

Plastics: The Big Picture

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What we'll look at today

- A short primer on plastics
- An overview of recycling markets
- Some key trends and issues

Plastics primer

The basics for plastics are:

- a carbon source is converted into a monomer, such ethylene or styrene
- the monomer is then polymerized (the molecular chain is extended), thus producing a plastic
- the plastic is often enhanced by a compounder
- the resin is then used by a converter to make a product

How the market is segmented

Thermoplastics versus thermosets

Commodity plastics versus engineered resins

Polyolefins as a special class

Petro-carbons versus bio-carbons

Compostables versus non-compostables

Degradables versus non-degradables (the oxo war)

The oxo war

These plastics contain a pro-oxidant additive to standard resins.

The additive contains transition metal ions of cobalt, iron, manganese and/or nickel.

The additive is used at a 1-4 percent loading.

No special equipment is needed to make a bag, bottle, etc.

The oxo war

When thermally stressed, the plastic breaks apart.

Suppliers say the plastics degrade. Others say they do not.

The recycling industry wants producers to prove degradable plastics don't harm recycling.

The State of California has sued three bottled water makers over their claims.

Industry segmentation

American Chemistry Council (ACC) -- monomer and polymer producers.

Society of the Plastics (SPI) – converters

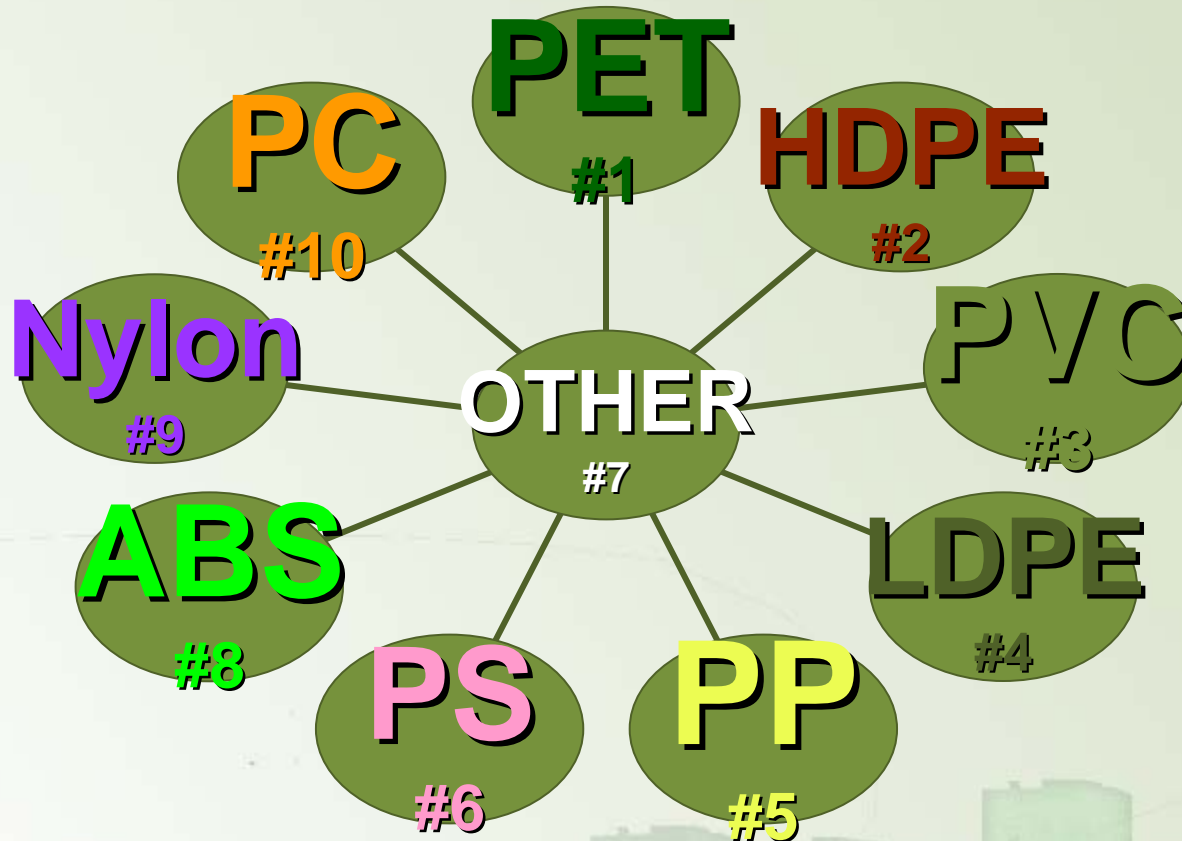
Society of Plastics Engineers (SPE) – the scientists

National Association for PET Container Resources (NAPCOR) – PET plastic bottle

Association of Post-Consumer Plastic Recyclers (APR) – plastic bottle reclaimers

Institute of Scrap Recycling Industries (ISRI) – other processors

Resin coding



Resin coding issues

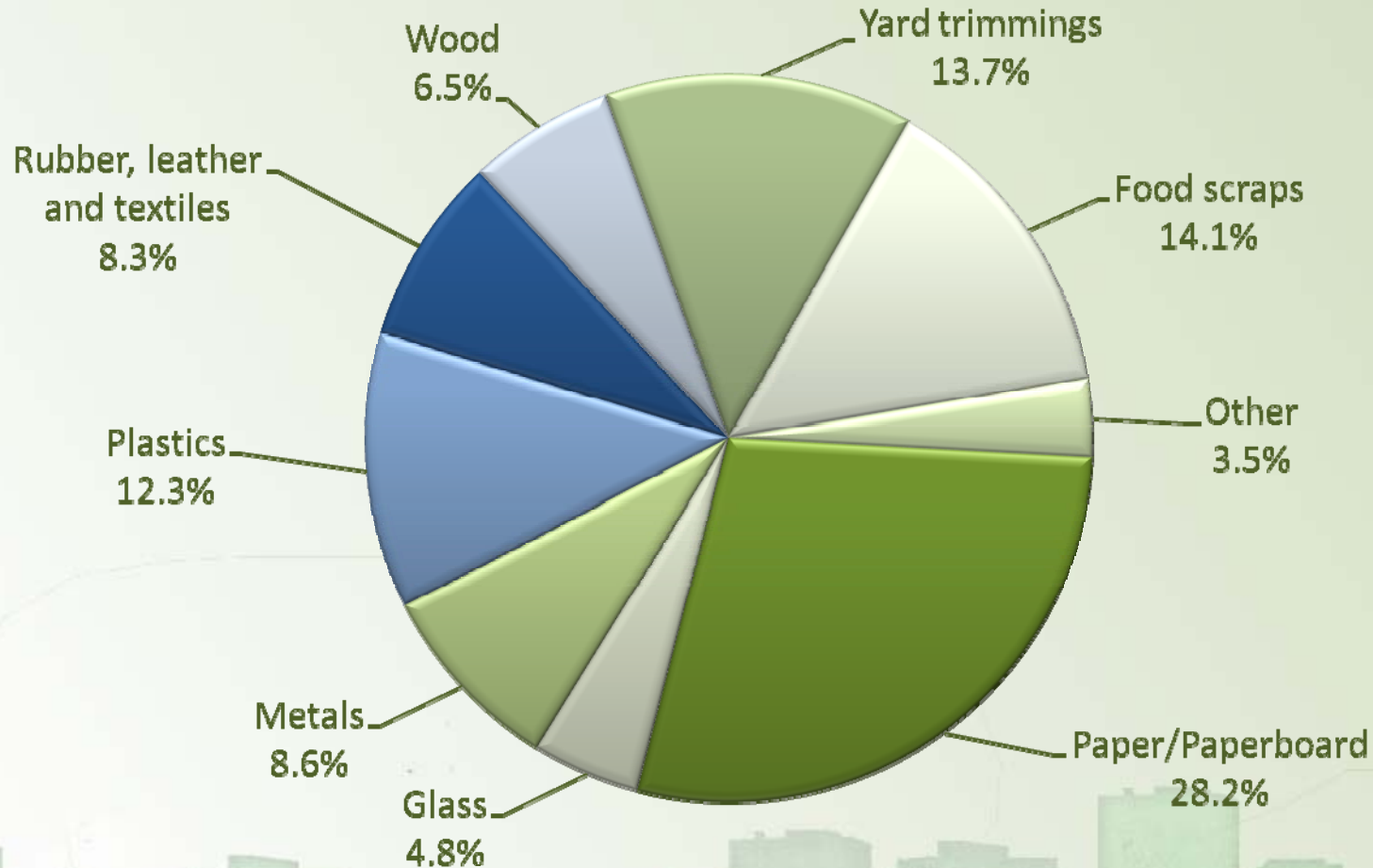
Very few use the current code for recycling purposes. The rise in 1-7 recycling collections means programs promote that they handle “all plastic bottles.”

New resins and sub-resins mean the code will always be behind.

A new code will likely be produced soon by a stakeholder working group within the American Society of Testing and Materials.

Of greater concern by many is the notion of “recyclable.”

Recycling markets: We have a lot of plastics in our MSW



Plastics are being collected

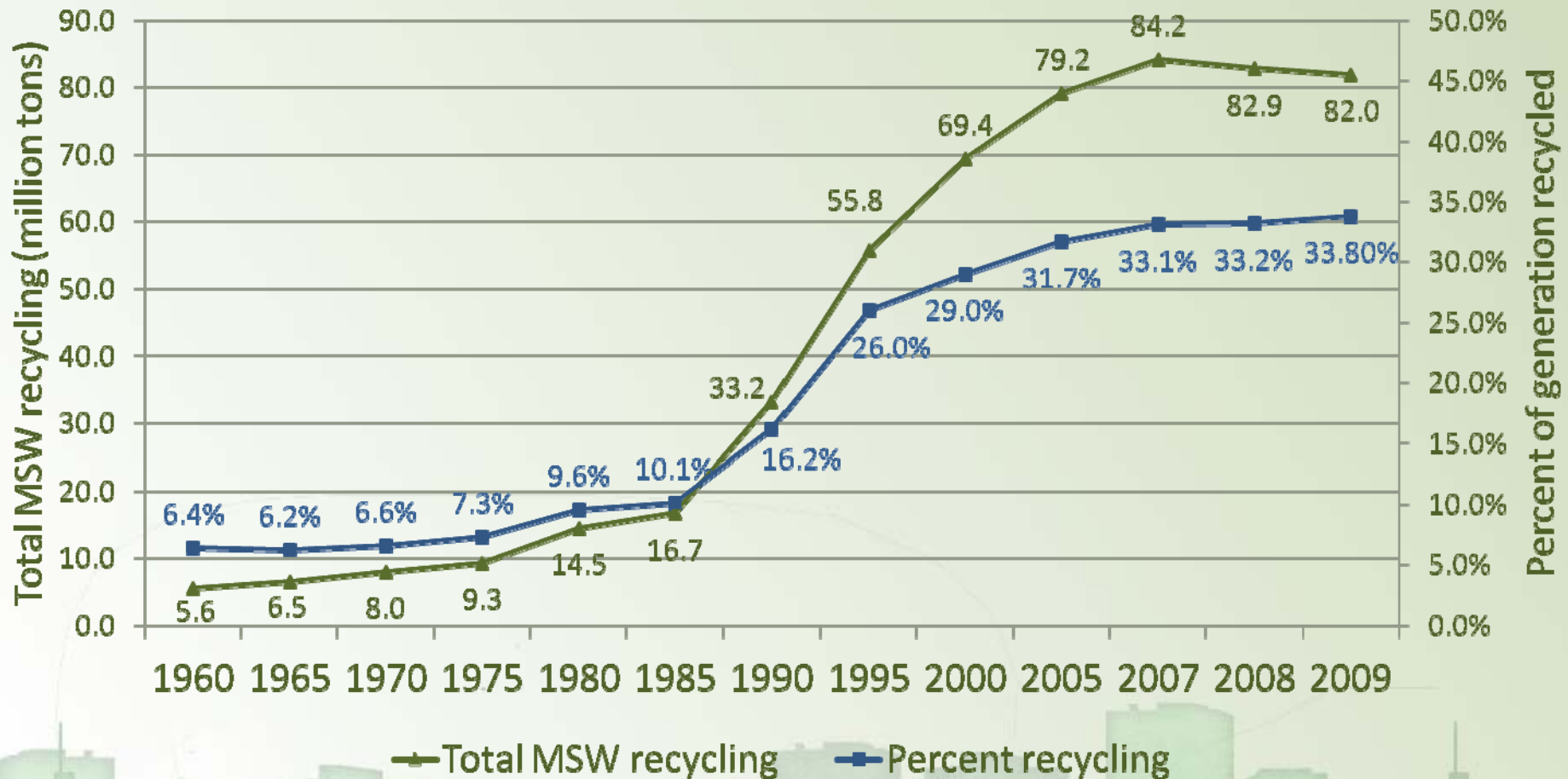


And are being processed

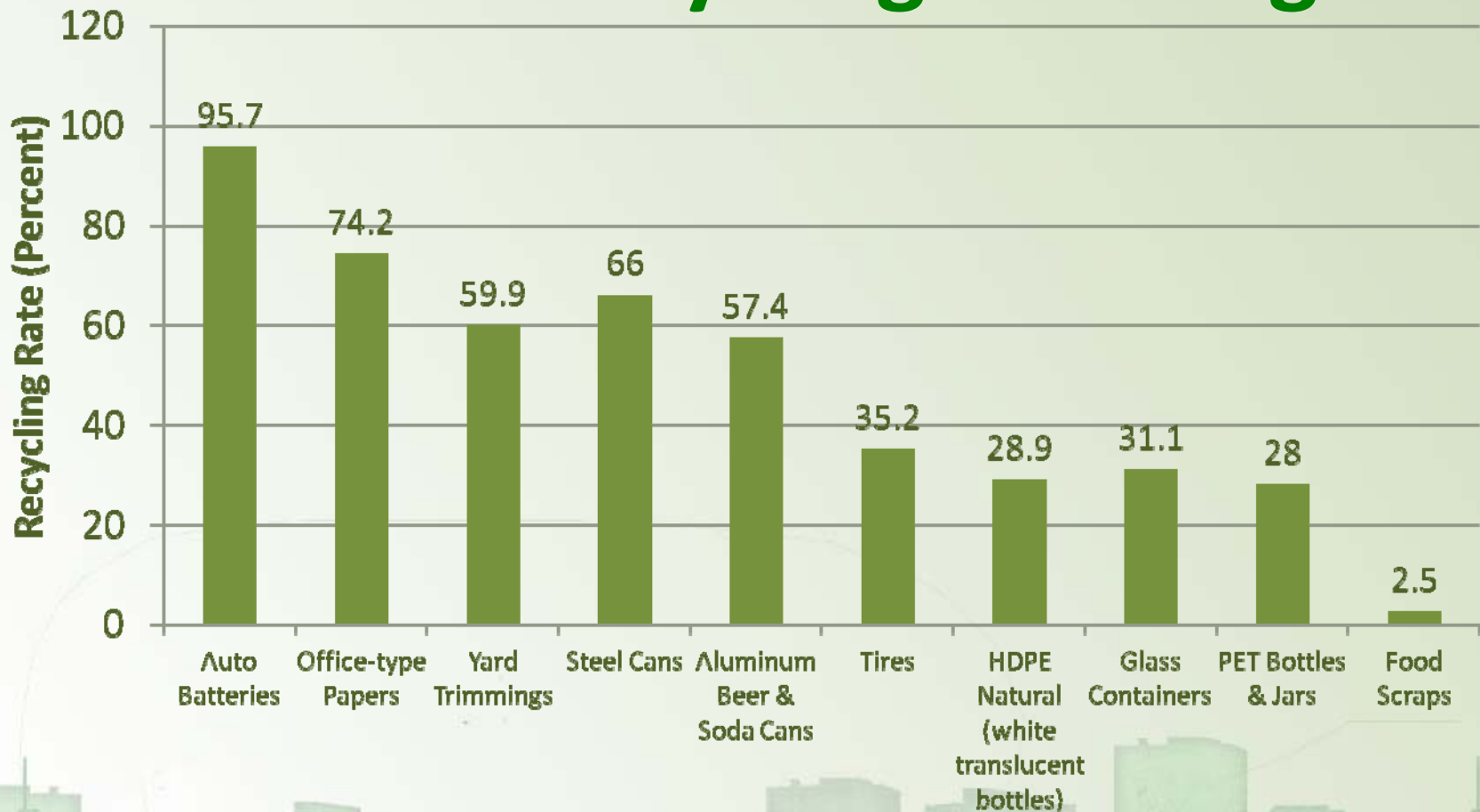


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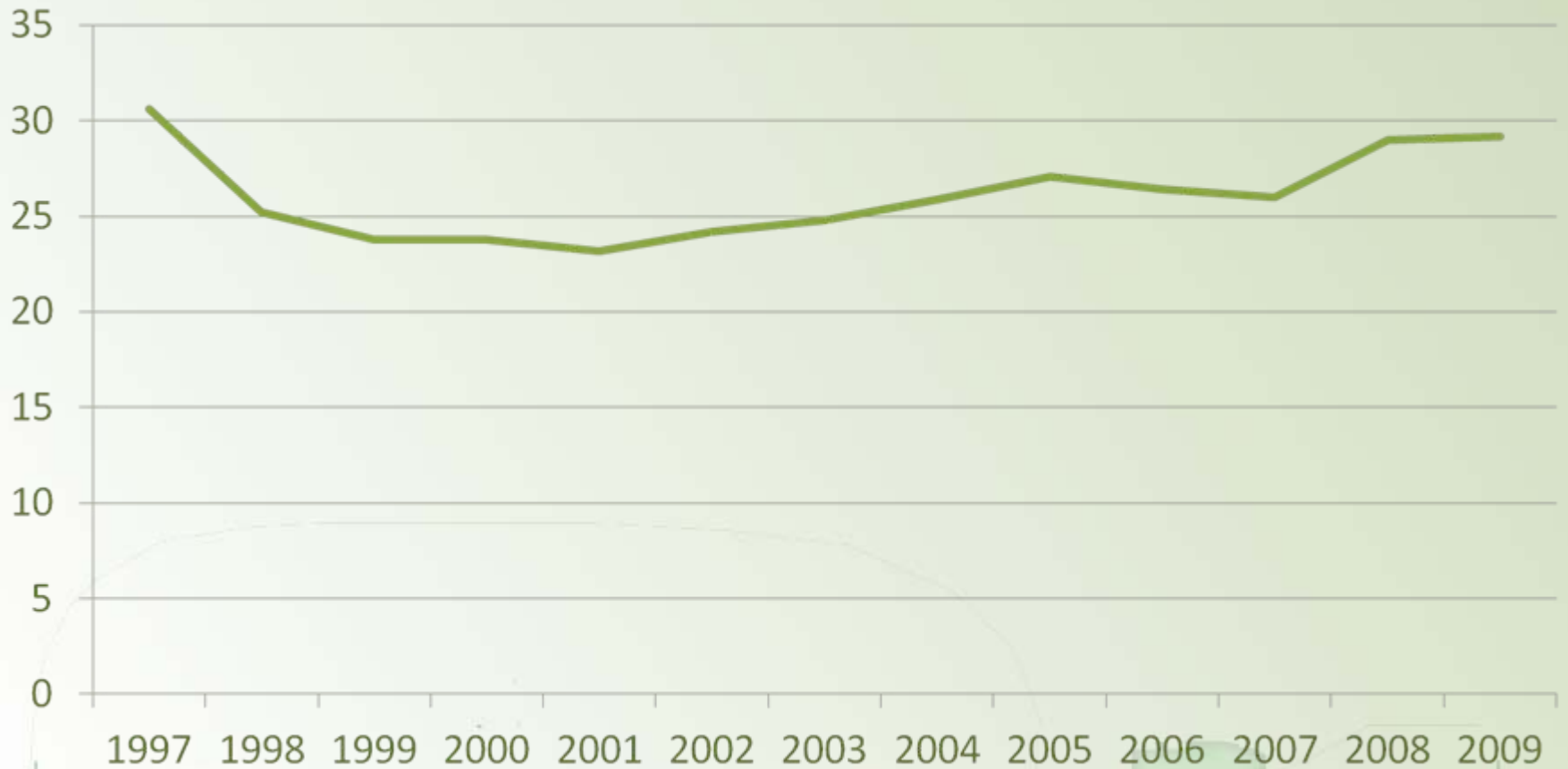
So, while we're recycling about a third of MSW



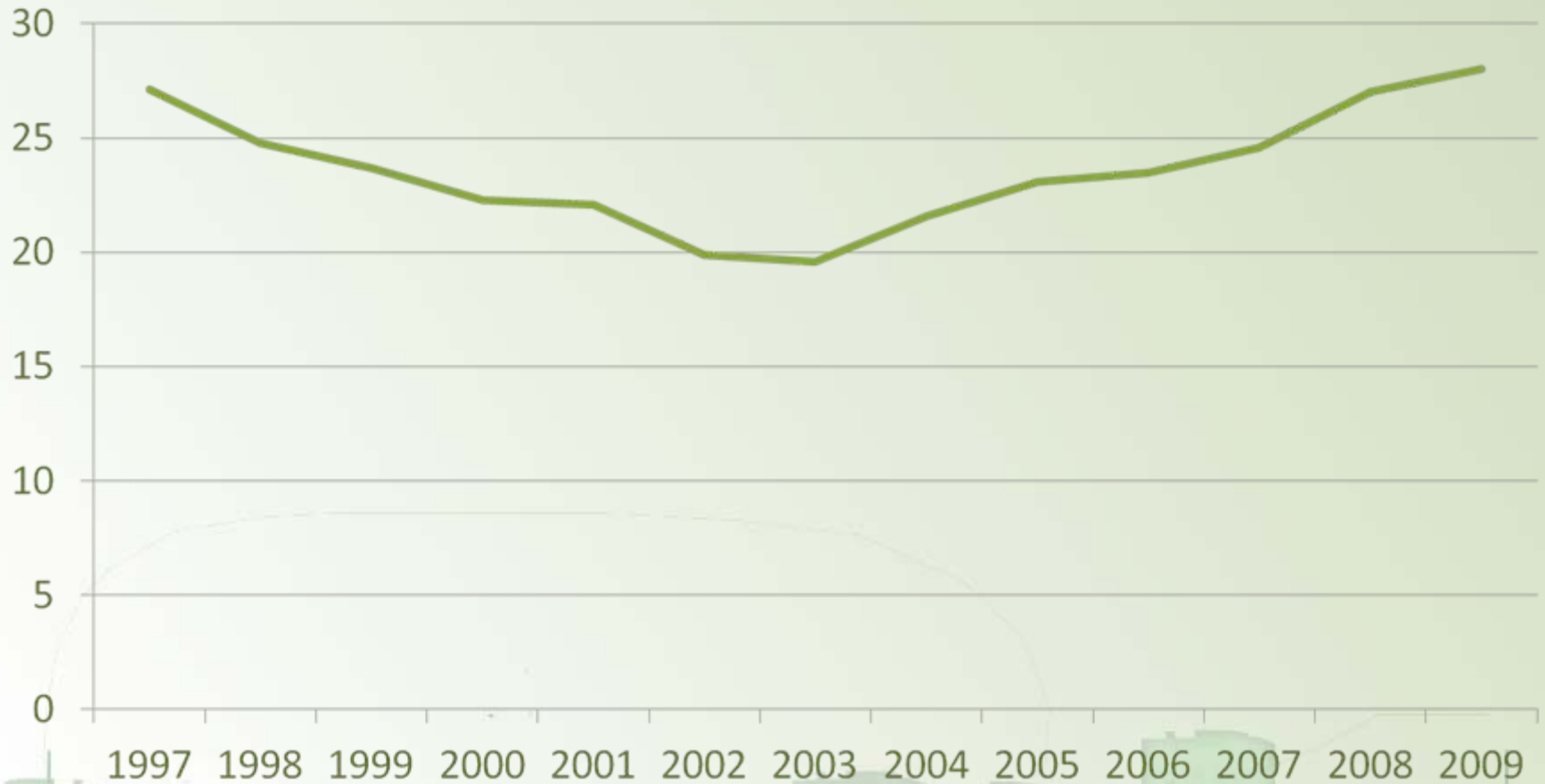
Plastic recycling rates lag



HDPE recycling rate



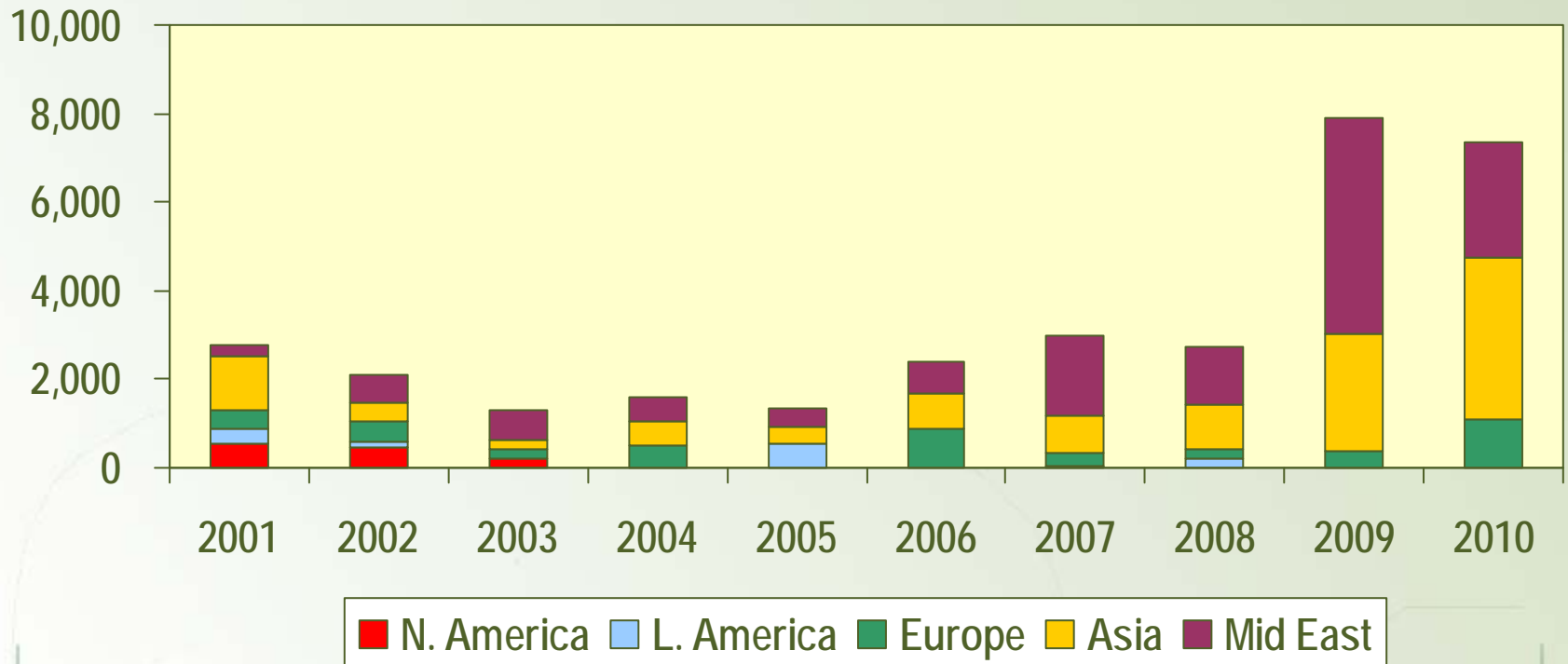
PET recycling rate



Recycling market factors

But plastics' growth is slowing. The number of plastics converters and the number of people employed in the industry have declined in the past decade, and this trend is expected to continue.

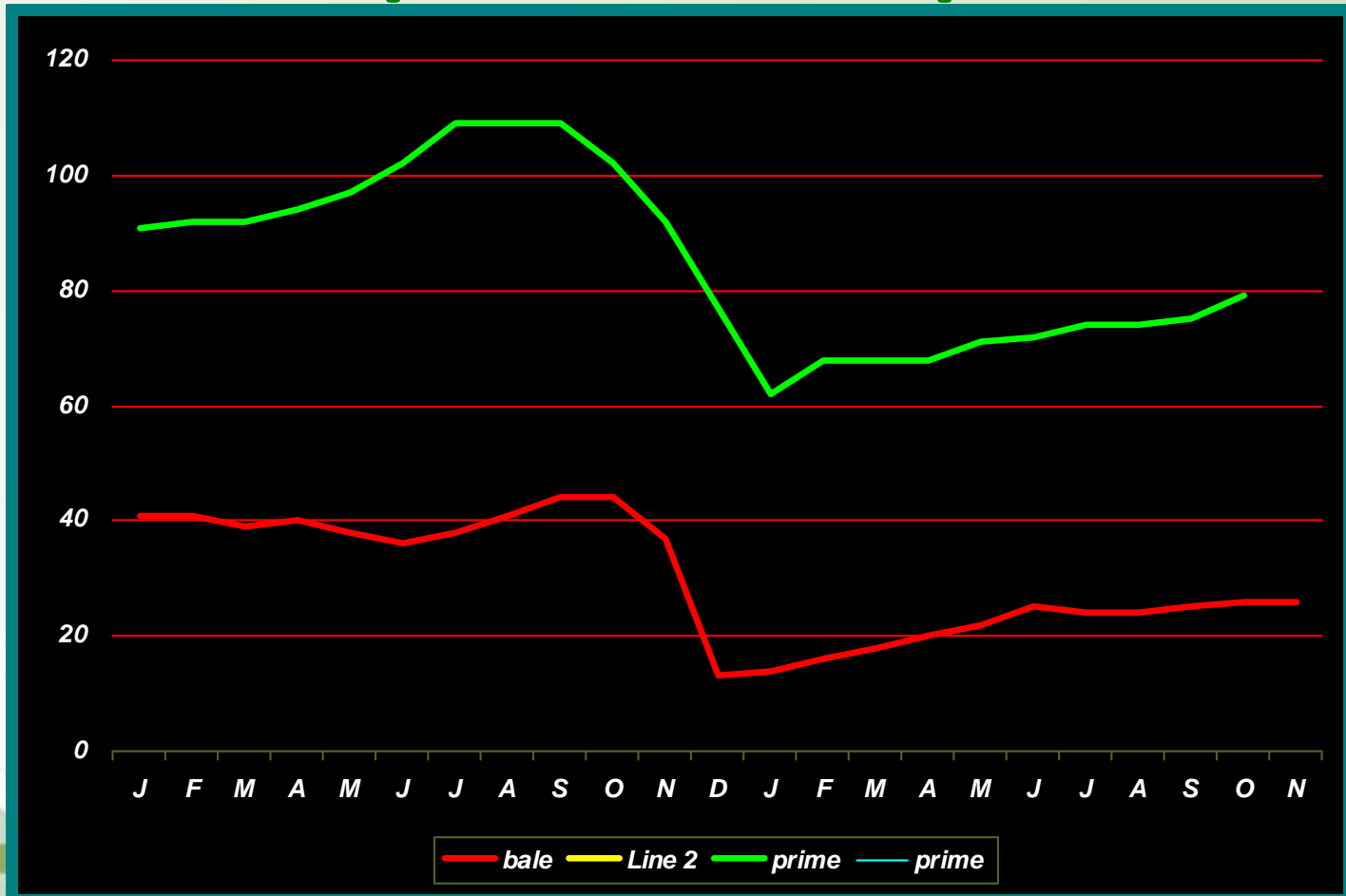
No new PE plants in developed countries



Recycling market factors

To the surprise of hardly anyone, the prime determinant of the price of recycled plastic is the current and expected price of crude oil or natural gas.

Homopolymer HDPE bale and prime resin prices



Recycled plastics have been at record highs (HDPE)



And the same for PET

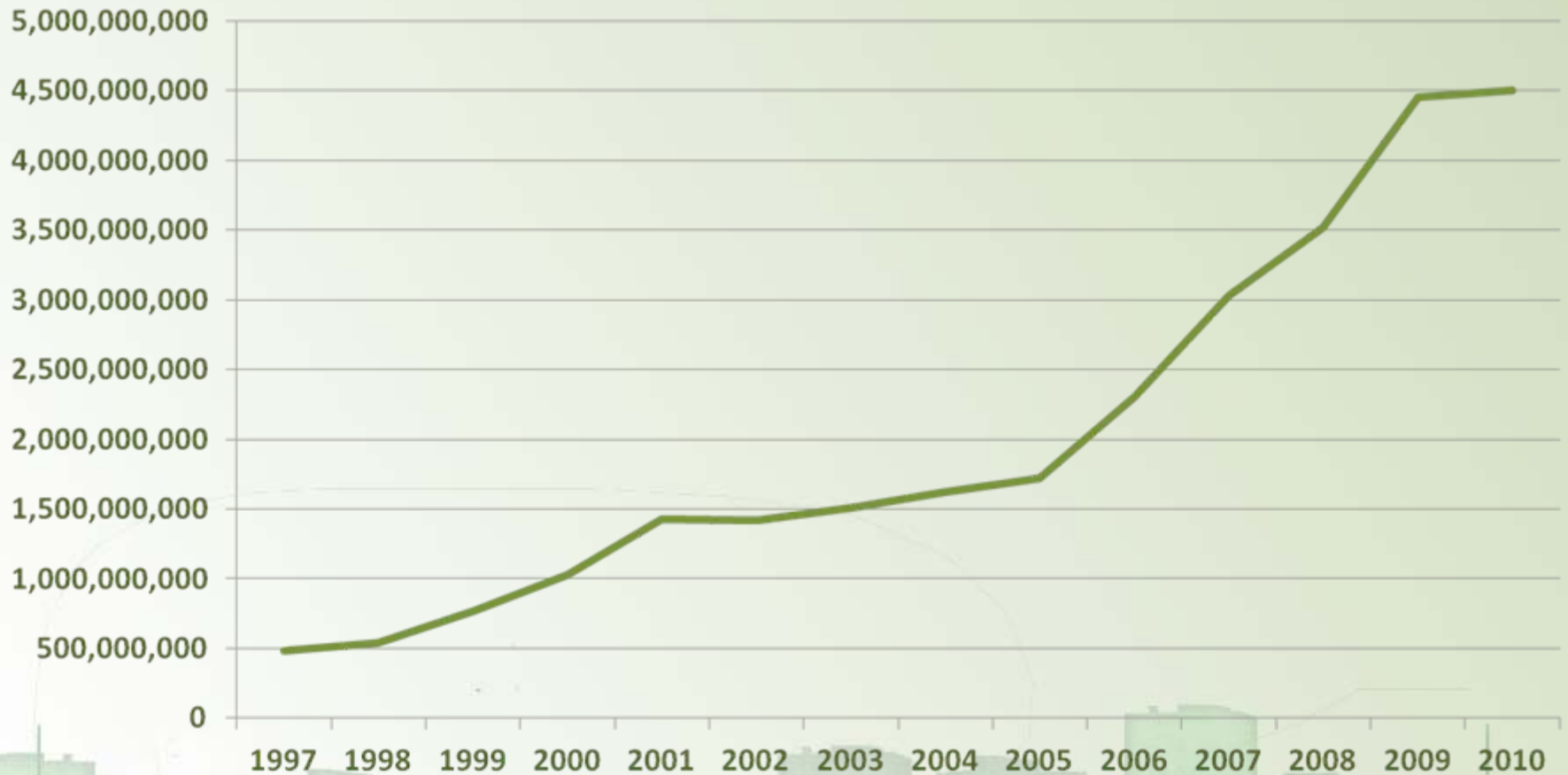


Recycling market factors

The principal way to accurately discuss plastics recycling markets is to focus on global market conditions.

Plastics exports

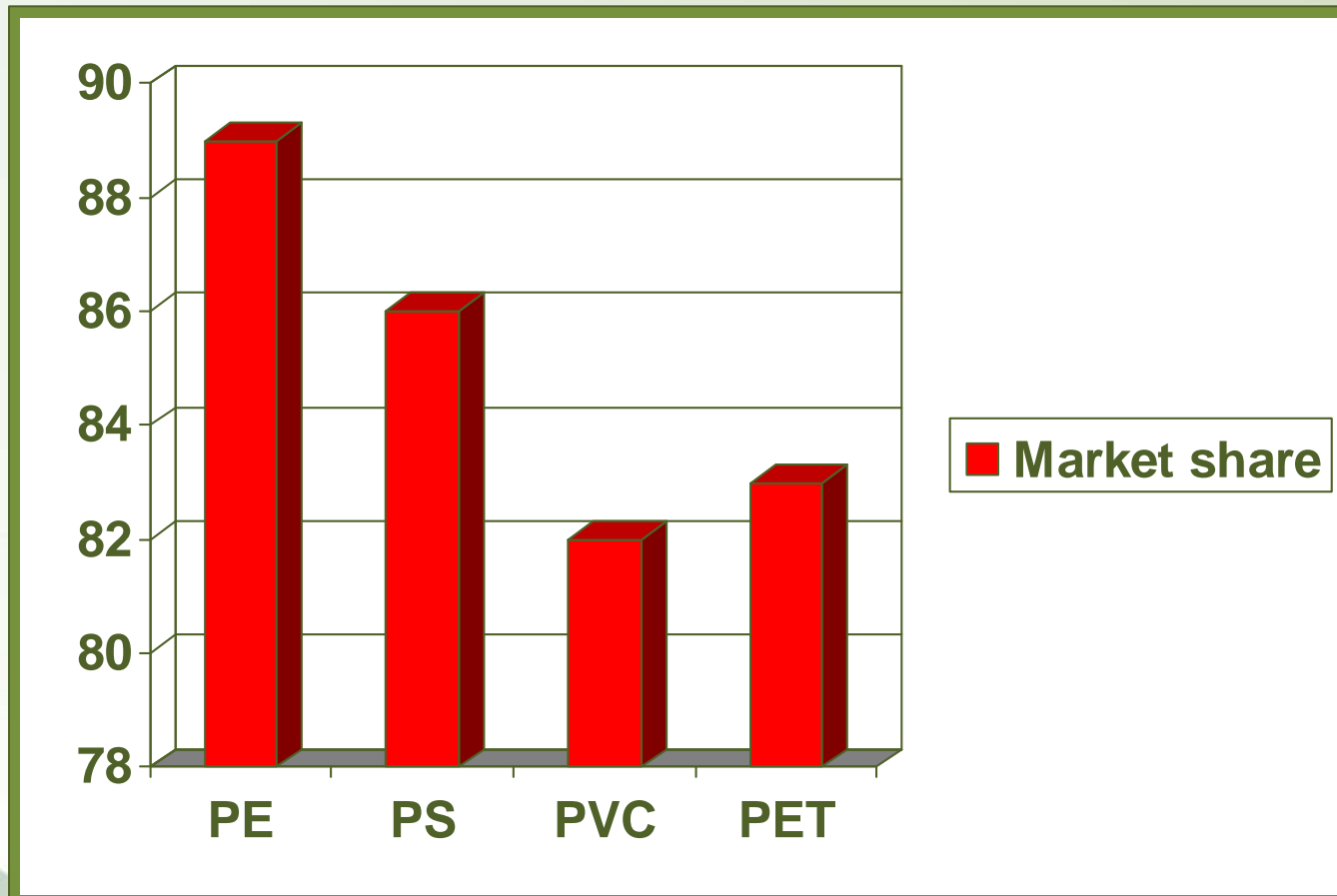
(In pounds)



Top exporters in 2010 in million pounds

Jetway International	267
America Chung Nam	187
Guangyi Group	146
JC Horizon Trading	104
Top Shipping Logistics	83

China's remarkable export market share



Domestic market contraction

PET reclaimers have lost share to Chinese buyers. This is the share held by exports for bales of plastic bottles from the U.S. MRFs:

2000	22 percent
2002	35 percent
2004	37 percent
2006	51 percent
2008	57 percent
2010	50 percent

Domestic market contraction

PET reclaimers are thus operating at less and less of their combined capacity:

2004	84 percent
2006	86 percent
2008	80 percent
2010	73 percent

The future: Chinese economic growth

Recycling markets will again shift as China becomes a developed country:

- modest return of U.S. manufacturing
- higher westbound freight rates will dampen demand for U.S. recyclables
- investment by China in raw material production in Africa, Asia and elsewhere
- China will become much more self-sufficient in recycling

The future: Chinese economic growth

National Association of Manufacturers:

“China’s challenge to U.S. manufacturing has peaked, and its competitive advantage is in decline.”

The future: Chinese economic growth

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The future: Chinese economic growth

Why China will change:

- high literacy
- rising wages
- growing unionization
- increasing costs of land
- rising costs of energy
- growing concerns over environmental issues
- attention toward working conditions

Trend 1: More innovation

Will we see continued innovation, as we have in the past?:

-- lightweighting

-- composite products

-- food-contact applications (from PET to HDPE to thermoformed PET in a decade)



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The Coca-Cola Company



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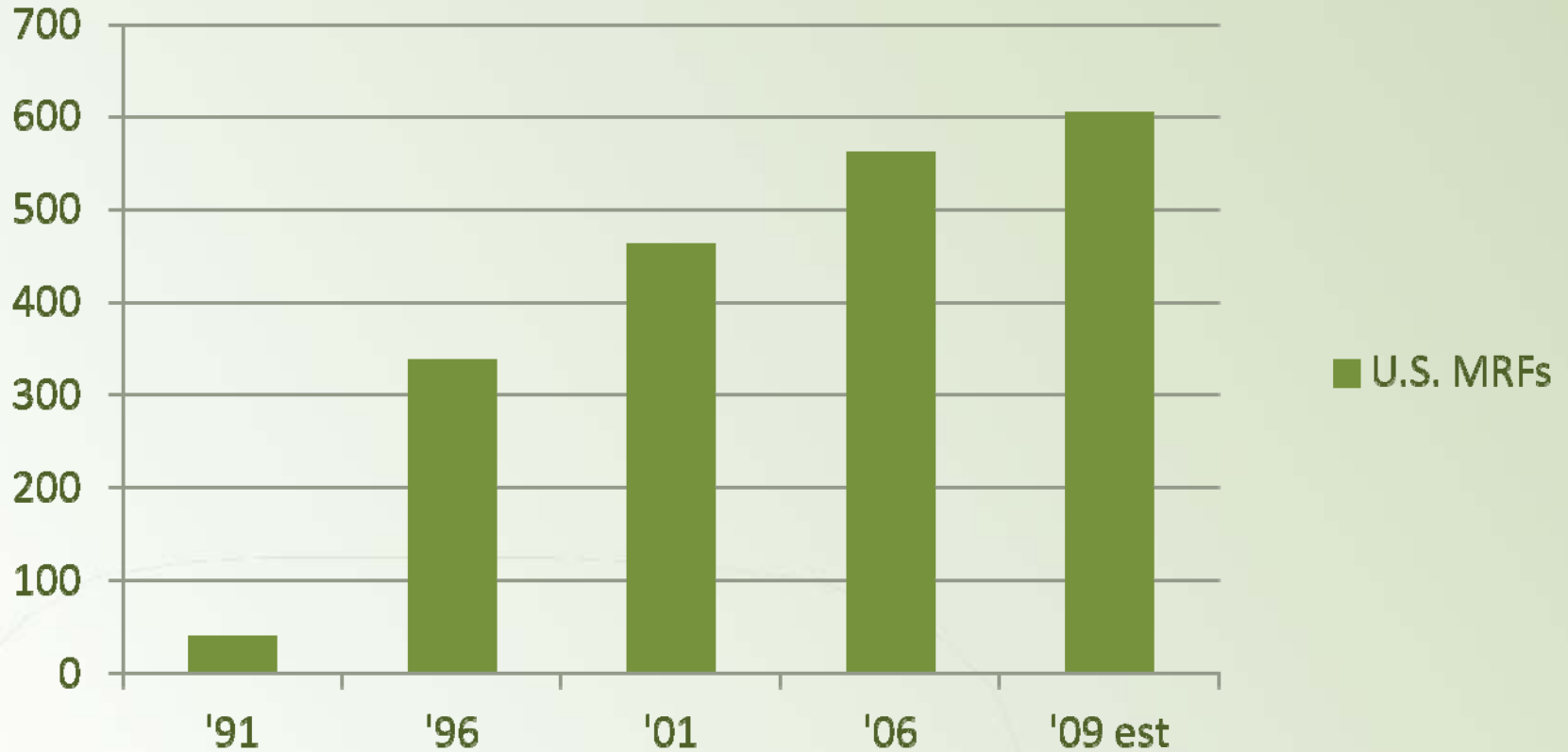
The Coca-Cola Company

Trend 2: Improved collection and processing practices

We can expect:

- more homes to be served (multi-family, especially)
- more small businesses
- service to public areas, events, etc.

We continue to grow



Trend 2: Improved collection and processing practices

Yes, more than 10,000 communities, where 63 percent of Americans live, now collect plastics curbside. Yes, 193 million Americans can set out plastics weekly. And we'll soon see about 70 percent of these programs being single-stream.

More single-stream programs

And more people will be provided single-stream recycling collection service:

2005 – 29 percent of the population had access to single-stream collection

2010 – 64 percent had access

But the MRF will change

First, the loss of fiber tons is affecting MRF operations. Many MRF operators are seeking new tons, such as cartons. Another growing opportunity is the collection and processing on non-bottle mixed-rigid plastics (tubs, lids, buckets, etc.) and PET thermoformed packages.

Mixed non-bottle rigids recycling

A 36-member APR stakeholder groups has worked for three years to:

- develop bale specifications
- determine demand for recovered materials
- launch a grocery store project targeting pails generated at large outlets

Mixed non-bottle rigids recycling

The American Chemistry Council has funded a project to develop case studies on successful mixed-rigid plastic recycling programs (collection, processing, markets, education and promotion, etc.).

PET thermoform recycling

A multi-stakeholder project involving NAPCOR, Stewardship Ontario and Canadian retailers, including Wal-Mart.

The result will be the addition of PET thermoformed packaging to curbside collection systems in much of Canada.

But the MRF will change

Second, larger MRFs allow for the efficient use of optical sorting systems. Research we performed for ACC showed an increase in MRF sorting systems:

<u>Year</u>	<u>Manufacturers</u>	<u>Systems</u>
2006	8	23
2010	18	52

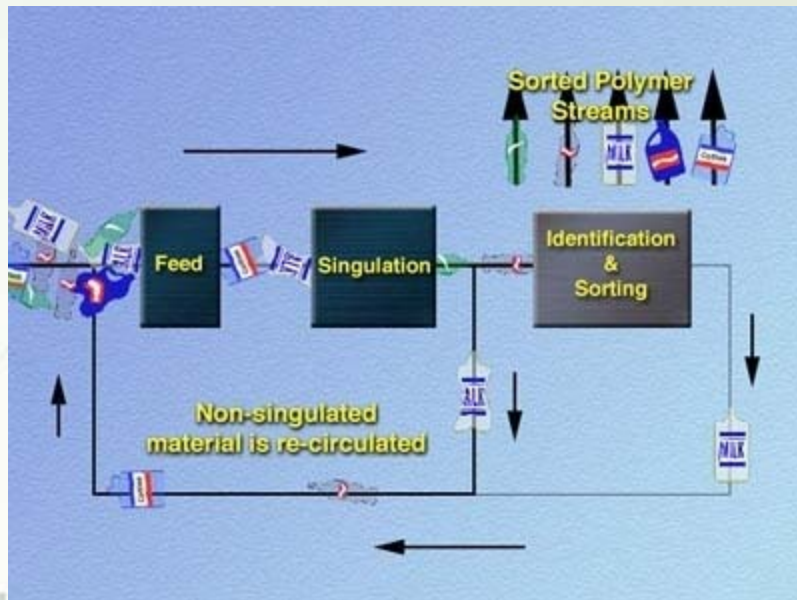
Automated sortation

Resin identification can involve spectroscopy, x-ray or x-ray fluorescence (XRF) technology.

Color identification can involve vision technology or spectroscopy systems.

Some handle whole bottles

Rofin Rapid Sort 75



Others handle flake



Trend 3: Plastics-to-oil

A sizable amount of scrap plastics will remain unrecycled:

- motor oil bottles
- plastic film in recovered paper bales
- MRF sweepings
- some forms of agricultural plastics
- some composites

North American systems

- JBI, Inc.
- Nexus Fuel
- Agilyx
- Envion
- Recycle Tech
- Infinity Energy
- PolyFlow
- Natural State Research
- Global Resources Corp.
- Vadyxx
- GEEP
- Climax Global Energy

Foreign systems

- Cynar/Sita (UK)
- Axion (UK)
- PlastOil (Switzerland)
- Blest (Japan)
- Warwick University (UK)
- Eicho Co. , Ltd. (Japan)
- P-Fuel, Ltd. (Australia)
- Korea Eco-Systems (Korea)
- Ozmotech (Ireland)
- PARC (China)
- Polymer Energy (Thailand and India)

Common feedstocks

- Scrap carpet
- Engineering grade resins
- Post industrial scrap
- Nos. 2, 4-7 (systems tolerate PE but are not designed to rely on it)
- Auto shredder residue
- Ag plastics
- Oil bottles
- Caps, labels and rejects from reclaimers

Trend 3: Plastics-to-oil

And we're seeing progress this year:

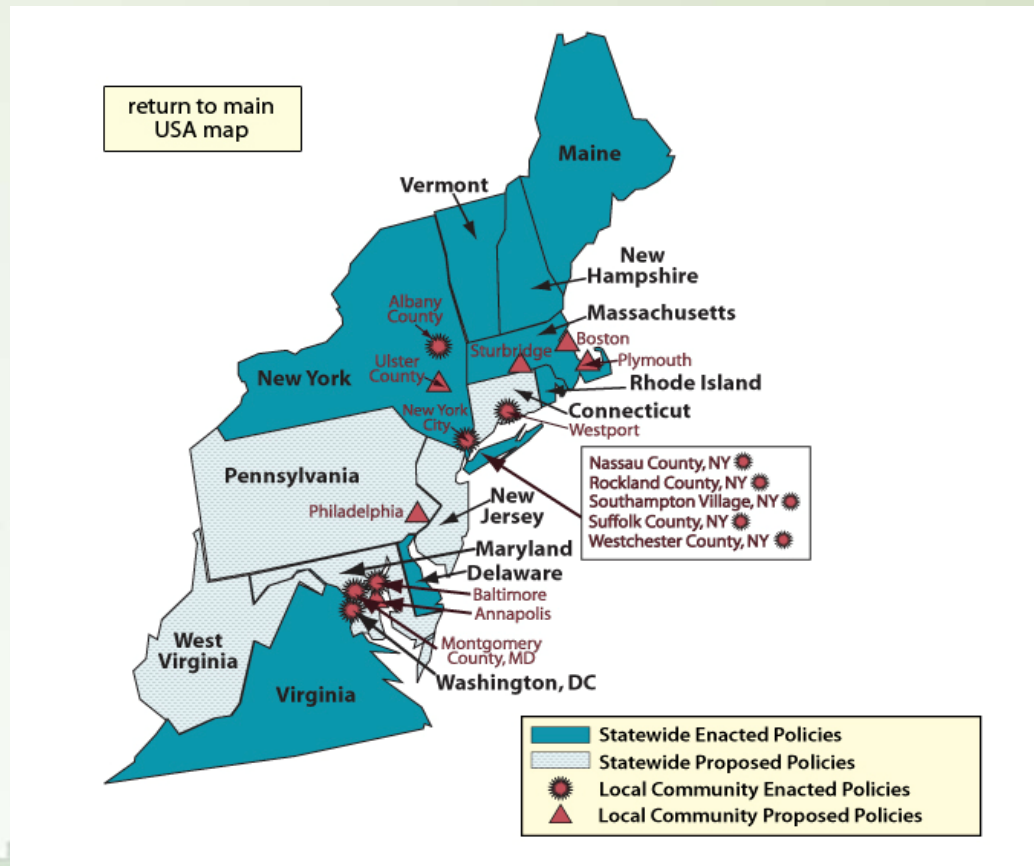
- Agilyx' \$28 million in funding, including Waste Management
- Vadyxx installing a unit in Greenstar's Akron, Ohio MRF
- JBI's alignment with RockTenn

Trend 4: Politics of plastics

We will continue to see political and policy actions targeting four plastic issues:

- Retail bags
- expanded PS service ware
- BPA-containing packaging
- plastic marine debris

Trend 4: Politics of bags



Trend 5: Equity issues

As with electronics recycling, attention will be aimed at the environmental, health and safety aspects of plastics recycling.



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Chinese CRT glass processing





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The ultimate in cradle-to-grave plastics recycling



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Drop me a line

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