Accelerating Domestic Styrofoam Reuse and Remanufacture for Environmental and Economic Gain

Issue

Regulations across Canada have encouraged the collection and recycling of Expanded Polystyrene (EPS) post-consumer products, commonly referred to as Styrofoam (a trademark name); however, the ability to re-use EPS waste is limited to specific types (clean, un-dyed, uncontaminated). Most EPS still ends up in landfills or shipped overseas regardless of how it was collected. EPS in landfills is comprised of 98% air that "overfills" sites per weight and lasts indefinitely. A common contaminant of EPS products is fire-retardant chemicals, such as hexabromocyclodocecane (HBCD) or perfluorooctanoic acid (PFOA) and related products. These compounds can leach into the ecosystem and are an environmental risk.

What is EPS

For more than 50 years, the effectiveness of Expanded Polystyrene (EPS) has been proven in numerous applications used by a wide variety of industries, consumer product manufacturers, and shipping companies. It is a rigid, closed-cell foam that is non-toxic, inert and made without chlorofluorocarbons (CFCs). EPS expandable polystyrene beads are processed and molded into either low or high-density foam products.

Lightweight EPS is ideal for packaging applications due to its cushioning characteristics, dimensional stability, and thermal and moisture resistance. There is a growing use of EPS in construction as insulating concrete forms and insulated EPS sandwich panels as well as structural blocks in road and highway construction.

EPS in Canada

According to the 2008 EPS Recycle Rate Report prepared by the Alliance for Foam Packaging Recyclers (AFPR), the total amount of post-consumer and post-commercial EPS sold in the USA was 172 million pounds.

A report compiled for the Canadian Plastics Industry Association, 2013, estimated the total amount of EPS recycled in Canada was about 2.5 million kilograms. The majority of the post-consumer and post-commercial EPS is impact-absorbent packaging for fragile electronic devices. In 2014, Canada imported nearly $59 billion worth of electronics. The estimated cost of packaging for electronics is approximately $860 million. Depending on provincial regulations, electronic companies may take the responsibility of recycling the end-of-life electronics through different product stewardship programs across Canada; however, electronic companies refused to recycle EPS packaging. This means that each year, hundreds of millions of dollars of packaging materials are sent to landfills, instead of being recycled.

Due to the weight of EPS, diversion will have minimal effect on municipal diversion rates or goals compared to heavier items (e.g., bottles) and is, therefore, low on the priority list.

Environmental Concerns

Unfortunately, EPS is virtually indestructible and does not biodegrade for hundreds of years and is resistant to photo decomposition.

In 2012, an estimated 14.4 million pounds (80%) of EPS waste in Canada went to landfills, rivers, streams and the ocean. This is the equivalent of 18.4 million cubic feet, or 208 Olympic sized swimming pools of EPS waste in Canada each year. In ten years, it is estimated that over 64,000 trailer loads (40' trailers) of post-consumer and post-commercial EPS waste will be buried in landfills across the nation. Due to the light weight and large volume physical properties, the total cost to haul EPS waste from transfer stations to landfill sites is estimated to be $20 million, and the landfill cost is estimate to be $2.4 million.

Clean EPS packaging has less impact on the environment than molded pulp packaging; however, toxic fire retardants such as hexabromocyclododecane (HBCD) is included in the production of EPS for insulation and imported for the construction industry, accounting for 99% of HBCD use in Canada. Approximately 92.4% of products contaminated with HBCD will ultimately be landfilled, with contaminants potentially leaching into the environment. The federal government is currently proposing to prohibit the importation of products containing HBCD and similar fire retardants as safer alternatives exist; however, future disposal of EPS made with fire retardants currently in use is unknown.

A Commercial Opportunity

EPS is 100% recyclable. Recycled post-consumer and post-commercial EPS can be turned into value-added plastic products, such as crown moldings, picture frames, park benches, movie props, faux marble and stone, etc., reducing the amount of virgin material needed. Comparing the various options for the 14.4 million pounds of EPS waste in landfills every year, and using the virgin material price at $0.90 per pound, following are the costs and Value Returned/Retained on each option (using 2012 figures):

	Market Value ($/lb)	**Economic Value ($)**
Landfill: Cost of hauling and landfill	0.13	(1,896,480)
Compacted and exported to China	0.16	2,304,000
Extrude & palletize PS, and sell in open market	0.50	7,200,000
Basic recycled plastic products	1.20	17,280,000
Innovate and high value recycled plastic products (conservative estimate)	2.00	28,800,000
Innovate and high value recycled plastic products (optimistic estimate)	3.00	43,200,000

Recommendations

That the federal government work with provinces and territories to:

1. Actively promote the diversion of waste Expanded Polystyrene (EPS) from landfills.
2. Engage with Canadian plastics industry companies and institutions and provide incentives to stimulate research into and the development of high value made-in-Canada products from recycled EPS.
3. Support the research and development of cost-effective mechanisms to decontaminate EPS for the purpose of recycling and re-use.

REFERENCES

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