

RECYCLING UPDATE IN THE U.S. AND CANADIAN VINYL INDUSTRY

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Mission and Vision Statements

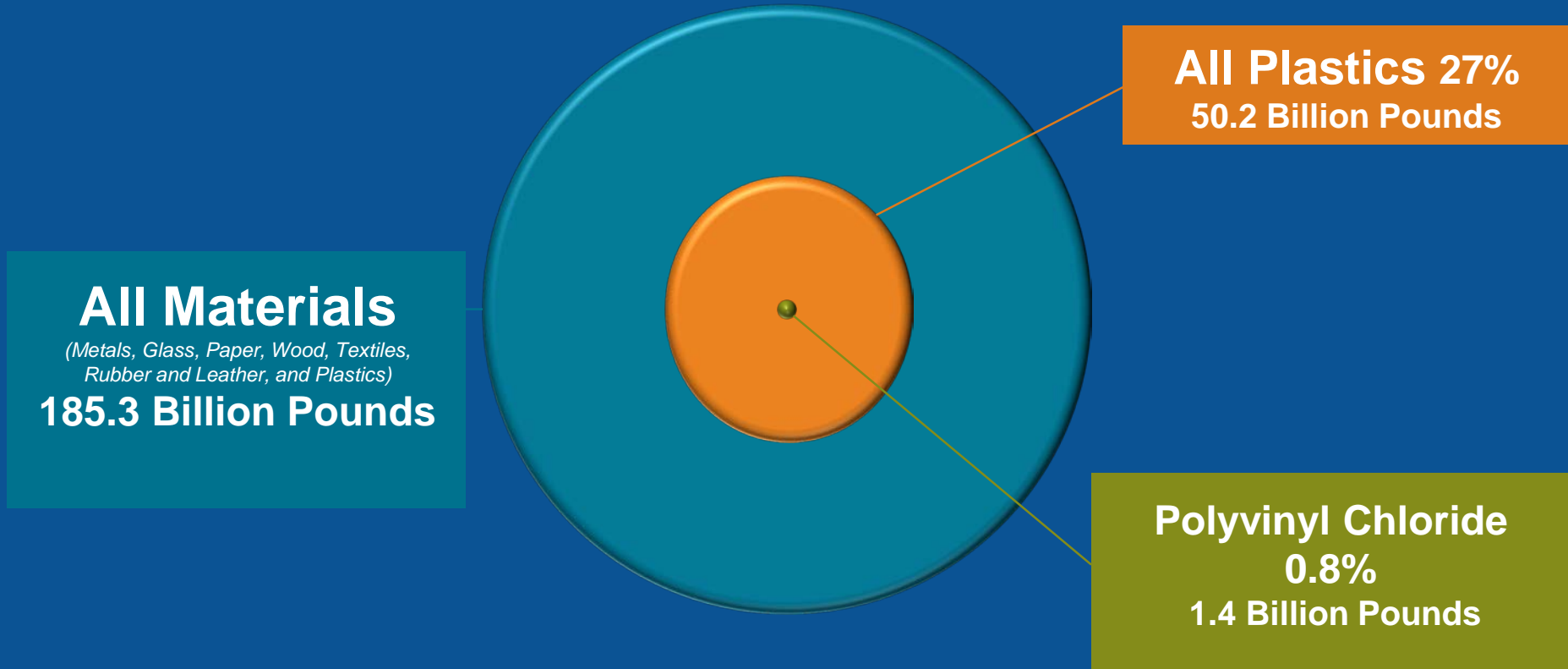
The Vinyl Institute, founded in 1982, is a U.S. trade association representing the leading manufacturers of vinyl chloride monomer, PVC resin, vinyl additives and modifiers.

- **Mission:** The Vinyl Institute is dedicated to promoting the benefits of vinyl products.
- **Vision:** Vinyl is the material of choice for diverse products that enhance the quality of life.
- The Vinyl Institute serves as the collective voice for the entire vinyl industry

Presentation Outline

- EPA Landfill Estimates
- Recycling enhances vinyl sustainability
- Codes and standards driving recycling
- U.S. vinyl markets
- Tarnell Survey Results
- Conclusions

Landfilled PVC in Perspective



Source: U.S. EPA Municipal Sustainable Materials Management Report for 2014

Circular Economy vs. Sustainable Materials Management

- *(Ellen MacArthur Foundation)* - A circular economy is one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times
- *(OECD)* - SMM is an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials.

Sustainability Principles

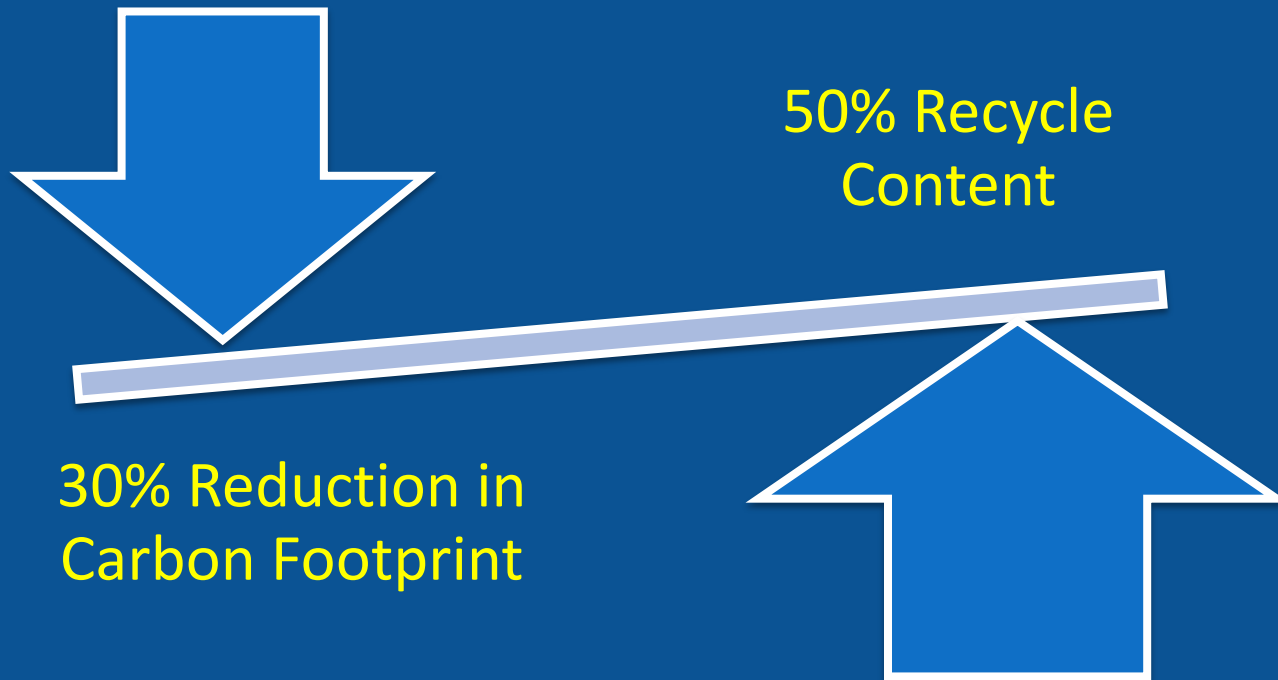


Impact of Recycling in Sustainability



Vinyl Recycling Life Cycle Benefits

Reference: Vinyl Product LCA Analysis by Sustainable Solutions



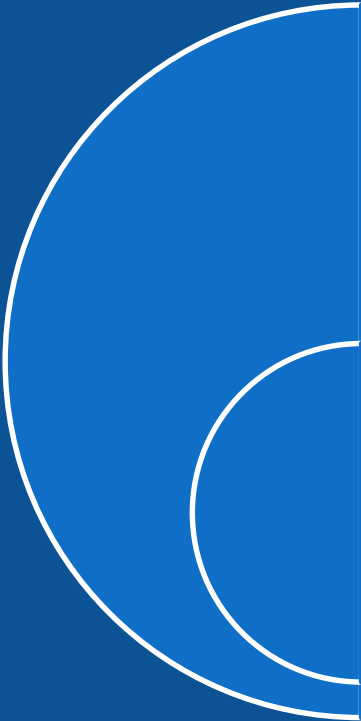
Green Building Certification Programs Include Recovery and Recycling

<u>Standard</u>	<u>Sub Category</u>	<u>Credit Levels</u>
GBI/ANSI 2010	R/M 10.1, -.2 Materials Content	1% or more of building materials contain pre- and post-consumer recycled content
GBI/ANSI 2010	R/M 10.5 Reduction, Re-use, and Recycling of Waste	25% or more of construction and demolition waste must be diverted from landfill
LEED	MR Construction Waste Management	Divert 50 to 75% from Landfill
LEED	MR Sourcing of Raw Materials Content	25% of cost from Post- & Pre-consumer product content

Green Building Codes Now Include Recovery and Recycling

<u>Standard</u>	<u>Sub Category</u>	<u>Requirement</u>
IGCC	503.1 Construction Material and Waste Management Plan	Divert 50% of Waste Materials from landfill or Incineration in accordance with recycling or salvage plan
IGCC	505.2.2 Recycled Building Materials Content	Minimum of 55% shall contain 25% Post-Consumer and Pre-Consumer Recovered Material
IGCC	505.2.3 Recyclable Building Materials	Material that contains recycle content must be able to be recovered and recycled at >30%

Recycling Credit in Standards and Codes



Recycle content credit for all building materials is an important objective in order to drive **landfill avoidance** contributing to the sustainability efforts in the building industry

But achievable thresholds for all types of building materials are necessary for this to be accomplished.

FTC Guidelines on Recycled Materials

- Federal Trade Commission “Green” Guidelines –
 - Established in 2011
 - Does not distinguish between pre- and post consumer as long as it has been diverted from the waste stream.
 - *Must have ability to be recycled to claim a product or material is recycleable, otherwise must clarify where;*
 - ACC/Sustainable Packaging Consortium Recycling Survey found post-consumer recycling for curbside vinyl packaging was available in roughly 60% of municipalities.

Standards Defining Recycled Materials

- ISO 14021 – Post Consumer is generated after material has served its intended purpose, and includes returns from distribution chain.
- ISO 14021 – Pre-Consumer is material diverted from waste stream during the manufacturing process, and excludes material capable of reclaim within its own process; this term has replaced Post-Industrial.

Standards Validating Recycled Materials

- ASTM E2129 – Standard Practice for Data Collection for Sustainability Assessment of Building Products
- ULE 2809 - Environmental Claim Validation Procedure for Recycled Content
- NSF ANSI Sustainability Standards – assigns points for end of life take back, and product recycle content

U.S. PVC Industry Tarnell Statistics

(<http://voicesforvinyl.com>)

Countrywide Totals

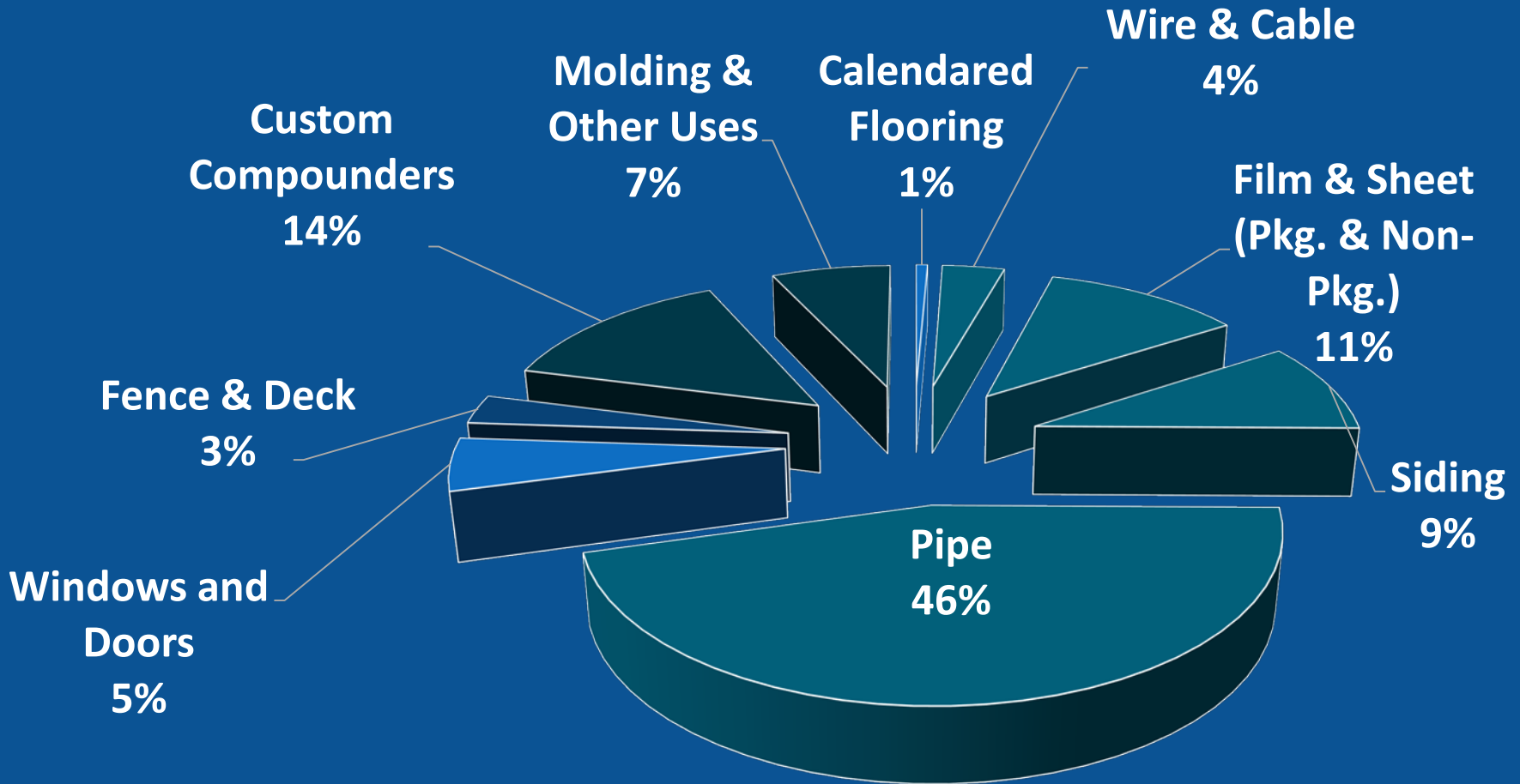
Number of Facilities: 2,941

Number of Employees: 357,071

Economic Value: \$54,478,350,000

U.S. Vinyl Markets – Up 3.7% for 2016

Domestic Resin Consumption: 10.4 Billion Pounds



Source: American Chemistry Council Resin Report 2017

Tarnell Survey Methodology

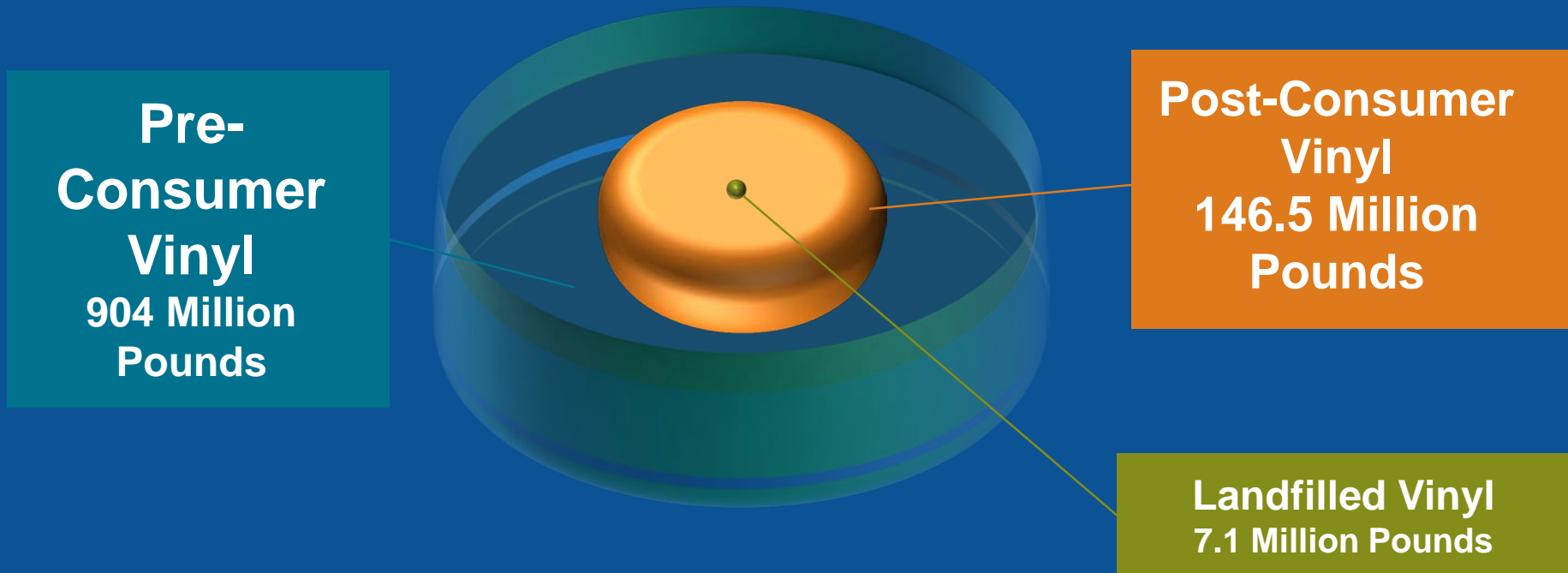
- Survey conducted from January to March, 2017 for recycling activities during 2016;
- Of 158 potential recyclers contacted, 109 U.S. and Canadian Companies vetted as current vinyl recyclers, brokers, or finished product manufacturers;
- Qualified recycler representatives surveyed included purchasing managers, engineers, or company principles;

Tarnell Survey Methodology

- Information was obtained on recycled material amounts and types purchased/sold/landfilled, reprocessing capabilities, and markets served.
- To avoid any double counting, purchased volumes were compared to sold volumes, and broker volumes were identified

Recycled Vinyl Materials – U.S. and Canada

Post-Consumer Recycled Vinyl Up 40% Since 2014



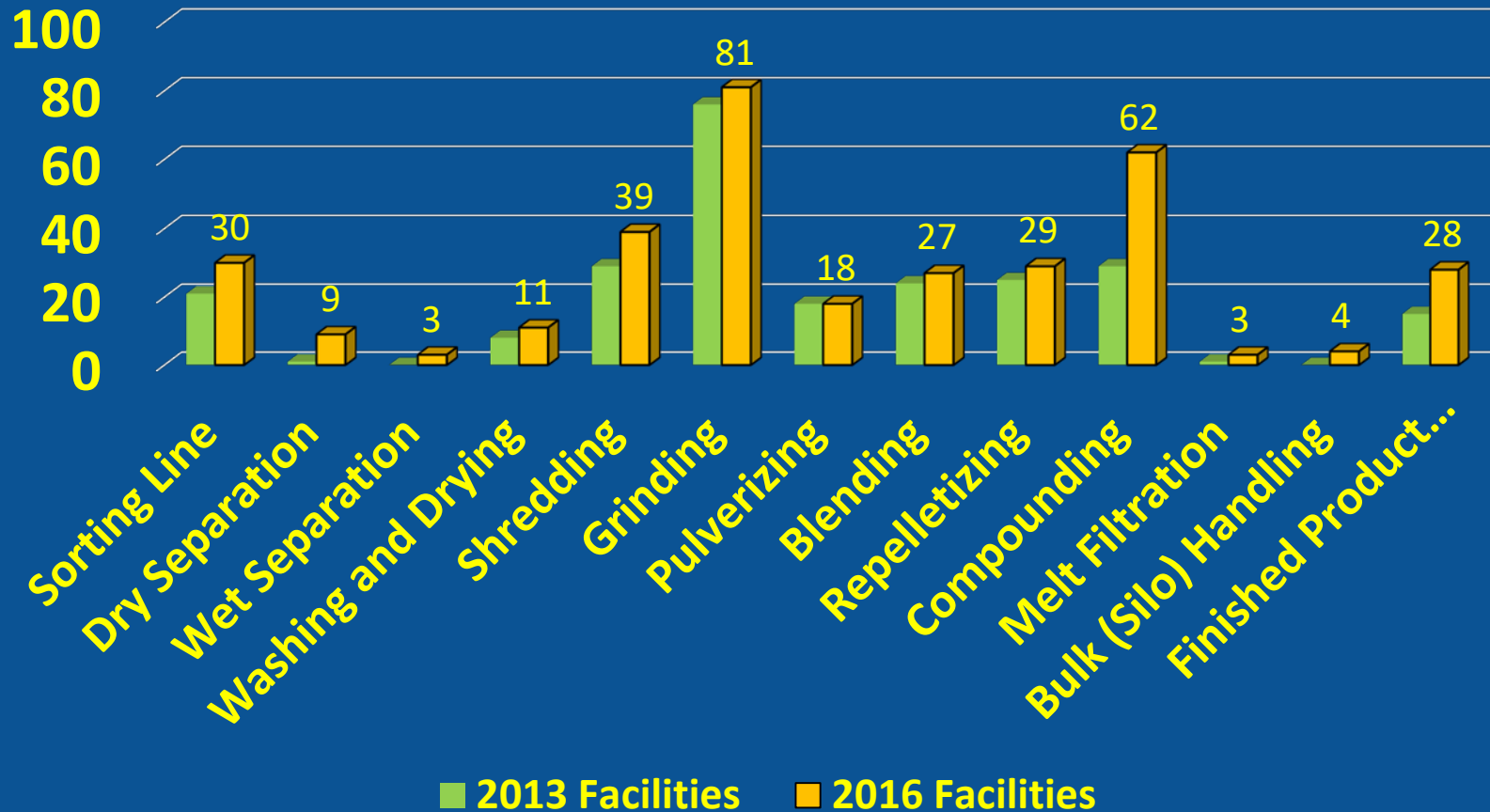
Source: Tarnell Company 2017 VI Survey, Sold Amounts

2016 Vinyl Recycling Summary

Tarnell Survey Sold Amounts

Type of Company	Number of Companies	Pre-Consumer Amount, MM lbs.	Post-Consumer Amount, MM lbs.	Landfill Amount, MM lbs.	Total Amount, MM lbs.	Total Amount, %
Broker	14	73.7	0.0	0.0	73.7	7%
Compounder/Repelletizer & Finished Product Processing	63	726.4	140.6	5.7	872.5	82%
Sorter/Grinder/Blender Processing	32	103.9	5.9	1.4	111.4	11%
Total	109	904.0	146.5	7.1	1,057.6	100%

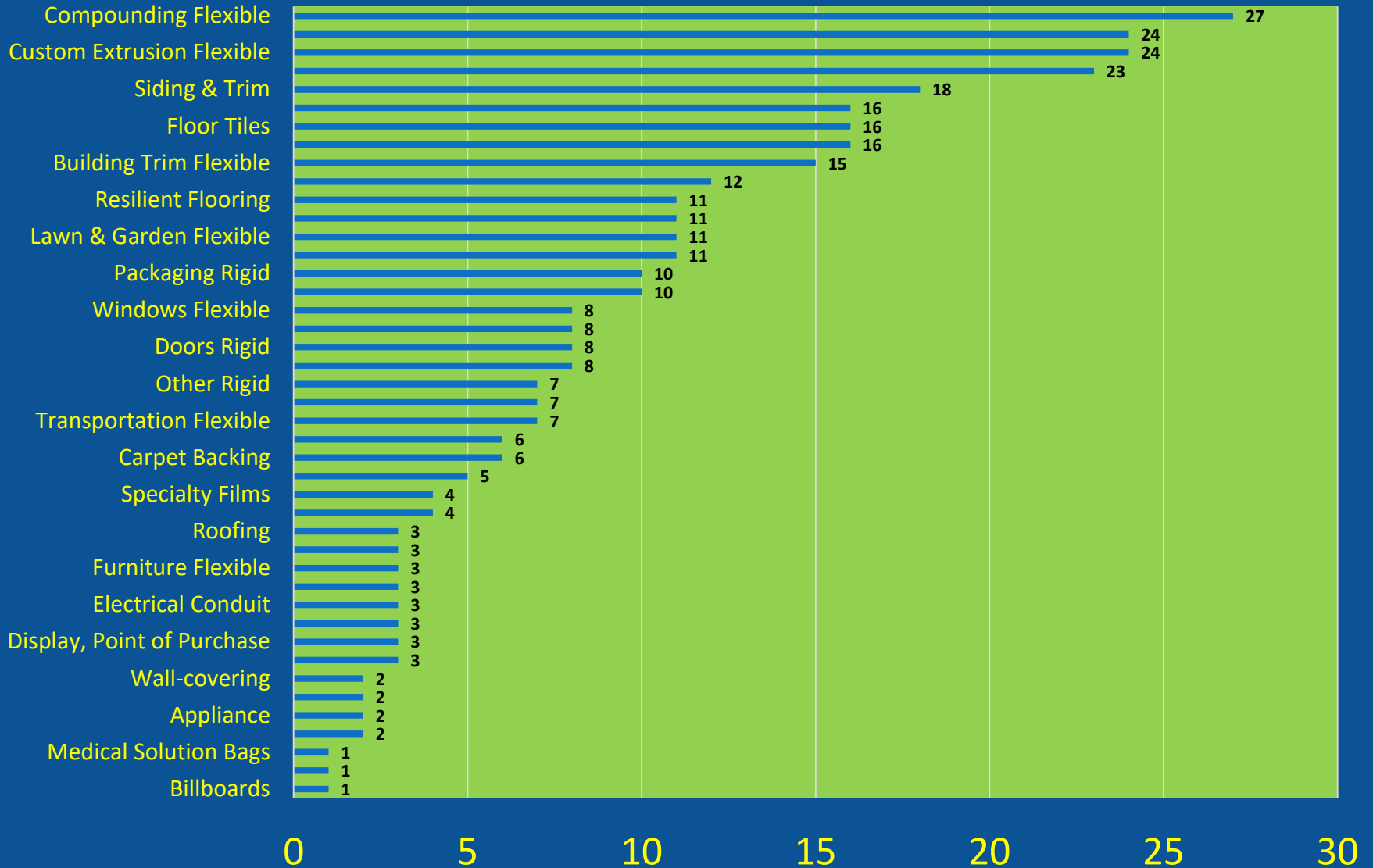
Reprocessing Capabilities Growing 2016 vs. 2013



Source: Tarnell Company Surveys

Sources of Recycle Materials

Number of Companies



Top 5 End Markets for Recycled Vinyl

- Custom Extrusion
- Building Trim
- Floor Coverings
- Small (<4") Diameter Pipe
- Siding, Soffits, and Trim

Post-Consumer Rigid PVC Recycling Flows in Building and Construction

<u>Category</u>		<u>Material</u>		<u>Recycle Application</u>
Installation Drops	→	Listed Pipe	→	Listed Pipe
		Vinyl Siding		Siding Substrate
Tearoff Recovery	→	Siding	→	Substrate for siding, Substrate for fence, deck
		Windows, Doors		
		Electrical Conduit		Electrical Conduit, Non-listed Pipe
		Pipe		Non-listed Pipe

Post-Consumer Flexible PVC Recycling Flows in Building and Construction

<u>Category</u>		<u>Material</u>		<u>Recycle Application</u>
Installation Drops	→	Wallcovering	→	Wallcovering sub.
		Roofing		Roofing sub.
		Flooring		Flooring sub.
Tearoff Recovery	→	Wallcovering	→	Wallcovering substrate
		Wallcovering Flooring		Substrate for flooring or wallcovering, carpet backing
		Roofing		Roofing

Conclusions

Vinyl recycling industry is robust and post-consumer amounts are growing

Recycling vinyl reduces the carbon footprint of finished products and enhances their sustainability

Acknowledgements

- The authors thank the SPE ANTEC for the opportunity to present today, the Vinyl Institute and its members for their support and wish to acknowledge the support of Tarnell Company, LLC for completing the survey and providing its information and data.

Thank you for your attention: Questions?

Attend the Vinyl Institute's
Annual Meeting

November 6 – 8, 2017

Ponte Vedra Beach, Florida

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