King County
Department of
Natural Resources and Parks
Solid Waste Division

Polystyrene Facts

What is polystyrene?

Polystyrene is a thermoplastic material made from petroleum-derived styrene. Polystyrene is made into both foam and rigid products. Foam or expanded polystyrene (EPS) is either expanded or extruded to manufacture products such as cups, plates, trays and packaging.[1] EPS is often mistakenly referred to as Styrofoam, which is a Dow Chemical Company trademarked form of polystyrene foam insulation introduced to the U.S. in 1954.

How is polystyrene made?

Styrene is the primary chemical component of polystyrene. It is a clear, colorless liquid derived from petroleum and natural gas by-products and formed by a reaction between ethylene and benzene (a hazardous substance). Styrene is used in everything from food containers and packaging materials to cars, boats and computers. It is polymerized by heat or by an initiator, such as benzyl peroxide, and then is suspended in water to form droplets, using a suspension agent. The beads of polystyrene produced by suspension are tiny and hard. To make them expand, special blowing agents (primarily pentane) are used.

How much waste does polystyrene create?

- In 2006, the US disposed of 870,000 tons of polystyrene plastic plates and cups (plus 590,000 tons on other polystyrene products), according to the EPA's report on Municipal Solid Waste.[2]
- Although EPS represents only one percent of the waste stream by weight in King County, it makes up a significant volume. Approximately 7.9 million cubic feet of EPS is disposed in King County each year, enough to fill 2½ buildings the size of Seattle's 38-story Smith Tower. Ultimately, this volume accounts for about 248,000 cubic yards of King County landfill space annually.[3]
- Polystyrene takes decades to hundreds of years to dissolve because it does not biodegrade. Instead, it "photo-degrades", meaning that sunlight breaks it into progressively smaller pieces. However, sunlight does not penetrate modern municipal landfills, therefore making it extremely unlikely that polystyrene will photo-degrade in our landfills.[4]

Can polystyrene be recycled?

- In some areas of the country, EPS is recycled and used to manufacture new products. Since food residue is a contaminant in the polystyrene recycling process, EPS food trays are rarely recycled. The extra step and cost of washing the trays more often proves prohibitive to recyclers.
- King County has identified EPS as a priority waste and is working to support the establishment of recycling facilities, with a focus on molded packaging. Molded packaging often provides a clean source of EPS that is untainted with food residue or other contaminants.

How does polystyrene affect health?

- Most health problems associated with polystyrene are due to exposure during manufacture of styrene or products using styrene (the primary component of polystyrene) and include depression, concentration problems, muscle weakness, tiredness, nausea and eye, ear and throat irritation.[5] The International Agency for Research on Cancer (IARC) has determined that styrene is a possible carcinogen.[6]
- Most exposure cases are associated with industry workers. However, styrene also can be transferred to food from polystyrene cups, plates and trays, and can enter the human body through air (released from industries that make and use styrene).[6]

What can you do?

- Purchase and use reusable or compostable products. (Some cities have banned polystyrene. The City of Seattle has proposed a ban on the use of EPS cups and containers in restaurants.[7] Some school districts, such as Issaquah School District in King County, have discontinued use of polystyrene trays -- see example on page 2 -- and instead have selected either reusable or compostable trays.)
- Recycle as options become available.

Alternatives to Polystyrene (EPS) Lunch Trays

Alternative #1: Durable Lunch Trays

Replacing all or some disposable trays with durable, reusable trays is a great option. Reusable products can be more cost effective over time than disposable products, but costs should be evaluated on a case-by-case basis. Schools with dishwashers and storage space are the best candidates.

Examples:

- Starting in March 2008, nine Portland Public Schools have eliminated EPS lunch trays as part of a pilot program. The schools will gather information throughout the school year on cost-effectiveness, volunteer time and the effects on garbage, water and energy use.[8]
- In 2006 Henry David Thoreau Elementary School in the Lake Washington School District switched from EPS to durable lunch trays. As a result, the school reduced its solid waste by 82 percent, or 230 cubic yards per year. The switch reduced lunch waste from 6.5 cubic yards of garbage per week (which had included 1,100 disposable EPS trays) to less than 1.2 cubic yards per week.[9]

Resources:

- *Durable Reusable Lunch Trays and Baskets*, prepared by King County Green Schools

Alternative #2: Paper/Cardboard (Compostable) Lunch Trays

Several schools purchase uncoated cardboard/paper lunch trays, which can be composted along with food scraps. Composting collection is less expensive than garbage collection, and therefore schools can realize cost savings by making this switch and contracting for composting collection.

Examples:

- The Davis Joint Unified School District (California) composts cardboard lunch trays at three elementary schools. Set up costs included sorting stations and outreach materials. The schools reduced solid waste by about 40 percent, resulting in an estimated gross savings of $6,230. The district plans to expand the program.[10]
- The Issaquah School District, a King County Green Schools Program participant, switched from EPS to compostable paper lunch trays. The trays (purchased from Food Services of America, *http://www.fsafood.com*) cost twice as much as EPS trays, but the district made the switch as part of an effort to use nontoxic and more environmentally responsible products. In the future, the district would like the trays, along with food scraps, to be collected for composting.

Paper options (from KCDA catalog)*:

Product Description	KCDA No.	Mfg No.	U/M	1-23	24+
5 compartment;8”x10”; Chinet	49690	VALLEY	500/Cs	$49.27	$47.28
6 compartment; 9”x12”; Chinet	49685	VALISE	500/Cs	$61.99	$59.49
3 compartment; 8”x9”; Chinet	49680	VAGRANT	500/Cs	$54.67	$52.47

Non-paper biodegradable options*:

- http://www.sinlessbuying.com/tep/catalog/catalog/index.php - Tree Free Biodegradable Trays
- http://www.ciwmb.ca.gov/RCP/ProdByType.asp?ProductTypeID=76 - California’s Recycled Content Product Directory

*Before buying compostable products, contact your local composting collection company to make sure the product is acceptable.

Sources:

1. http://www.americanchemistry.com/s_plastics/sec_pfpg.asp?CID=1432&DID=5224
2. http://www.epa.gov/garbage/pubs/06data.pdf Page 7
3. http://www.metrokc.gov/dnrp/swd/linkup/eNewslink/current.asp
4. *Use and Disposal of Polystyrene in California: A Report to the California Legislature Dec 2004*
5. http://www.epa.gov/ttn/atw/hlthef/styrene.html; http://www.epa.gov/OGWDW/dwh/t-voc/styrene.html;
6. http://www.atsdr.cdc.gov/toxfaq.html; http://www.atsdr.cdc.gov/toxprofiles/phs53.html
7. http://www.seattle.gov/util/Services/Garbage/Reduce_Garbage_&_Litter/GreenFeeFoamBanProposals/SPU01_003525.asp
8. http://www.oregonlive.com/portland/oregonian/index.ssf?/base/portland_news/120536070512750.xml&coll=7

9. http://www.kingcounty.gov/environment/dnrp/newsroom/newsreleases/2007/november/1102GreenSchoolsLWSD.aspx
10. http://www.ciwmb.ca.gov/FoodWaste/CaseStudies/Contracts/2000/Davis2.pdf