



Virgin plastic pellets are the biggest pollution disaster you've never heard of



AP PHOTO/KOJI SASAHARA

Before plastic is made into anything else, it is made into pellets. And those pellets are leaking everywhere.

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The climate economy

Every industry can be part of the solution — or part of the ongoing problem.



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Some 30 miles north of Pittsburgh, Pennsylvania, in a township adjacent to a state forest, oil and gas giant Royal Dutch Shell is building a sprawling new plant to support what it sees as the future of its business: making millions of tons of new, virgin plastic.

US president Donald Trump visited the facility last week, highlighting the 5,000 construction jobs it has created. The plant is just one of more than 300 new plastic facilities proposed or permitted for the US in the near future. Shell, along with other major oil and gas companies like Exxon, sees plastic as one avenue for

growth as natural gas prices plummet—and, longer-term, as a way to weather the world's slow rejection of fossil fuels as an energy source.

For now, if Shell can't make money selling its plentiful natural gas, it can certainly make plastic with it. As a whole, the oil and gas industry aims to increase plastic feedstock production by at least 33% by 2025.

The Shell plant will rely on a process known as “ethane cracking,” where ethane gas, once seen as an unusable byproduct of gas extraction, can be molecularly “cracked”—its carbon and hydrogen atoms rearranged—to form ethylene, the main building block of plastic.

When completed, the new facility will pump out 1.8 million tons (1.6 million metric tons) of plastic each year. In a world where buying virgin plastic is often cheaper than using the recycled stuff, the new product will likely find an eager manufacturing market. The vast majority of that plastic, like the vast majority of all plastic made up to now, will likely not be recycled. And it will exist virtually forever, crumbling into microplastics that show up most everywhere scientists look for them.

But first, that new plastic will take a ubiquitous, often overlooked form: It will be born into the world as tiny plastic pellets. Those small spheres, sometimes known as “nurdles,” are a massive source of plastic pollution, escaping into the environment before they have a chance to be molded into a useful shape. With roughly 22,000 nurdles per pound of plastic, the Shell plant intends to produce the rough equivalent of 80 trillion nurdles per year.

Very little research exists to quantify how many of these pre-production pellets end up in the environment. Available estimates tend to be locally isolated; one recent study found that production facilities in the UK lose between 5 billion and 35 billion pellets a year, for example. In 2017, two shipping vessels collided, spilling 49 metric tons of pellets into the sea and coating 2,000 kilometers (1,243 miles) of South Africa's coastline with nurdles.





REUTERS/TYRONE SIU

Nurdles show up everywhere. In this photo, volunteers are cleaning nurdles on the coast of Hong Kong's Lamma island in 2012. Hundreds of millions of the plastic pellets were dumped when containers were knocked off a vessel during a typhoon.

Short of any more specific quantification, researchers do know that pellets account for a whole lot of the world's total plastic pollution. Some estimates suggest half of all microplastics might actually be these pre-production pellets.

“Pellets make up the second most common type of microplastic that we find, second to fragments which break down from things that are bigger,” says Sherri Mason, a plastics pollution researcher at Pennsylvania State University who has published foundational studies on microplastics found in freshwater. She spends much of her time collecting and counting bits of plastic in the environment. “I can go to any beach, give me five minutes and I’ll find a nurdle,” she says. “Along a river, 10 minutes. Once you know what a nurdle looks like you find them everywhere.”

Nurdles are about the size of a lentil. And like anything tiny and round, they are tough to keep track of. They roll away. They tumble into waterways. The wind can blow them around. In the vicinity of plastic manufacturing or packaging plants, nurdles have been documented spilling onto the ground and tumbling out of water discharge pipes.

Manufacturers often use pneumatic hoses, like vacuums, to move the pellets from place to place. Wherever those hoses connect and disconnect—to fill train cars or trucks for shipping, for example—pellets are known to spill out. The new Shell plant will have its own rail system, equipped with 3,300 freight cars.

Miriam Gordon, the director of plastic policy advocacy group Upstream, spent time walking around plastic processors in California, taking photos of the piles of pellets that accumulate beneath hoses. “Each of these rail cars has two or three valves where the hose connects to the rail car,” she says, “and you’ll see that at the point of those valves there’s big piles of pellets or powders right under them.”



COURTESY MIRIAM GORDON

Pre-production plastic pellets strewn on the ground near a facility in California.

“Once they’re on the ground they won’t put them into the manufacturing process, because they’re contaminated with dirt,” Penn State’s Mason says. “So they wash them into drains. And those don’t go through treatment like your sink or toilet—they go straight to waterways.”

A REGULATORY WILD WEST

In Texas, a major plastic-producing state, petrochemical company Formosa Plastics released millions of pellets into Lavaca Bay, a cove that washes into the Gulf of Mexico. In its wastewater permits, the Texas Department of Environmental Quality prohibits leaks of pellets—“in other than trace amounts,” a quantity that the agency

hasn't defined and which advocates say amounts to a pollution loophole.

That meant that for years, the plant discharged pellets without recording them as pollution. And for years, residents, fed up with beaches covered in plastic pellets, paddled by kayak around a nearby creek, collecting data on the nurdles being discharged from the company's plant. This June, noting the more than 1,000 days of violations recorded by those volunteers, a federal judge ruled that Formosa could be held liable for violating state and federal water pollution laws.

As the Royal Dutch Shell plant rises in Pennsylvania, environmental groups and scientists are worried about the lack of regulation to specifically address plastic pellet pollution. California is the only state with regulations to specifically control for plastic pellet pollution.

Gordon helped craft that legislation, which passed in 2008. But adopting rules is not enough, she says.

Enforcement is the biggest challenge. California doesn't have any plastic manufacturers like the Shell plant in Pennsylvania, but the state is home to roughly 7,000 companies that transport, repackage, or make products out of nurdles. The state is "way too understaffed to inspect and investigate all of these facilities," she says. "There continue to be reports about spills and discharges of the powders and pellets into the stormwater system." Just last year, the EPA fined two Los Angeles-area plastic companies for dumping pellets, citing the Clean Water Act, though there are no federal rules that address pellets specifically.

Pellets beneath a freight car valve at a California plastic facility.

Instead, states rely on the industry to set standards for itself. Right now, the only national program on plastic pellets is completely voluntary, and industry-led. The American Chemistry Council and the Plastics Industry Association, two major trade groups, maintain a program called Operation Clean Sweep, where members can voluntarily commit to a set of best practices for preventing raw plastic from spilling into the environment. The criteria is fairly rigorous, but it doesn't require reporting, or have any mechanism for oversight. (Update: A Shell spokesperson says the new plant in Pennsylvania is designed to "adhere to the standards of Operation Clean Sweep Blue," the most recent and rigorous version of the program.)

Little by little, so-called "activist investors" are trying to change that. Green investor group As You Sow announced in January that it had filed shareholder resolutions against DowDuPont, ExxonMobil, Chevron Phillips Chemical, and Phillips 66, asking the companies to file annual reports on plastic resin spills, and what the companies were doing to prevent them. After negotiations, As You Sow agreed to withdraw their resolutions after Chevron Phillips Chemical and ExxonMobil said they would publish reports on the amount of pellets they spilled in 2018.

Last month, Chevron Phillips made good on the deal, publishing a report last month that said the company spilled just 4 pounds—or approximately 88,000 pellets—in 2018. It also reported it spilled another 31.5 million pounds, but cleaned that up before it could reach the environment.

Exxon has been less prompt. "We are still waiting on Exxon's report; it is past due from when the company told us they would release it," wrote Kelly McBee, As You Sow's waste program coordinator, in an email to Quartz. Dow DuPont also recently told the group it would

publish information about its 2018 resin spills after the As You Sow resolution went to a shareholder vote, McBee said.

Last month, 280 public health, environment, and indigenous groups signed on to a formal petition to urge the EPA to “update the 26-year-old water pollution rules it uses to approve industrial facilities that create plastic,” and to ban them from discharging raw plastic into the environment. With 300 new plastic manufacturing facilities currently proposed in the US, the petition argues, there should be rules made specifically to govern them. The EPA did not return a request for comment.

Plastic pellets emptying from a storm drain into the Los Angeles River.

MIRIAM GORDON

In Pennsylvania, state regulators reached by email said the state’s water quality standards are enough to regulate plastic pellets. The language of those standards prohibit discharging pollution in “concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life.”

But Mason, the Penn State researcher, says that the data doesn’t yet exist to know how much plastic would even meet criteria for harm within existing water standards. “We have no knowledge of the

human or aquatic impacts and what would be an appropriate limit,” she says. “There has been no human health assessment.”

“This is the forefront of science. This is where we’re trying to go with understanding.”