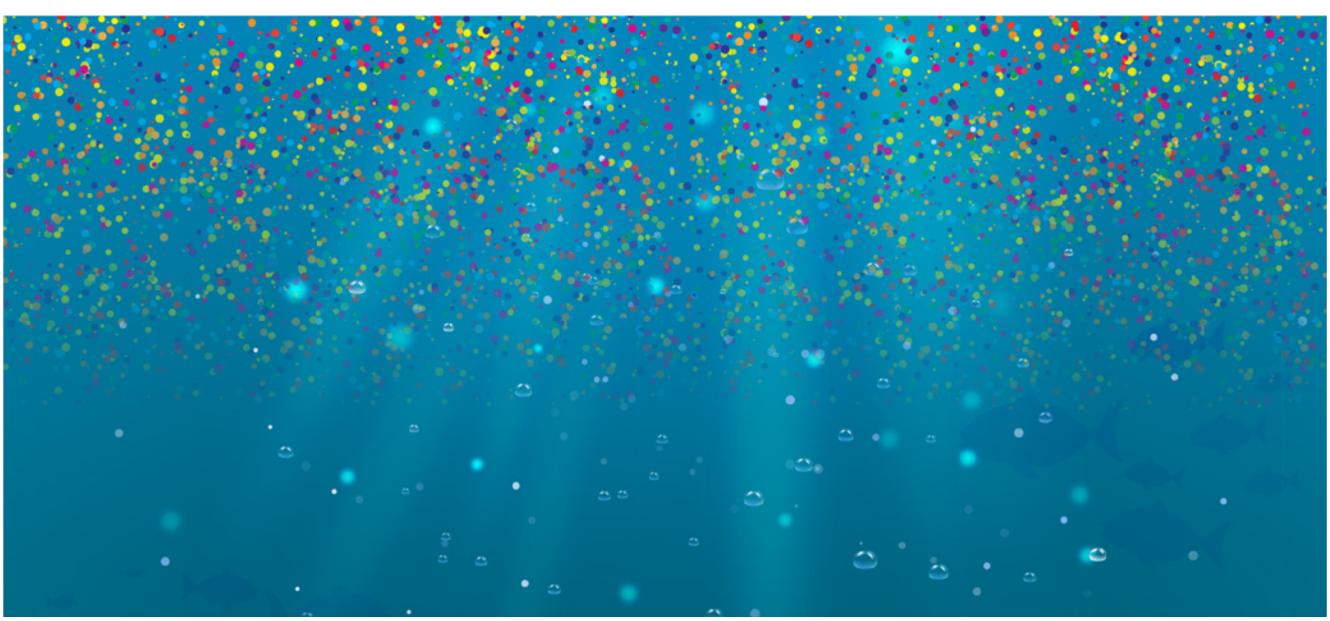
TECHNICAL ARTICLE

Does grinding create microplastics?

Microplastics are a growing threat to global water sources. In the quest to mitigate the amount of microplastics in the wastewater effluent, some industry professionals have concluded that they must eliminate the use of grinders. The thought process is that as plastic solid waste enters the grinder, it is chopped into microplastics, thus contributing to the problem. However, this thinking is wrong for a range of reasons. The first is that it misunderstands how a grinder works. The second is that it fails to account for the primary sources of microplastics in global water sources.

Microplastics are small pieces of plastic that are less than 5 mm in size. The World Health Organization estimates that freshwater sources can have up to 1,000 particles of microplastics per liter. Drinking water and wastewater facilities have struggled to find solutions to remove microplastics from the water cycle. Unlike traditional contaminants like phosphorous or even per- and polyfluorinated substances (PFAS), microplastics have variable sizes, compositions, densities, and more. This makes testing for the presence of microplastics, let alone filtering them out, incredibly complex.



How a grinder works (and what it does not do)

"The macro-trend in wastewater is that the ratio of water to solids is changing and will continue to change," says Greg Queen, president of JWC Environmental, a market leader in grinders and other solids handling solutions. "As low-flow toilets and shower heads have been introduced, as well as commercial products like disposable wipes or even non-flushable wipes that get flushed, wastewater facilities have been seeing much higher solids content per gallon."

Any hard solid material that ends up in the wastewater stream can potentially damage downstream equipment. A grinder reduces solids, minimizing the risk of clogs, blockages, and equipment damage.

Queen explains that when solids and debris end up in a grinder, the grinder creates cross-cut strips. "This is similar to the way a paper cutter works; when the grinder is outfitted with the correct cutter, it will reduce the solids to about a half-inch thick strip that downstream pumps and equipment can manage and eventually remove," he says. "The low-speed, high-torque cutting action is smooth and crisp. In other words, plastics and other debris aren't micro-cut or ground in a manner that would create microplastics."

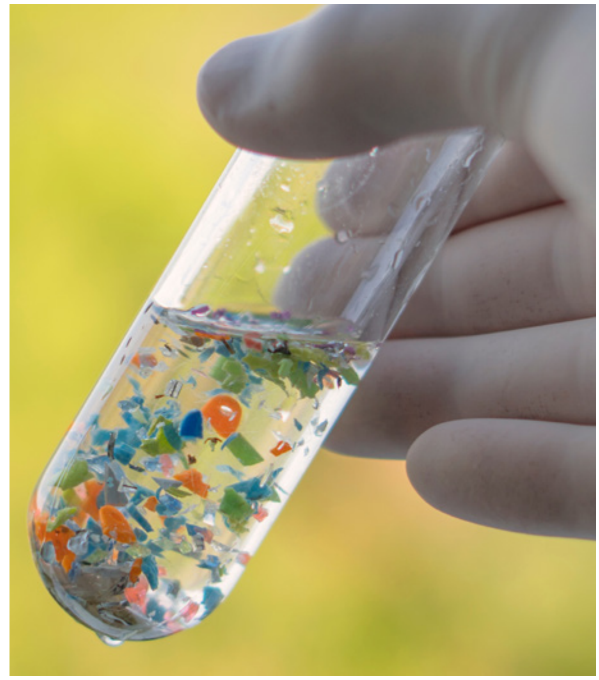
Alternatives to grinding do exist, but Queen notes that they will not work for every application. "Bar screens can be installed in the pump station to remove physical debris and other large solids in place of a grinder," he says. "But these devices require potential infrastructure rework and now create a solids disposal dilemma."

While chopper pumps and macerators are often seen as an alternative to grinders, these technologies work at high speeds with low torque, making them less effective at handling challenging solids.

Sources of microplastics

There are two main types of microplastics. Primary microplastics are released directly into the environment as small particulates, usually as scrubbing or abrasion agents in cosmetics, but also as waste created in the manufacturing of plastic and textile products. Secondary microplastics occur when larger plastic products degrade over time.

A study by the International Union for the Conservation of Nature (IUCN) found that the single largest source of microplastics in global waters comes from laundering clothes and textiles. Much of today's clothing is made



35%

synthetic textiles

7%

road markings

28%

car tires

3.7%

marine coatings

24%

city dust

2.3%

personal care products, plastic pellets, wet wipes, tea bags, cigarrette butts, laundry/dishwasher pods, household plastic waste from synthetic materials derived from plastic. These materials shed small particles each time they are washed. IUCN estimates this source accounts for 35% of annual microplastics releases into waterways.

Another 28% comes from rubber tire particles that end up in waterways via stormwater runoff, while 24% comes from what the study called “city dust.” This refers to microplastics created by everything from abrasion of footwear on pavement to the degradation of synthetic cookware and tableware during cleaning, among other things. In fact, the study shows that nearly all microplastics enter a wastewater treatment plant (WWTP) already in particulate form before entering a grinder.

Solutions to microplastics

Numerous studies have shown that most types of municipal wastewater treatment, including activated sludge, membrane bioreactors, and more are effective at removing microplastics from released water. Preliminary treatment techniques, including screening and skimming, can remove up to 58% of microplastics in settled solids. Primary and secondary treatment have been found to remove up to 97.8% of microplastics. Operations with tertiary treatments have been found to eliminate nearly 99% of microplastics from the final effluent.

But these are not long-term solutions, according to Queen. “Those processes remove microplastics from the effluent, but it is still in the sludge, which then has to be disposed of,” he says. “So, it’s still in the environment.”

Thus, if WWTPs truly want to eliminate microplastics, the focus should be on how to isolate them from sludge, and they can do that with their grinders running.

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