.33	3323.74
	Supplier#9	69	70%	20%	10%	3145.73	2202.01
MIX3SS	Supplier#10	70	68%	21%	11%	15591.48	10602.21
	Supplier#11	68	68%	16%	16%	4947.63	3364.39
MIX3SS	Supplier#12	68	68%	16%	16%	3705.97	1161.26
MIXCOLR	Supplier#13	74	68%	1798%	-1767%	2346.34	1595.51

- Created incoming inspection program 2012 and implemented beta testing
- Rolled out internal testing in 2013 and started to share data with suppliers
- Tied pricing to incoming quality in 2014
- Started to install testing tables at suppliers who want to test prior to shipping to SMI

**DB Report #101**  
Mixed Glass - Detail by Supplier by Plant



**Unverified-Test Report**

Plant: 1066 Seattle Supplier: #12346 Date Range: 2015-01-01 - 2015-01-31

Product Group: MIX3SS

Date	WT#	Sample ID #	Tons	RATING	Usable %	Undersize Non-Glass	Weight	Weight in Grams				
								UNDER 3/8"	Usable Glass	Non-Glass	Other	
1/2/2015	1066-15-08425	1066-IB-001008	34.19	90	90%	7%	3%	2882	191	2698	93	0
1/5/2015	1066-15-08473	1066-IB-001026	32.1	75	75%	7%	18%	2568	176	1924	458	0
1/5/2015	1066-15-08474	1066-IB-001028	33.82	79	79%	7%	14%	2089	152	1650	287	0
1/5/2015	1066-15-08497	1066-IB-001035	32.69	74	74%	14%	11%	2729	391	2026	312	0
1/8/2015	1066-15-08538	1066-IB-001043	32.01	70	70%	15%	16%	2300	364	1608	338	0
1/8/2015	1066-15-08565	1066-IB-001047	32.83	76	76%	6%	18%	2227	128	1893	408	0
1/6/2015	1066-15-08587	1066-IB-001063	33.02	77	77%	14%	8%	2687	379	2091	227	0
1/7/2015	1066-15-08592	1066-IB-001074	34	78	78%	16%	7%	2553	400	1984	169	0
1/12/2015	1066-15-08635	1066-IB-001075	30.85	80	80%	7%	13%	2682	185	2152	345	0
1/12/2015	1066-15-08843	1066-IB-001078	34.83	79	79%	13%	8%	2481	317	1938	206	0
1/7/2015	1066-15-08790	1066-IB-001096	33.18	82	82%	5%	9%	2655	235	2101	219	0
1/7/2015	1066-15-08798	1066-IB-001112	31.09	81	81%	5%	14%	1557	83	1260	214	0
1/8/2015	1066-15-08763	1066-IB-001119	-1	73	73%	8%	19%	2541	214	1847	480	0
1/9/2015	1066-15-08731	1066-IB-001130	34.43	79	79%	13%	9%	3024	380	2385	259	0
1/9/2015	1066-15-08748	1066-IB-001131	33.32	87	87%	4%	9%	2963	116	2687	280	0
1/9/2015	1066-15-08762	1066-IB-001133	35.29	82	82%	5%	13%	2502	127	2062	313	0
1/9/2015	1066-15-08710	1066-IB-001134	31.76	82	82%	5%	13%	2502	127	2062	313	0

SMI Developed a "Tool" to Measure Quality for Single Stream Supply

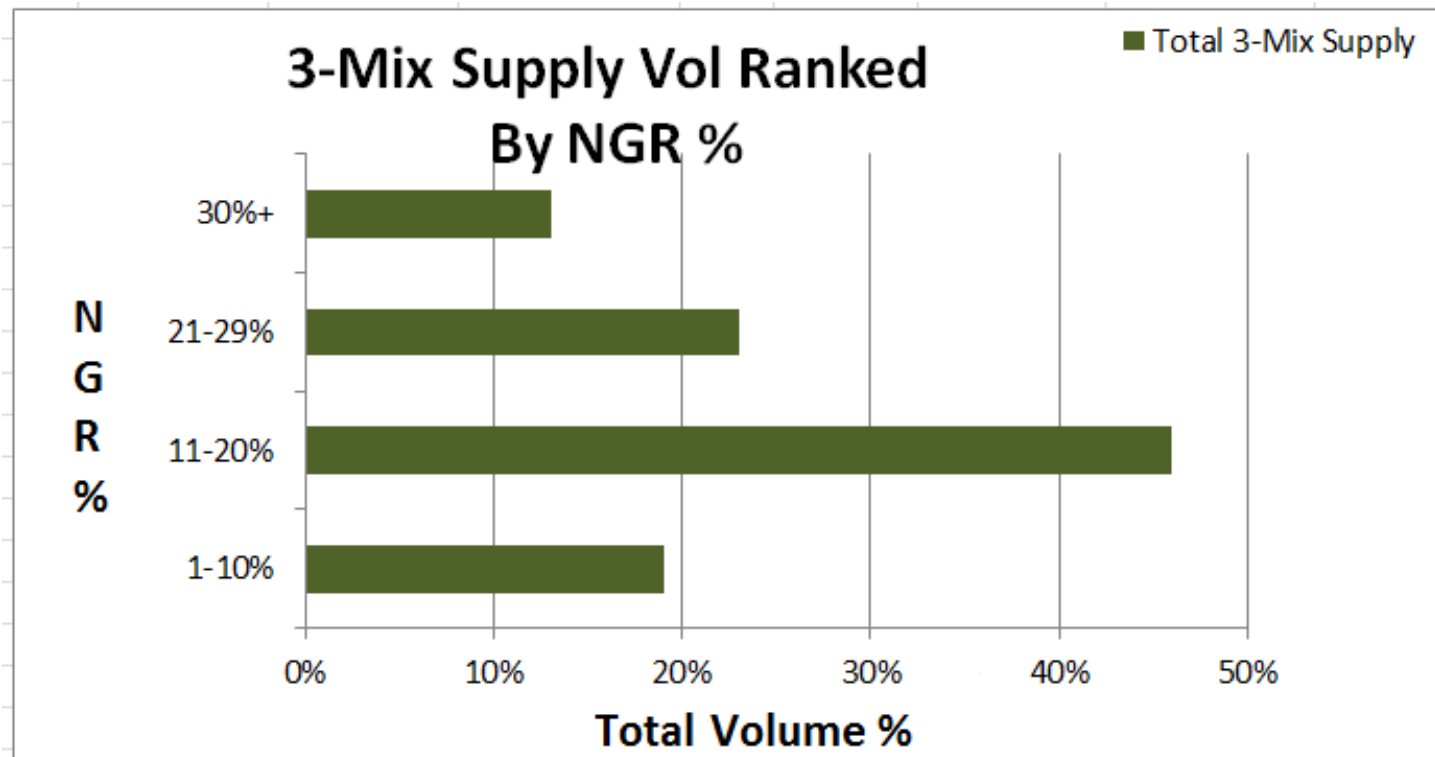
# 3-MIX Single Stream Matrix (market specific)

- Trying to be open and transparent on pricing.
- Key drivers for our pricing is
  - Non-Glass Residue % and local landfill rates
  - Undersize %, plant capabilities and local disposal options
  - Local vs Export markets
- Allows MRF's to evaluate economic value to improving/ deteriorating quality

		Undersize									
		0.0%	1.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%
NGR	0.0%	\$ 20.80	\$ 20.56	\$ 19.60	\$ 18.40	\$ 17.20	\$ 16.00	\$ 14.80	\$ 13.60	\$ 12.40	\$ 11.20
	1.0%	\$ 19.60	\$ 19.36	\$ 18.40	\$ 17.20	\$ 16.00	\$ 14.80	\$ 13.60	\$ 12.40	\$ 11.20	\$ 10.00
	5.0%	\$ 14.80	\$ 14.56	\$ 13.60	\$ 12.40	\$ 11.20	\$ 10.00	\$ 8.80	\$ 7.60	\$ 6.40	\$ 5.20
	10.0%	\$ 6.80	\$ 6.56	\$ 5.60	\$ 4.40	\$ 3.20	\$ 2.00	\$ 0.80	\$ (0.40)	\$ (1.60)	\$ (2.80)
	15.0%	\$ 2.80	\$ 2.56	\$ 1.60	\$ 0.40	\$ (0.80)	\$ (2.00)	\$ (3.20)	\$ (4.40)	\$ (5.60)	\$ (6.80)
	20.0%	\$ (3.20)	\$ (3.44)	\$ (4.40)	\$ (5.60)	\$ (6.80)	\$ (8.00)	\$ (9.20)	\$ (10.40)	\$ (11.60)	\$ (12.80)
	25.0%	\$ (9.20)	\$ (9.44)	\$ (10.40)	\$ (11.60)	\$ (12.80)	\$ (14.00)	\$ (15.20)	\$ (16.40)	\$ (17.60)	\$ (18.80)
	30.0%	\$ (16.20)	\$ (16.44)	\$ (17.40)	\$ (18.60)	\$ (19.80)	\$ (21.00)	\$ (22.20)	\$ (23.40)	\$ (24.60)	\$ (25.80)
	35.0%	\$ (23.40)	\$ (23.64)	\$ (24.60)	\$ (25.80)	\$ (27.00)	\$ (28.20)	\$ (29.40)	\$ (30.60)	\$ (31.80)	\$ (33.00)
	40.0%	\$ (31.40)	\$ (31.64)	\$ (32.60)	\$ (33.80)	\$ (35.00)	\$ (36.20)	\$ (37.40)	\$ (38.60)	\$ (39.80)	\$ (41.00)
45.0%	\$ (37.00)	\$ (37.24)	\$ (38.20)	\$ (39.40)	\$ (40.60)	\$ (41.80)	\$ (43.00)	\$ (44.20)	\$ (45.40)	\$ (46.60)	

Creating a roadmap on economic value

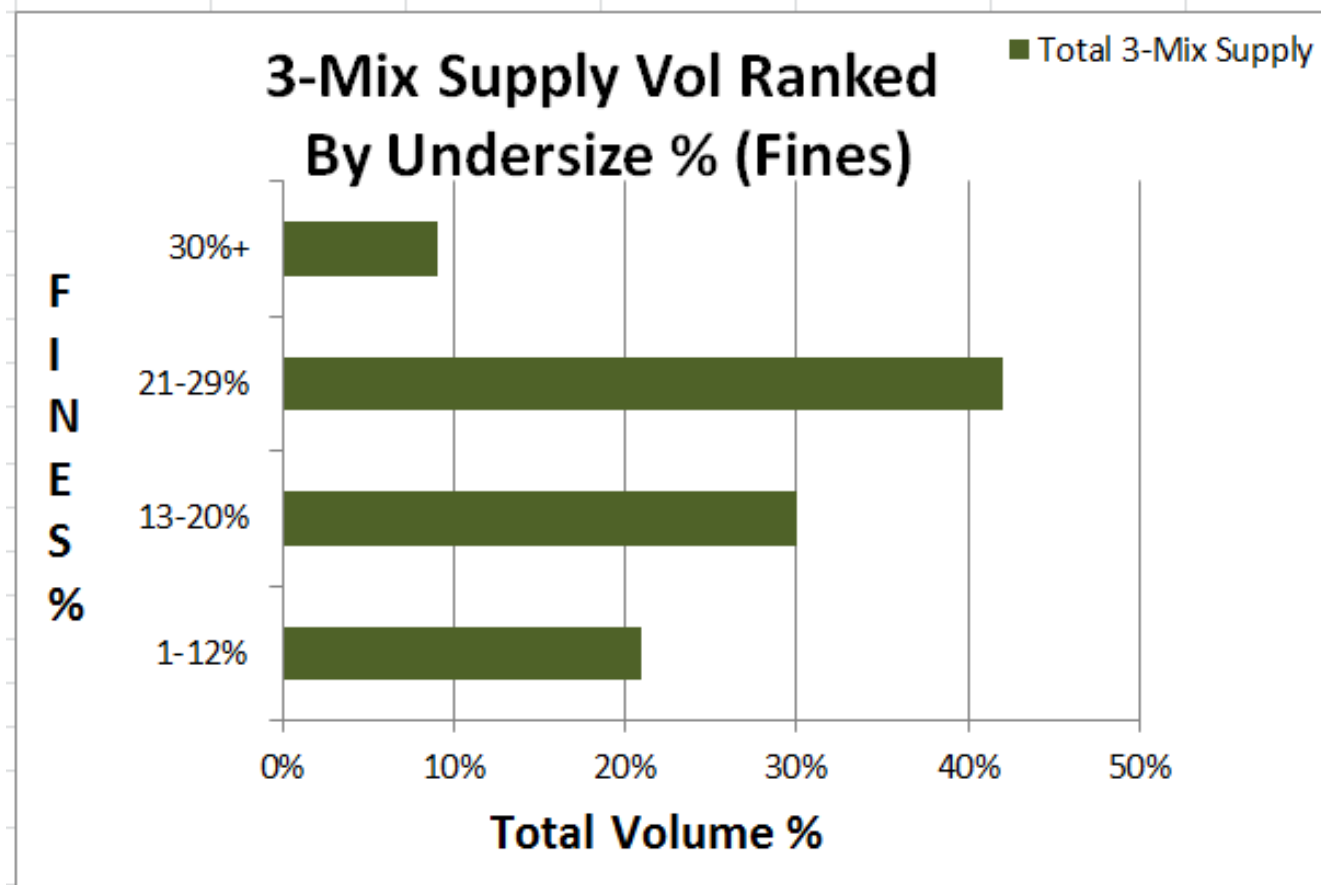
# 3-Mix Single Stream – NGR % in Tot Supply



Over 2 years of Quality Inspection Data



# 3-Mix Single Stream–Undersize % in Tot Supply



Over 2 years of Quality Inspection Data

# 3-MIX Single Stream Specification

3-MIX Single Stream Specification			
Criteria	Description	Examples	Target
<b>NGR</b>	Non-Glass-Residual found in municipal recycling program	Paper, Plastic, Aluminum, steel	<b>10% Maximum</b>
<b>U/S</b>	Undersize Glass particles < 3/8" (or < 1/8" *)	Mixed color glass particles	<b>12% Maximum</b>
<b>Other Criteria</b>			<b>Target</b>
<b>Ceramics</b>	Broken bits of household ceramic	Dinner plates, mugs, cups	<b>.01% Maximum</b>
<b>Color</b>	Flint, Amber, Green(s) & other	Food containers, beer bottles, wine/ soda bottles	<b>See above table in Definition</b>
<b>Moisture</b>	Excessive water mixed with glass**	Rain, snow, ice	<b>5% Maximum</b>
<b>Excluded Waste</b>	Other, possibly hazardous waste	CRT, radioactive, medical waste, heavy metals, etc.	<b>0% (Zero) see 'Excluded Waste' Definition</b>

## Publishing a new nationwide target specification for 3mix which

- Sets an achievable target for Mrf operators
- Should help Cities & Mrf operators to establish target specification and economic formulas

All Incoming glass is not created equal