Sustainability and Current Corporate Practice and Examples of Plastics Technology that are Enablers

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Abstract: Principles of sustainability are becoming associated with best practice in more and more corporations.. This paper will review the results of a 2011 sustainability survey of the Plastic Industry and then suggest examples of plastics technology that contribute to toward sustainability objective in manufacturing. The examples chosen are: Foam Technology, Biorenewables in Durable applications and considerations for the Medical Plastics Industry.

Background

In the past, the definition of sustainability has been difficult to find consensus and there did not seem to be a universal definition. SPE Marketing and Management division in collaboration with The Missouri University of Science and Technology set as an objective to conduct a survey of plastics industry professionals to define and understand the drivers for sustainability. The survey was conducted using the Society of Plastics Engineers membership and the results were analyzed. We were able to draw some conclusion regarding broadly acknowledged definitions and drivers.

In the second part of the paper, several technologies are chosen that seem to embody the definitions of sustainability and the drivers for adoption.

- Foam Technology
- Biorenewables in Durable applications and Medical technology

Definition of Sustainability

What constitutes a good definition? Sustainability is equal to a firm's commitment to the triple bottom line (economic, social, and environmental responsibilities)

However Sustainability is contextual. Sustainability is implemented differently from industry to industry and company to company. There is no across the board solution but they do follow the following motivations:

Drivers/Motivations include:

- Gaining Competitive advantage
- Improved profitability
- Increasing stakeholder pressure,
- Meeting Legal requirements
- Reputation concerns
- Environmental performance and innovation

A survey was implemented as the methodology- An online survey with 27 questions including demographics of the respondents was created, distributed, and analyzed using Qualtrics, a web based surveying software application

The survey was distributed to the Society of Plastics Engineers (SPE) membership via an email blast.

A total of 230 responses were collected and analyzed.

Demographics of participants

The survey tested respondents via the Size of Organization (Figure 1), Role of Respondent (Figure 2), Industry Segment (Figure 3), and Market Served (Figure 4).

Results and Findings

Definition of Sustainability

45% of the senior managers that responded believed sustainability refers to addressing issues from a long term perspective. 40% of those that claimed they were experts indicated that sustainability incorporates climate change, environmental, social, and economic issues. 47% of the companies based in the USA believed sustainability refers to addressing issues

from a long term perspective. 46% of the companies operating in three or more regions (global) believed sustainability incorporate climate change, environmental, social, and economic issues.

Who is Responsible in Organization?

Only 6% indicated their organizations did not address sustainability issues. 11% were not clear on who has responsibility but 37% indicated all employees have a responsibility. 11% reported a senior or executive-level individual has full responsibility. This is also a trend- upper level management has specific responsibility for sustainability.

Current Sustainability Strategies

Larger companies ($100-500 MM+) are focusing on improving efficiency of energy consumption, reducing waste, while improving image; they are also designing for reuse or recycle. Companies in the <$10 MM range are focusing on reducing waste and energy. Medium sized companies are designing products for reuse or recycle to re-position themselves in market

What are the Impacts of attention to sustainability?

34% of the respondents said cost savings. 36% believed that emphasis on sustainability improved a product, service, or market, i.e. innovation
40% believed that it improved competitive advantage

Current Economic Environment
Most of those surveyed felt that the current economic climate has had little impact on sustainability commitments
The perceived Benefits of sustainability to an organization e.g. competitive advantage
Cost savings, and Improved company image or brand equity,

The respondents selected the following as the most critical capabilities for sustainability

- Innovation in product, service or market
- Vision and leadership commitment to sustainability
- Sustainability scorecard with clear, measurable metrics

Companies Focused on Sustainability Best Practices

Company	# of respondents
Proctor and Gamble	14
Wal-Mart	11
Dow Chemical.	10
DuPont	6
Coca Cola	4
Pepsi	4

Foam Technology as sustainable

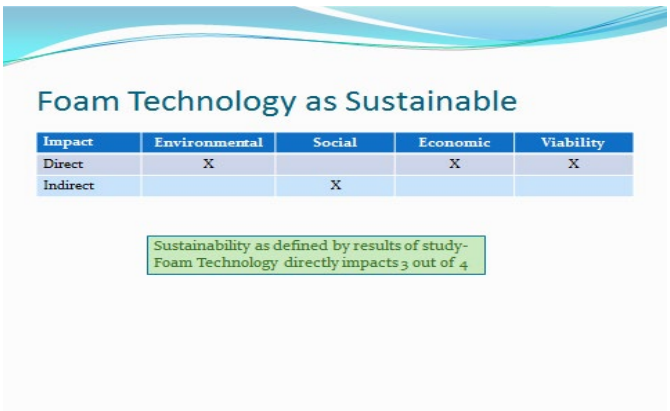
Foams exist in nature, e.g. Bones, Cork, and Wood are natural cellular or foam structures. Polymer foams mimic nature.

Polystyrene- most energy efficient polymer foam. Earth Shell- bio content with polymer binder, Composite Decking is cellular.

Polymer Foams enable commodity and engineering materials to process more easily and often with improved properties. They offer improvements in part weight and impact strength.

If the resin and its additives are compatible they form a polymeric emulsion, which is ideal for foam processing.

Often improved shear heating forces, melt flow and the resulting polymer melt index. Polymer foams match the blowing agent with the resin and additives system- a tremendous processing advantage.



Examples:

HDPE – 15 pound shot with 3 minute cycle reduced to 2 minutes- savings of $1.00/part.

Resin producers interested in expanding their product offering to include foam friendly resins and foam friendly additives. The evolution of polymeric flame retardant additives is one example. Here the move toward more environmentally friendly blowing agents is underway.

Polymer Foam processes and environmentally friendly blowing agents

10 separate plastic processes using blowing agents Straight Injection molding, Low pressure structural foam molding, High Pressure Structural foam molding, Gas Counter Pressure Structural Foam Molding, Nitrogen Injection structural Foam Molding

Gas Co-injection Structural Foam Molding, Gas Assist molding, Chemical Gas Assist, CoralFoam, Over Molding Structural Foam Molding.

CO2 and H2O- , Low vapor pressure gases with low pressure solubility can lower the Tg of most resins. Thus the processing temperature of most resins can be reduced by 10-20 degrees F resulting in energy savings and well as improving mold filling and sink marks.

Improved melt flow can mean fewer gates, thinner wall sections, less molded-in-stress reduced burning through shear heat

Chemical blowing agents can improve performance and productivity in injection molding processes, improved physical properties and improved processing economics.

Biorenewables in Durable Applications

Biorenewable resins like PLA had their initial success in single use packaging applications but PLA and other bio-content materials are finding application as blending agents in some conventional resins for durable applications. These compounds are being used in consumer electronics, consumer products, automotive and even in building interior applications. The USDA efforts in helping define a standard for bio-content have helped legitimize this approach.

LEED Certification (Green Building Council) recognizes these materials as well.

PolyOne and Teknor Apex are a couple of compounding companies involved in this approach.

Medical Plastics

Sustainability is becoming a more important issue for manufacturers and designers of medical devices. Plastics in general offer important sustainability – related benefits to the medical device sector. Plastics bring the following benefits: high strength to weight ratio, processing flexibility, property characteristics, design flexibility- all factors that contribute to energy efficiency and material efficiency. However the medical plastics industry does dispose a lot of plastic and therefore still needs to improve its sustainability profile.

One way to help would be designing products with more autoclavable plastics, therefore increasing the ability to re-use.

Incorporating more biorenewable content is another way to potentially improve medical plastics' sustainability. Arkema (Altuglas International) has recently introduced a new family of bio-based transparent polymers for drug delivery systems, blood reservoirs and fluid and blood collection systems.

Conclusion

Sustainability is growing in importance as a best practice in corporate America. It is not driven solely by customers. It is a prominent part of corporate strategy with Consumer product companies and suppliers in the forefront.

The function that has responsibility for Sustainable initiatives vary but it is a role of growing importance.

There are multiple paths mentioned by the respondents concerning sustainability strategies- Short term, medium and long term. Larger organizations are taking a triple bottom line philosophy while smaller ones are looking for efficiency and productivity.

With increased environmental pressure on sustainable technologies and solutions we believe that plastic technology is a route to sustainability – Foam

technology, bioplastics and the use of plastics in markets like the medical device industry will support the continued growth of plastics in the OEM community that is concerned with their corporate sustainability profile.

Keywords: Sustainability, Plastics, environmental, triple bottom line, foam, biorenewables, durables, medical plastics

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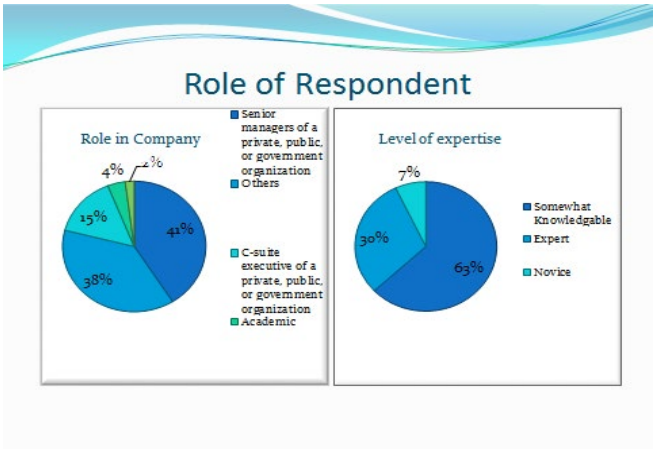

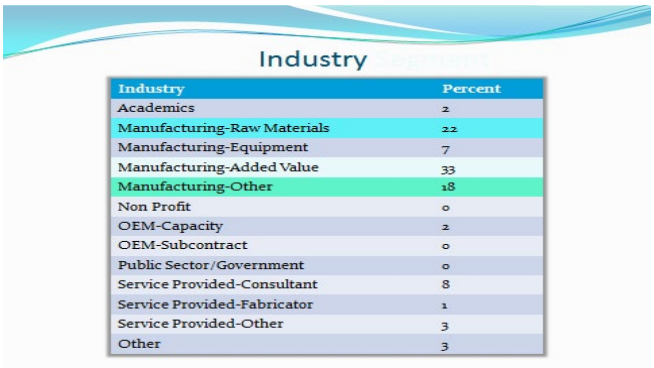

Figure 4