The Use of PVC Plastics for Aquaculture in Puget Sound

Summary of data presented in this report:

There are 364 acres of active geoduck farms in Puget Sound (Per Dept. of Ecology)

Assumption:

1/3 of all geoduck farms have installed PVC tubes

The amount of plastic pollution this adds to Puget Sound (based on 121.32 acres) is:

One thousand miles of PVC tubing

Four million pounds or two thousand tons of PVC

The amount of toxic PVC material left in Puget Sound:

If 2% of PVC tubes by weight are lost into Puget Sound, it results in **120 tons of toxic material** entering the aquatic environment.

"Such plastic poses one of the grave threats to the health of Puget Sound. The particulate plastic from such PVC tubes enters the food web and does untold harm to all the creatures in Puget Sound, including us. It is not healthy to eat geoducks raised in such a fashion."

Quote from Dr. Curtis Ebbesmeyer PhD, Oceanographer/expert on plastics in the marine environment.

June 3, 2010

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The geoduck aquaculture industry embeds approximately 8 miles of PVC pipe per acre in pristine intertidal habitat areas of Puget Sound, mostly in South Sound. Based on the approximate weight per acre calculations provided by the geoduck industry, 4 inch schedule 10 PVC tubes, the smallest size used, weigh about 32,000 pounds, or 16 tons per acre of PVC. The best current estimate according to the Shellfish Aquaculture Regulatory Committee, as of June 1, 2010, suggests there are currently 364 acres of active geoduck farms in Puget Sound. This represents nearly 3 thousand miles, 12 million pounds or 6 thousand tons of PVC in Puget Sound from geoduck aquaculture. If one assumes that at any given time only one-third of all geoduck farms have PVC tubes installed in the tidelands, then this would yield about 1 thousand miles, 4 million pounds or 2 thousand tons of PVC.

It is known that the geoduck industry uses and reuses the PVC tubes until they are unusable. In other words, until they are worn or chipped away so much that they can no longer hold water. PVC was not designed for outdoor use in the marine environment, where it is exposed to temperature fluctuations, UV light, and wave and sand erosion and the effects of scouring.

PVC is the most common of all chlorinated plastics. It is made up of about 43 percent petroleum and 57 percent chlorine from rock salt. Vinyl chloride, the main chemical in PVC, is a known human carcinogen according to the World Health Organization.

PVC is one of the most environmentally hazardous consumer materials ever produced. The PVC lifecycle presents one opportunity after another for the formation and environmental discharge of organochlorines and other hazardous

When its entire lifecycle is considered, it becomes apparent that this seemingly innocuous plastic is one of the most environmentally hazardous consumer materials produced, creating large quantities of persistent, toxic organochlorines and releasing them into the environment. PVC has contributed a significant portion of the world's burden of persistent organic pollutants and endocrine-disrupting chemicals—including dioxins and phthalates— that are now present universally in the environment and the bodies of the human population. Beyond doubt, vinyl has caused considerable occupational disease and contamination of local environments as well.

The hazards posed by dioxins, phthalates, metals, vinyl chloride, and ethylene dichloride are largely unique to PVC, which is the only major building material and the only major plastic that contains chlorine or requires plasticizers or stabilizers. PVC building materials therefore represent a significant and unnecessary environmental health risk.

The geoduck industry claims that they only use structural PVC, which may not contain plasticizers. Without plasticizers, PVC remains brittle and hard. However, all PVC contains stabilizing additives. One of the most common of these additives is lead. No safe threshold for lead exposure has been discovered. Lead is highly toxic even in microscopic amounts.

Heat stabilizers are necessary in all PVC formulations to prevent the decomposition of the PVC by heat and shear during processing. They can also enhance the PVC's resistance to UV light, and to weathering and heat aging. In addition, heat stabilizers have an important influence on the physical properties of the PVC and the cost of the formulation. The choice of heat stabilizer depends on a number of factors including the technical requirements of the PVC product, regulatory approval requirements and cost. The main heat stabilizers are usually combined with costabilizers, which are organic materials, such as polyols, epoxidised esters, and phosphites. They create a synergetic effect between the additives. Lead compounds are the most cost-effective and common forms of stabilizer used for PVC. They are used for about 75 percent of all PVC applications. The lead from PVC has been documented to contaminate water and aquatic organisms, and to **cause nerve damage in people** near PVC manufacturing facilities.

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PVC tubes out of Eld Inlet, heading toward Hunter Point

Because PVC catalyzes its own decomposition, metal stabilizers are added to vinyl for construction and other extended-life applications, including structural PVC pipe. Common PVC additives that are particularly hazardous are lead, cadmium, and organotins, with global consumption of each by vinyl estimated in the thousands of tons per year. Metals do not degrade in the environment. All three of the major PVC stabilizers resist environmental breakdown and have become global pollutants. Metal stabilizers are highly toxic. Lead is an extremely potent developmental toxicant, damaging brain development and reducing the cognitive ability and IQ of children in infinitesimal doses. Cadmium is a potent neurotoxin and carcinogen, and organotins can suppress immunity and disrupt the endocrine system. Metal stabilizers are released through out the PVC product lifecycle. Metal stabilizers are released from PVC products when they are formulated, used, and disposed of. Releases of lead stabilizers from interior PVC building products have been documented.

The PVC tubes used by the geoduck industry contain lead, cadmium or organotins as stabilizing additives. Different geoduck farmers use different diameters and wall thicknesses of PVC pipes, but the most common is 4 or 6 inch, Schedule 10 PVC. All contain lead, cadmium or organotin additives, and all are environmentally hazardous.

The PVC tubes also get ground and worn down by wave and sand scouring into smaller and smaller pieces, the same way that rocks get ground down into sand. PVC starts out as a powder or small pellets before it's melted down for extrusion. Recent scientific articles suggest that these tiny pieces are taken in by zooplankton, and spread up through the food chain. Puget Sound citizens could very well be eating oysters or fish from Puget Sound containing traces of PVC and its toxic additives as a result of contamination from geoduck aquaculture. If only 2 percent of PVC tubes by weight are lost into the aquatic environment from geoduck tubes wearing away due to scouring, weathering or leeching, that would still amount to an astounding **120 tons of toxic material entering the aquatic environment** based on the total acreage of geoduck farms currently in Puget Sound.

House Bill 2220 mandated that plastic debris from geoduck aquaculture be quantified. The amount of PVC and its additives entering Puget Sound at the microscopic level must also be quantified. The best way to determine this is to weigh individual PVC tubes before use and then again after use and before disposal.

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