



**Styrenic,
PC & Specialty Resins
What's Hot, What's Not and Why:**

**Sustainability and Energy
Recovery of Plastics**

Paul Moyer, VP & General Manager, Plastics
Tuesday, January 31, 2012
Plastics News Executive Forum

Good afternoon. I'm going to take the next 30 minutes or so to share my thoughts about what's happening in the resin markets. I also want to suggest that we look at the future of these markets from a slightly different perspective – *not supply/demand curves and growth markets, but from a sustainability perspective, focusing on end-of-life issues rather than on short term factors*. Before I go on, I'd like to provide you with some background on Styron – because we are still a relatively new company and you may not be familiar with us.

BACKGROUND ON STYRON

Fast Facts



- Styron is a leading global materials company focused on Plastics, Rubber and Latex.
- Leader in our key products:
 - Among the largest producers of polystyrene globally.
 - #1 producer of styrene-butadiene latex globally. Supplier to more than 75% of new paper machine start-ups in the past 15 years.
 - A leading supplier of synthetic rubber in Europe.
- Part of Dow Chemical until 2010, Styron is now owned by Bain Capital
- 67 manufacturing plants at 20 manufacturing sites around the world
- 2,100 employees, based in 25 countries



Styron is a global materials company that focuses on Plastics, Rubber and Latex. We're among the largest producers of polystyrene globally; we're the #1 producer of styrene-butadiene latex globally, and we're a

leading supplier of synthetic rubber in Europe. We spun off from Dow Chemical in 2010 and are now a completely independent company with 67 manufacturing facilities at 20 sites around the world. We have approximately 2,100 employees in 25 countries. We're owned by private equity, Bain Capital, and our global Operating Center is in Berwyn, Pennsylvania, just outside of Philadelphia.

You might say we're a 75-year-old startup company. This is exciting to all of us who are part of Styron. We're unencumbered by the bureaucracy of a larger organization and can be nimble and flexible when it comes to product development and supporting our customers.

Plastics Overview

Styron Plastics			
	Polystyrene	ABS/SAN	PC / Compounds / Blends
Key Products	<ul style="list-style-type: none"> Polystyrene ("PS") Expandable Polystyrene ("EPS") 	<ul style="list-style-type: none"> Acrylonitrile -butadiene -styrene resins ("ABS") Styrene -acrylonitrile ("SAN") 	<ul style="list-style-type: none"> Polycarbonate resins ("PC") Compounds and blends ("C&B") Polypropylene ("PP") Ignition resistant polystyrene ("IRPS")
Brands	<ul style="list-style-type: none"> STYRON™ STYRON A -TECH™ SCONAPOR™ 	<ul style="list-style-type: none"> MAGNUM™ TYRIL™ 	<ul style="list-style-type: none"> CALIBRE™ INSPIRE™ EMERGE™ PULSE™ CELEX™ VELVEX™
Markets	<ul style="list-style-type: none"> Appliances Consumer electronics Packaging Building and construction 	<ul style="list-style-type: none"> Appliances Consumer electronics 	<ul style="list-style-type: none"> Appliances Consumer electronics Consumer goods Automotive Optical media Glazing and sheet 

STYRON™

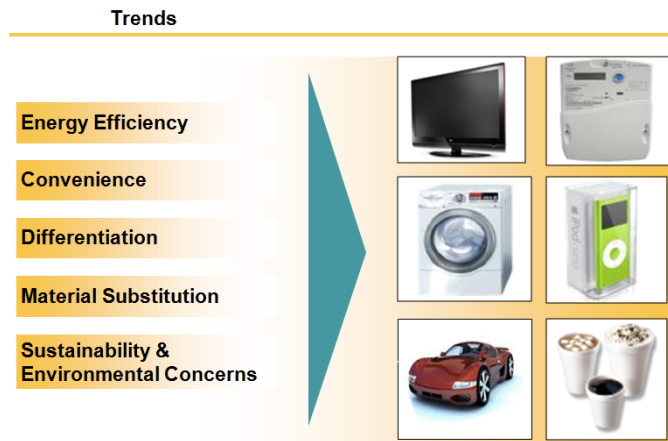
This is an overview of the plastics side of our business. You can see we offer several products Polystyrene ... ABS and SAN ... and Polycarbonate and Compounds & Blends.

We have some of the most recognizable brands in our markets: CALIBRE™, EMERGE™, and MAGNUM™, and of course, STYRON™.

You can also see the markets and application areas in which we participate ... Automotive, Medical, and Consumer Electronics, Packaging to name a few.

With our portfolio of products, global presence, and the breadth of markets we support, we're able to adapt to the volatility that is inherent in our industry. For example, right now, Automotive, Medical Devices, and Packaging are doing well while other markets are more challenged.

Resins Market Trends



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For those of us who have been around a while, we know there are a number of factors that impact the resin markets. This slide provides an overview of major trends we track so we can effectively develop products and solutions to meet our customers' needs.

A number of these trends cross multiple industries. First,

- **Energy Efficiency**. This is a big driver. Manufacturers are interested in maximum efficiency and economy and are interested in down gauging, light weighting and substituting plastics for traditional materials. We're seeing this in Automotive, Building & Construction and Appliances, a common theme: more efficiency; reduce energy consumption.
- **Convenience**. As our lives change and we're continually "on-the-go," our products have to support the consumer's need for convenience, such as in Packaging, with convenience foods, and in Consumer Electronics, with mobile devices.
- **Differentiation**. Our customers want materials that help set them apart. For example, our ABS grades, with their deep matte finish, provide the rich appearance and texture customers want in applications in appliances, automotive interiors and electronics.
- **Inter-material Substitutions**. We're seeing some materials gaining market share versus others because of volatility, market conditions, and functional performance. Another important driver of this is a cost. In the context of cost, a recent example is the substitution of PET in Packaging. This occurred largely because of the reduced availability of cotton which created a need for textile manufacturers to look for synthetic substitutes, which in this case, was polyester. This in turn caused a shortage of polyester for the plastics industry, forcing PET packaging converters to seek an alternative solution due to high cost and low availability. Polystyrene was one of the materials that benefitted from this dynamic. Another

recent example was the increased demand for SAN due to a higher cost of polymethyl methacrylate (PMMA).

- Sustainability & Environmental Concerns. Customers are demanding more information about the total sustainability of the materials we provide, and this is driving growth in plastics with recycled content, bioplastics, and biodegradable plastics. From a lifecycle standpoint, these are not always the better alternatives, but this is still an important, long-term trend in our industry. Information, accurate or otherwise, is being widely circulated and shared.

ENERGY RECOVERY

Prediction for 6, 12, 18 months out?

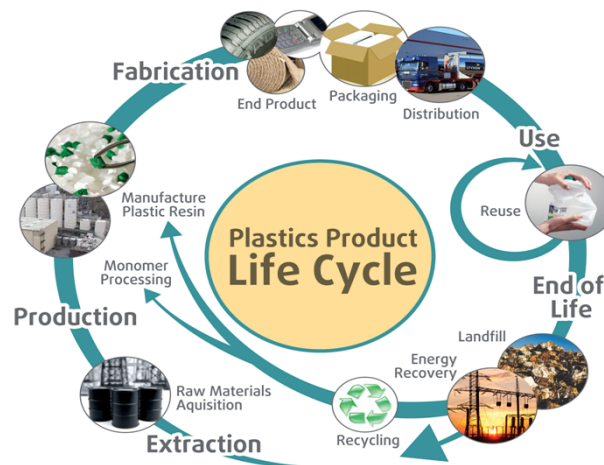


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So what does this mean for the future of the resin markets – what’s hot and what’s not? With so many variables, it’s impossible to predict what will happen 6, 12 or 18 months out and I am not going to try. And while we continue to focus on these trends to manage our business based on short-term dynamics, I’d like to take a broader perspective and consider our future through the lens of sustainability since we believe it is an important driver for our industry long-term.

Specifically I want to talk about one area of sustainability that I think is very interesting, and could hold the key to reputation of our industry in the US, as well as our long-term growth prospects.

Lifecycle of Plastics



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This slide shows a typical Lifecycle View of Plastics.¹ Historically, when we consider this view we're looking at the processes involved in manufacturing and are considering the environmental impact at each stage. I think the weak point in this lifecycle story is the *end of the process* – the end-of-life of the materials, or resource management. I believe the industry as a whole can be doing more – a lot more -- to promote the recovery of plastics from the waste stream. There are some recent developments in the area of end of life – *particularly the recovery of plastics*– that I think are not being well communicated or not well understood.

So why do we want to focus here? There are several important reasons:

Why End-of-Life Focus?

- Opportunity to change negative perceptions
- Growing waste management concern
- Intrinsic value of plastic as a resource for energy production

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One, we have an opportunity to impact perceptions of plastics and of our industry in a real and lasting way. Not only can we *change negative perceptions* but we have a *positive story to tell*. For once we're able to move from a defensive posture to one that's more offense ... and we need to take advantage of that.

We also have a real Waste Management issue. This is a growing concern and we need to address it before it gets worse. Managing the stream of waste – *particularly plastic-related waste* – is already a major logistical and environmental challenge for society. Although the industry is committed to recycling, dealing with future population and consumer trends require a bolder, more realistic approach.

Finally we're stewards of a product – *Plastic* -- that has a tremendous intrinsic value as a resource for producing energy. We have a responsibility to bring this forward.

Changing Perceptions

- Third quarter 2011 research targeted informed Americans, opinion leaders and politically active to understand perceptions of “single use” plastics



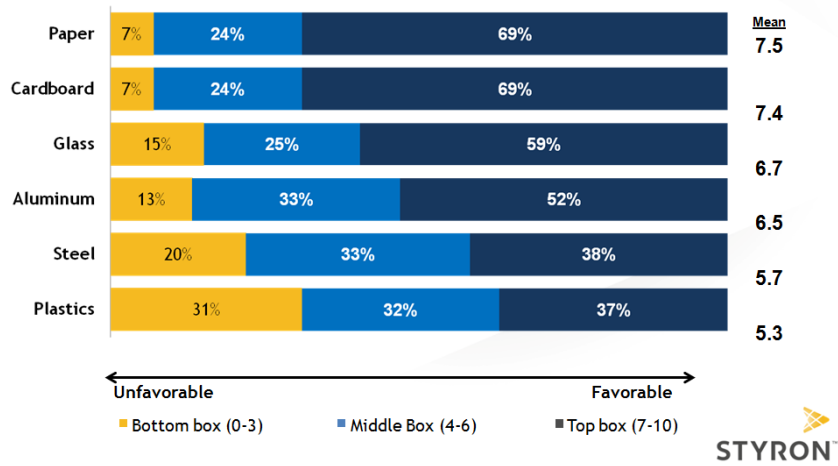
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Let's look at some opinion research conducted last year by the American Chemistry Council.² First, we know about the negative perceptions. This is a word cloud of the current perception of plastics. The size of the word corresponds to how often it was mentioned when people were asked what they think about when they consider plastics. You can see that the majority of these words are pretty negative.

The Plastics Division of the ACC conducted an in-depth survey in the third quarter of 2011 to better understand consumer perceptions around “single-use” plastics and the reason for these perceptions. They surveyed informed Americans, opinion leaders and politically active people.

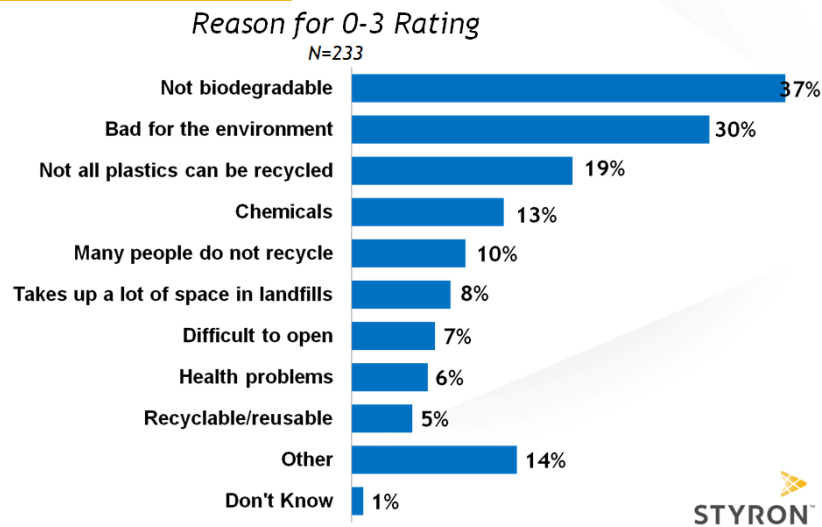
Key findings of this research were,

Plastics vs. Other Materials



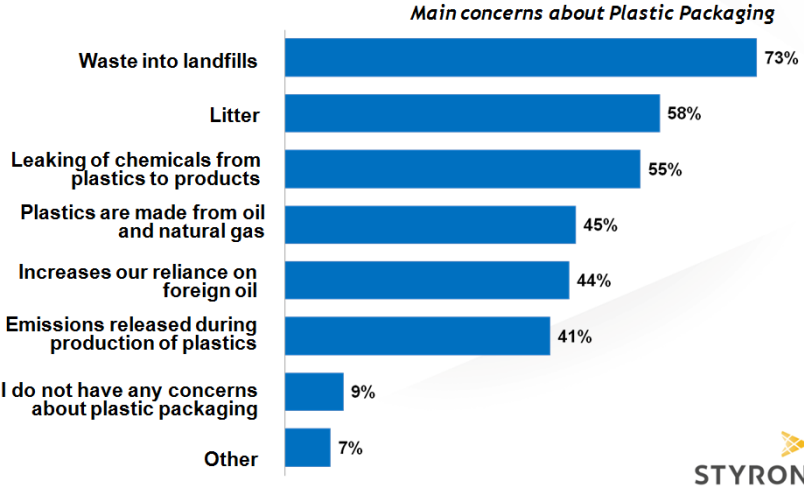
Nearly 1/3 of consumers have an unfavorable view of plastic packaging compared to other types of packaging materials. In fact, Plastics ranked at the bottom of the list, as you can see on this slide.

Top Line Concerns



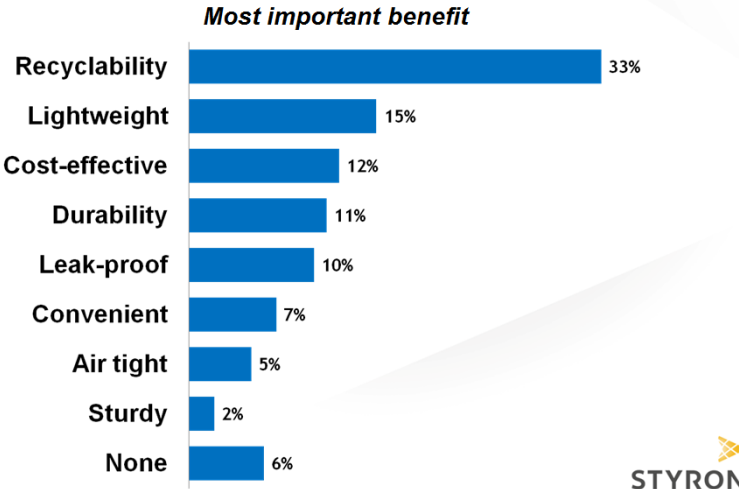
Interesting though are the reasons consumers have negative perceptions. The major reasons had to do with end-of-life issues. In fact, those issues were more important to consumers than really anything else.

Environmental Issues



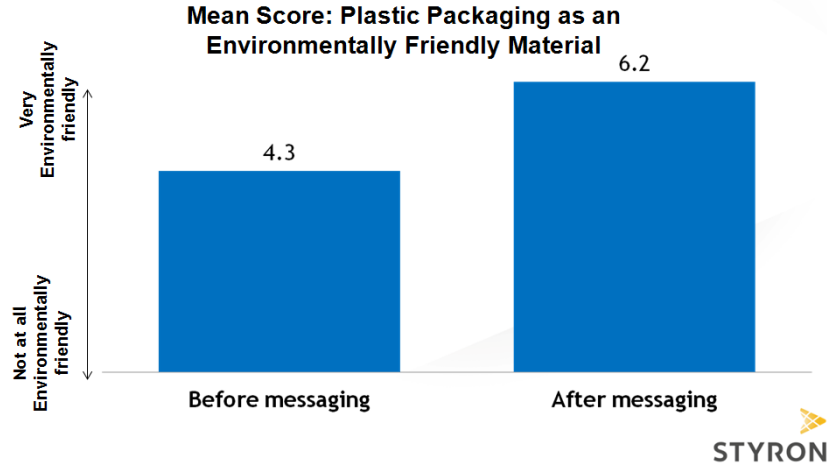
As this next chart shows, landfill waste and litter were clearly the primary environmental concerns. These were followed by the concerns that we might be more accustomed to hearing, such as *“Leaking of chemicals from plastics into products,”* and *“Emissions released during production of plastics.”*

Benefits of Plastic



Finally, consumers felt that recyclability is the most important benefit or attribute of plastics packaging, which indicates an environmental awareness and interest.

Changing Opinions



If you dive deeper into the study, it indicated that after consumers were exposed to messages about the positive environmental impact and overall benefits of plastics, their opinion about “environmental friendliness” of plastics improved significantly. You can see the mean score rose by almost 2 points.

As leaders in the plastics industry, this is important because it means that if we develop communications focused on the benefits of plastics and engage opinion leaders in our industry conversations, I think we can truly change perceptions. Most importantly, we can encourage citizens to take action, in other words recycle and recover their plastics.

Waste Management



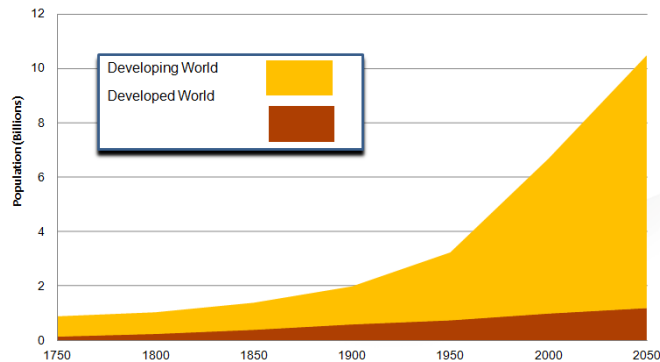
In the U.S., 55% of all municipal solid waste and approximately 85% of plastics waste ends up in landfills

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A second reason for supporting energy recovery has to do with **Waste Management** concerns. We need to continue to divert waste from our landfills. This is a growing problem for our U.S. cities, and unless we do something, it is not going to get better. Currently 55% of all municipal solid waste and 85% of plastics waste ends up in landfills³. I wouldn't call that sustainable?

World Population Growth

A World of 7 Billion ... and Counting



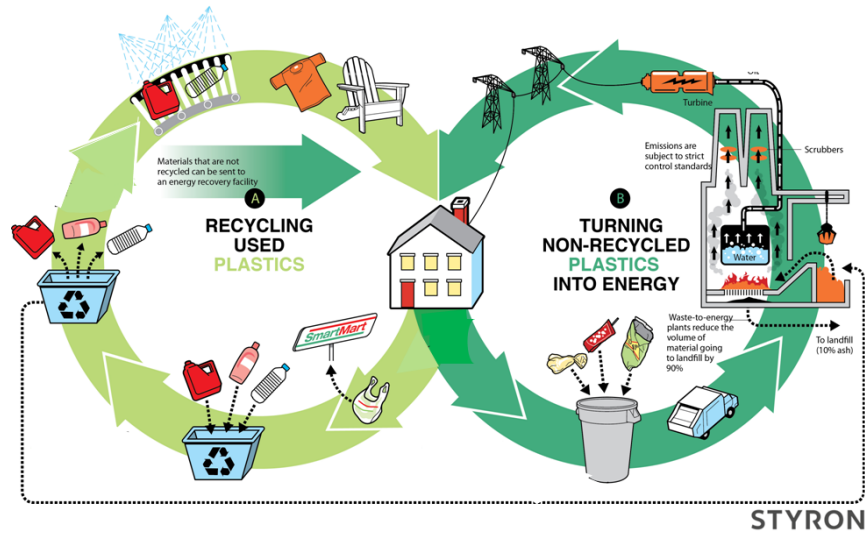
Source: United Nations Population Reference Division and Population Reference Bureau



In October of last year, our planet hit an historic milestone of 7 billion in global population.⁴ -- the most rapid pace of growth in history. We're adding more people in less time than ever before. By some estimates, we're expected to reach 9.3 billion people by 2050 and by 2100 we could be at 10.6 billion! With this comes the real challenges of infrastructures of our cities, the merging and building of megacities, capacity for fresh food and water, and also the depletion of our natural resources, including oil, gas, and most importantly land.

We're also going to have serious waste management issues with this population growth, and we need to try to get our arms around it now.

DIVERTING PLASTICS FROM LANDFILLS: A TWO-PRONGED APPROACH



As an industry, we've been committed to recycling as a solution for managing our resources.⁵ This chart shows recycling in conjunction with energy recovery and how they work together. They're actually two complementary approaches to resource management; the difference being that in one scenario the plastic material ends up as a new product; in the other scenario the material ends up in a Waste-to-Energy facility and is converted to fuel or electricity.

On the left side of the screen we have recycling. I think as an industry, we have done a pretty good job here. Once we're done with our plastics, the materials leave the household, they're placed in recycling bins and sent to a recycling center for separation, cleaning, grinding, reprocessing and pelletizing. The resin pellets are then made into new products.

On the right side of the screen, we have the energy recovery cycle. Similarly, the plastic material leaves the home. These are the plastics that are not candidates for recycling. In the same way they're placed in a bin for pick up. They're transported to an energy recovery facility where they're processed through methods such as combustion, gasification or pyrolysis. This generates fuel and electricity. In the case of electricity, it is transmitted through power grids to homes and businesses.

In both cases, you can see plastics are a valuable asset.⁵

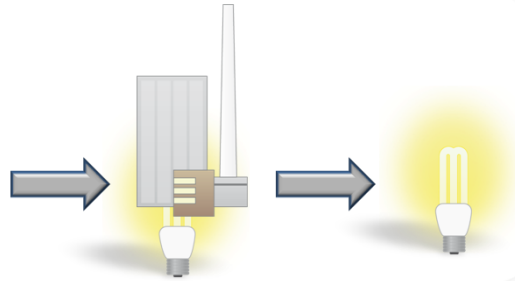
Recycling of plastics has been available in the U.S. since the late 1980s. In spite of this, recycling rates here are among the lowest in the developed world.

In the future though, I believe energy recovery will grow in importance for several reasons. One, as plastics become more complex in their composition, it will become harder to separate materials and maintain purity for recycling. Two, as recyclables are processed over and over, they lose their mechanical properties and can no longer be effectively recycled for input into future products. And, three, while recycling capacity is likely to increase worldwide in the next few decades, it won't be sufficient or logistically feasible to process the

amount of waste that an expanding population will continue to produce. And, due to its versatility and convenience, plastics – *particularly packaging* – will undoubtedly be a major contributor to waste generation.

For now though, both approaches are valid and credible. Studies done around the world show that in communities where waste-to-energy facilities exist, their rate of recycling goes up. For example, U.S. communities with waste-to-energy facilities have an average recycling rate of 33 percent, which is 5 percent higher than the national average of 28 percent.⁶

Energy Recovery



86 Waste-to-Energy plants in 25 states

- 97,000 tons of material is processed daily
- Capacity to generate 2,700 megawatts of electricity
- Saves 30 million barrels of oil annually
- Prevents the release of 40 million tons of CO₂ equivalents



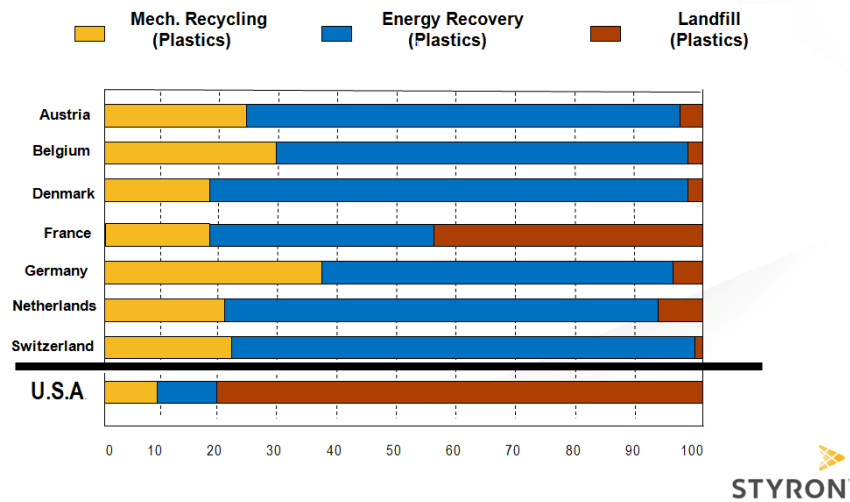
Finally, let's look at the intrinsic value of plastic. There's real value in plastics as a resource to produce energy. The fact is that as a nation, we need to control our energy costs and improve our energy security ... and plastics provide the solution.

Energy recovery through Waste-to-Energy processes provides a clean alternative and sustainable energy source that's available as long as there is a waste supply.⁷ We need to take advantage of that.

In the U.S. we have 86 waste-to-energy plants in 25 states which process general post-consumer waste, including plastics.⁸ These plants process about 97,000 tons of materials each day, with the capacity to generate 2,700 megawatts of electricity.⁹ This saves an equivalent of 30 million barrels of oil annually and prevents the release of 40 million tons of CO₂ equivalents into our environment.¹⁰ This is great ... we need to increase this activity even more. We also need to get this message out.

The U.S. actually lags behind other developed countries in its adoption of energy recovery systems.¹¹ In fact, Europe, which is approximately the same size as the U.S., has 400 Waste-to-Energy plants, compared to our 86.¹²

Energy Recovery Adoption



This chart shows the utilization rate of recycling, energy recovery and landfills. Recycling is shown in gold, energy recovery in blue, and landfilling in dark red.¹³

The top portion of the chart shows the adoption rates of each method in various European countries. You can see that countries like Austria, Belgium, Denmark and Switzerland are processing a significant part of their waste through the energy recovery process. Recycling is also high ... landfilling is negligible.

At the other end of the spectrum we can see that in the U.S. landfilling is most common and recycling and energy recovery represent a small percentage of the total picture.

The point I want to make is we have a tremendous opportunity here to divert our waste, including plastics, from landfills to recycling and recovery. We can see by the examples of some of our neighbors that it's truly possible.

The difference is that many of the European countries have the infrastructure in place to make it convenient for residents to participate in energy recovery. Residents have even come to see it as part of their civic responsibility to participate in end of life management. In some European cities, energy recovery plants are being strategically positioned as attractive structures located right in the heart of the cities. Residents recognize that these facilities are built with the most advanced emissions control features available and are highly regulated so the energy they produce is among the cleanest possible. They are proud to be active participants.

Value of Plastics

A study by Columbia University found, when looking at the Plastics waste stream:

- Each year in the U.S. we bury enough non-recycled plastics to provide electricity for 5.2 million households
- That's all the homes in Georgia and Oklahoma combined
- 7 billion pounds of plastic are recovered from landfills and converted annually

Plastic has a 25% higher energy value than coal



To give you an idea of what energy recovery could mean for *plastics* as an energy resource right here in the United States, a study conducted by Columbia University and sponsored by the American Chemistry Council late last year looked at the Plastics component of the waste stream and found that each year in the U.S. we bury enough non-recycled plastics in landfills to provide electricity to power 5.2 million households.¹⁴ This is all the homes in Georgia and Oklahoma combined.¹⁵

Looking at it another way, through energy recovery, 7 billion pounds of plastics that otherwise would not be recycled are recovered from landfills and converted into electricity annually.¹⁶

Plastics are a particularly important part of energy recovery systems because of their high energy value. This value is as much as 25 percent higher on a unit basis than coal.¹⁷

Bottom line: Plastic is a valuable resource instead of a cheap throw away. Wouldn't it be great to have the public think about plastics this way?

So, where do we go from here?

Building Awareness



The North American Plastics Alliance, which includes the American Chemistry Council (ACC), the Society of the Plastics Industry (SPI), and the Canadian Plastics Industry Association (CPIA) is actively engaged in advocating for energy recovery, particularly of plastics.¹⁸

Building Awareness

Roll Call Opinion

THE NEWSPAPER OF CAPITOL HILL SINCE 1955

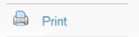
POLITICS LOBBYING & INFLUENCE OPINION AROUND THE HILL RC JOBS Search

Dooley: Capitol's Waste-to-Energy Program Is a Good Model

By Cal Dooley
Special to Roll Call
Nov. 28, 2011, Midnight

One of America's most underutilized energy sources finally seems to be getting the attention it deserves — at least on Capitol Hill.

For too long, most of America's garbage has been buried in landfills that essentially entomb valuable resources such as wood, textiles, plastics and paper. That's predominantly what we've been doing with



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- Alan Grayson Pitches In to Help Democrats 10:09 a.m.
- GOP Heads to Caucuses in Iowa 10:09 a.m.



One notable impact they made recently is, through active outreach, they have helped convince Congress to begin converting its waste to energy and, consequently Congress will send as much as 90% of its nonrecyclable solid waste from Capitol Hill to a Waste-to-Energy facility in Virginia.¹⁹ In 2010 alone, more than 5,300 tons of solid waste were collected from Congressional facilities²⁰ and this now will be converted to generate steam

and electricity instead of being buried in landfills. This is enough energy to power a Senate office building for several months annually.²¹

This is a great example of our lawmakers doing something positive for energy independence. It is also an indication, that energy recovery is making it to the top of our national agenda.

Get Involved

- Get Informed
- Visit www.plastics.org
- Talk to legislators



I want to end by emphasizing that *“we have a good story to tell.”* We should all care about how our industry is perceived ... and the negative perceptions won’t change unless *we* make it happen.

Our entire industry needs to go beyond traditional sustainability goals, to include an expanded view of sustainability. We need to encourage lifecycle thinking -- particularly focused on end-of-life plastics.

What can we do to get involved? First, get informed. *End-of-life processes, Waste to Energy ...* It’s an exciting new field. Processes and technologies are being developed and commercialized all the time and it’s really exciting. And opinion research clearly favors movement in this direction.

Another suggestion is to get involved on a governmental level. Ask your local officials and state legislators about energy recovery in your state to make sure it’s on a level playing field with other clean, alternative sources of energy. Ask if they are supporting plastics recycling as well as energy recovery. Show them you care about the topic, and that you’re interested in seeing them support both recycling and energy recovery. And if they’ve never heard of it before, this is your chance to talk it up.

Adopting energy recovery in the U.S. is in our best interest as an industry and also will help sustain and grow the U.S. Plastics industry.

Looking back at where we started this afternoon *what’s hot in the resin markets, what’s not and why*

Ultimately, our demand model for plastics will be driven as much by sustainability issues as it will be by traditional marketplace dynamics ... so let's address this perception challenge we've had and get proactive and create more demand for our products.

References

1. Lifecycle of Plastics
 - a. Plastics Europe, *The Plastics Portal*
2. American Chemistry Council's Plastics Division Survey
 - a. November 2011, American Chemistry Council, "*Marine Debris and "Single Use Plastics."*
3. 55% of all municipal solid waste and 85% of plastics waste ends up in landfills
 - a. U.S Environmental Protection Agency, *Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts & Figures for 2009*, Table 3, 2009
4. Historic milestone of 7 billion in global population
 - a. October 2011, World Resources Institute, *United Nations Population Division and Population Reference Bureau*
5. Recycling / Recovery work together. In either scenario, Plastics is a valuable resource
 - a. American Chemistry Council, Plastics Europe
6. Communities that have waste to energy facilities have a 5 percent higher recycling rate.
 - a. Berenyi, E., Government Advisory Services. *Recycling and Waste to Energy – Are they Compatible*, 2009 Update.
7. Energy recovery through WtE processes such as combustion, gasification and pyrolysis provides a clean alternative and a sustainable energy source that's available as long as there is a waste supply
 - a. American Chemistry Council, Plastics Europe
8. In the US we have 86 WtE plants
 - a. Energy Recovery Council, *The 2010 ERC Directory of Waste to Energy Plants*, American Society of Mechanical Engineers, Municipal Waste Management Association, Solid Waste Association of North America, Integrated Waste Services Association; *America's Own Energy Source*

9. These plants process about 97,000 tons of material each day with the capacity to generate 2,700 megawatts of electricity
 - a. Energy Recovery Council, *The 2010 ERC Directory of Waste to Energy Plants*, American Society of Mechanical Engineers, Municipal Waste Management Association, Solid Waste Association of North America, Integrated Waste Services Association; *America's Own Energy Source*
10. This saves an equivalent of 30 million barrels of oil annually and prevents the release of 40 million tons of CO₂ equivalents into our environment
 - a. Energy Recovery Council, *The 2010 ERC Directory of Waste to Energy Plants*, American Society of Mechanical Engineers, Municipal Waste Management Association, Solid Waste Association of North America, Integrated Waste Services Association; *America's Own Energy Source*
11. The US is lagging behind other developed countries in its adoption of energy recovery systems
 - a. American Chemistry Council / Plastics Europe
12. Europe has 400 Waste to Energy plants
 - a. *Canadian Energy from Waste Coalition website*, downloaded February 2011
13. This chart shows the utilization rate of recycling, energy recovery and landfills. Switzerland processes approximately 80 percent of its waste this way (WtE) with 25 other countries processing greater than 40 percent of their waste using this method and eight EU countries processing greater than 60 percent
 - a. *American Chemistry Council and Canadian Energy from Waste Coalition website*, downloaded February 2011
14. Each year in the US we bury enough non-recycled plastics in landfills to provide electricity to power 5.2 million households
 - a. November 2011, *"Tapping Into America's Garbage Power,"* Huffington Post
15. This is all the homes in Georgia and Oklahoma combined
 - a. Earth Engineering Center, *Columbia University*
16. Seven billion pounds of plastics that otherwise would not be recycled are recovered from landfills and converted into electricity annually
 - a. Jawad A. Bhatti, *"Trends in recycling of plastic waste and means for increasing recovery – 2010"* Waste to Energy Research and Technology, Columbia University

17. The value of plastics is as much as 25 percent higher on a unit basis than coal because most plastics made in the US are made from natural gas
 - a. American Chemistry Council, *“Energy Recovery: An Issue Brief for Illinois Policy Makers.”*
18. The North American Plastics Alliance, which includes the American Chemistry Council (ACC), the Society of the Plastics Industry (SPI), and the Canadian Plastics Industry Association (CPIA) is actively engaged in advocating for energy recovery, particularly of plastics.
 - a. American Chemistry Council
19. The US Congress will begin converting waste to energy and will send up to 90 percent of its nonrecyclable solid waste from Capitol Hill to a WtE facility in Alexandria, Va.
 - a. November 2011, Roll Call, *“Dooley: Capitol’s Waste to Energy Program is a Good Model”*
20. In 2010, more than 5,300 tons of solid waste were collected from Congressional facilities
 - a. November 2011, Roll Call, *“Dooley: Capitol’s Waste to Energy Program is a Good Model”*
21. This is enough energy to power a Senate office building for several months annually
 - a. November 2011, Roll Call, *“Dooley: Capitol’s Waste to Energy Program is a Good Model”*