Paint Accounts for Majority of Ocean Microplastics

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A new study published by the Swiss-based Environmental Action has found that paint accounts for 58% of microplastics in the world's oceans and waterways. According to the research, 1.9 million tons of paint found in oceans and waterways each year outweighs other sources of microplastics, including textile fibers and tire dust.

The report, "Plastic Paints the Environment," was authored by Dr. Paola Paruta, Dr. Margherita Pucino and Dr. Julien Boucher of EA. The study was commissioned by ocean impact company Pinovo.

"This report highlights the need for more attention to the problem of microplastics. There are likely to be other equally important sources of microplastic in our environment, and the more we dig the more we will understand and help find solutions to address this human induced problem," wrote Boucher.

"Current literature shows us that consequences of microplastic on biodiversity and human health are negative, and the potential effects of increasingly smaller and invisible particles, such as nanoplastics, may be even more harmful. We are at the tip of the iceberg of knowledge in our understanding the impacts and solutions surrounding microplastics and nanoplastics."

Report Findings

According to the study, paint produced with plastic polymers can leak into the environment several ways: during application, wear and tear and removal (micro-leakage) or with unused paint or end-of-life of the painted object (macro-leakage). Paint has on average a 37% plastic content.

Environmental Action

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The EA report notes that the study was based on a 2019 baseline year, with a global paint demand of 52 metric tons that included 19.5 metric tons of plastics. The six paint sectors analyzed in the study and their total leakage rate of plastic in paint included:

- Architectural (33%);

- Marine (66%);
- Road markings (74%);
- General industrial (60%);
- Automotive (28%); and
- Industrial wood (36%).

Additionally, researchers looked at the percentage of leakage in ocean and waterways for each sector:

- Architectural (24%);
- Marine (90%);
- Road markings (52%);
- General industrial (50%);
- Automotive (11%); and
- Industrial wood (8%).

The total leakage from paint is reportedly estimated to be between 5.2 to 9.8 metric tons per year, with the average being 7.4 metric tons annually and a 40% leakage rate. About a third, or 37%, of this leakage occurs as a result of waste mismanagement and about 18% stems from wear and tear or maintenance of ships and offshore rigs.

Pinovo estimates, based on Norway figures, that approximately 1,100 kilograms of paint microplastics and 260 kilograms of heavy metal emissions are produced from oil rigs annually. This amount is the equivalent of 100,000 empty plastic water bottles being dumped into the ocean.

In terms of location, the Asia Pacific region accounts for 54% of total leakage rate, 22% from North America and 50% from Europe. The highest per capita leakage is reportedly from Asia with 1.7 kilograms per capita per year, compared to the world average of 1.1 kg/cap/year.

Researchers explained that this is likely due to the fact that 62% of the world shipping fleet is manufactured in South Korea and Japan. Additionally, they assume that 62% of drydocking maintenance happens in this region.

EA reports that this is the first study to show that the paint industry is the sector with the highest contribution to primary microplastic leakage.

“The intention of this research is not to criticize paint, but to increase the level of knowledge and awareness of the issue, so as to pave the way towards a better-managed paint system where paint can deliver its full value without compromising the health of our environment,” said Boucher, who is also the EA founder.

The study noted that while paint is the largest contributor, it is “not without reason as paint delivers value by protecting objects from environmental degradation and corrosion” used on infrastructure. It increases the lifetime of objects and eliminates the need for frequent replacement or maintenance, including any associated environmental impacts.

Pinovo chairman Declan McAdams said the study should be a “wake-up call for the paint industry.”

“We need a systemic change in the use and management of paint, now that these findings have shone a light on the extent of the pollution being caused,” said McAdams. “We warmly welcome the recent decision by the EU Commission to turn their attention to paint as a source of microplastics. This is a big step in the right direction.”

The full study can be read here.

Recent Microplastic Studies

In October, a study conducted by the University of Plymouth and the Marine Biological Association (MBA) observed that paint flakes could be one of the most abundant types of microplastic particles found in the ocean.

The study, published in *Science of the Total Environment*, collected 3,600 samples from the North Atlantic Ocean. Each cubic meter of seawater reportedly contained an average of 0.01 paint flakes, following behind 0.16 particles per cubic meter of microplastic fibers.

“Paint particles have often been an overlooked component of marine microplastics, but this study shows that they are relatively abundant in the ocean. The presence of toxic metals like lead and copper pose additional risks to wildlife,” said Andrew Turner, the study’s lead author and associate professor in environmental sciences at the University of Plymouth, in an interview.

These paint flakes also contained high quantities of lead, iron and copper due to having anti-fouling or anti-corrosive properties. Researchers explained that this could pose a threat to the ocean and marine life if ingested.

Additional research findings included:

- Microplastics have been identified in plankton trawls of the North Atlantic;
- About 17% of microplastics were non-fibrous, and of these, the majority were paint flakes; and
- XRF analysis revealed a variety of Cu-based antifouling formulations and Pb-based paints.

In December, a research team from the Department of Environmental Sciences at the University of Basel and the Alfred-Wegener Institute at the Helmholtz Centre for Polar and Marine Research on the island of Heligoland published a study analyzing microplastic particles and paint fragments in Antarctica.

The research, published in *Environmental Sciences and Technology*, was the first time something of this scope has been conducted in Antarctica, according to Clara Leistenschneider, doctoral candidate in the Department of Environmental Sciences at the University of Basel.

The research team, led by University of Basel Professor Patricia Holm and Dr. Gunnar Gerdts of AWI, hypothesized Weddell Sea would have substantially lower concentrations of microplastics due to its minimal human activity. However, microplastic concentrations were only slightly lower than other more populated regions in the area.

Researchers collected 34 surface water samples and 79 subsurface water samples from the remote Weddell Sea in 2018 and 2019. The team took two expeditions in the research vessel, Polarstern. Once filtered, the approximately eight million liters of sea water contained microplastics.

The study also noted that more than half of the sample fragments collected had visual characteristics similar to the ship paint on the research vessel Polarstern. Researchers further analyzed these fragments at the Center for Marine Environmental Sciences (Marum) at the University of Bremen.

Utilizing x-ray fluorescence (XRF) to identify pigments and fillers, it was revealed that 89% of the 101 microplastic particles studied had originated from the team’s Polarstern ship, with the other 11% coming from other sources.

Researchers indicated in the study that ship paint would typically be released during ship maintenance at docks, but also during operation through coating abrasion and weathering. They also noted that water surface tension might retain paint particles in the water surface layer, negatively affecting the environment.