Plastic-free oceans
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Sewage and wastewater are generated aboard all ships, sometimes in large quantities. Discharge of such waste into the ocean, port, or marina waters can include microplastic particles from toiletries, cosmetics, and from on-board laundering of synthetic textiles such as nylon, polyester, lycra, polysatin and spandex, which are widely used in marine applications. On July 13th, 2015, marine researchers agreed that such oceanic plastic pollution is best defined as aquatic plastic smog.

From cargo ships accommodating as few as 13 crew members to cruisers carrying 3,000 passengers, laundering synthetic textiles releases fibers into the ship’s sewage system (a cruise ship this size has approximately 18 conventional washing machines spread over six different decks). Although most vessels have a treatment system designed to remove pollutants from sewage water, none of the primary, secondary, or even advanced sewage treatment systems are designed to filter out microplastic particles (beads and fibres). These particles end up being released into our oceans, and that’s where the problem begins.

Why “plastic smog”?
Smog is typically made of microscopic particulates that drift in the air unevenly. Air pollution is linked to human health, and we know its effects vary across the population. Likewise, plastic particles float unevenly on the surface and in the water column of the oceans. The impact of microplastic particles is of concern, because synthetic fibers are not readily decomposed. These discharges have the potential to impair water quality, adversely affect aquatic environments, and increase health risks to sea-life and humans. The amount of plastic particles in effluent plumes emitted by ships is unknown and could cause a number of negative environmental and human health-related impacts.

In addition to their own potential toxicity, these plastic particles, such as bits of polyester and acrylic (smaller than the head of a pin), act as “sponges,” collecting and transporting pollutants and other chemicals in the water which can be ingested by sea organisms. Recent research has revealed that aquatic plastic smog is being consumed and passed up the food chain from plankton, invertebrates, fish, turtles, seabirds, and marine mammals (which apparently mistake it for food), with...
direct and indirect impacts to these species. We also know that plastic smog particulates get trapped in the respiratory systems of crabs and is accumulated in shellfish. Eventually, it settles on the bottom of the ocean, much like air smog is constantly settling to the ground.

**Plastic Smog Emissions Closed Loop System**

At the Vancouver-based Upcycle the Gyres (UpGyres), we work to increase the awareness of, prevent, and clean up marine plastic pollution. In cooperation with Motoca Specific, we developed the Plastic Smog Emissions Closed Loop System (PSECLS) to divert microplastic resources from landfill, incineration, and wastewater, by recovering them at source point. It provides an innovative method to monetize the value that is locked in wastewater discharges containing plastic fiber and bead resources.

UpGyres has formed scientific and technology partnerships in the fields of oceanic plastic pollution research, water infrastructure and water treatment technologies, filtration of microplastics, and the collection and reutilization of difficult-to-recycle materials to deliver marine and human health benefits and net economic gains.

PSECLS recovers wastewater and turns it into clean water for reutilization in domestic, industrial, textile, irrigation, and maritime applications—and, at the same time, recovers microplastic resources from dryer machine lint to use as raw materials for the manufacture of plastic beams.

The customer base for PSECLS are the plastics, textile, and apparel industries, real estate developers, industrial textile washing operations, laundry appliance manufacturers, municipalities and ship and fleet owners. In other words, those whose problems are wastewater treatment plants or on-board systems not designed to capture microplastic fibers or beads. We should definitely pay more attention to this problem. After all, organisms that ingest these microplastic particles may very well end up on our plates.

Compared to other water filtration services for maritime applications, PSECLS uses nanoflotation technology to recover microplastics from clothing, cleaning products like toilet and dishwashing scrubs and mops, and beads from cosmetics and toiletries at the on-board and/or at port wastewater treatment system stage. Nanoflotation is cost and energy-effective, and allows us to harvest microplastic particles at a large scale for re-use.

The PSECLS installation at ports or aboard ships will recover gray water so that it can be reutilized in the vessel, sold to other ships, or cleanly discharged into the port’s waters.

By having their own PSECLS, ship owners, operators, and ports will reduce fresh water consumption and the cost of purchasing clean water.