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Oshkosh Corp. introduced its electric Volterra ZFL garbage-truck concept this year. OSHKOSH



At top, New York City's Empire Bins, a new type of smart garbage can. Above, standard bins —from left to right, compost, trash, paper/cardboard, and metal/glass/plastic. DSNY

Companies Make Haste to Rethink Waste

BY BRETT BERK

It's a common 5:30 a.m. routine. A surge of panic sets in as you wonder: Did I put the trash out?

In the coming years, instead of jumping out of bed, you might be able to lie back and relax. Your self-driving trash receptacle would have already taken itself to the curb.

Urban planners, the refuse industry and cities across the country are reimagining how we manage and dispose of our waste. The New York City Department of Sanitation and the Massachusetts Institute of Technology are among those leveraging artificial intelligence, robotics and electric power to tackle a growing garbage crisis fueled by cheap products and throwaway culture.

Americans are among the top producers of trash per capita. Each person in the U.S. disposes of nearly a ton of refuse annually, according to 2018 figures from the U.S. Environmental Protection Agency. Simplifying trash day, and diverting the 80% of reusable material that still ends up in landfills, is one key to solving our problems, says Javier Lojan, acting commissioner of the New York City Department of Sanitation.

“We want to make it easier for residents to recycle, and for us to recover more of the recyclable materials,” he says.

Here’s how technology could change garbage day in the future.

Most of Americans don’t recycle regularly, citing the inconvenience and confusion involved in sorting their trash. To help people up their sustainability game, sanitation engineers are promoting a new system: the single-stream model.

The operation is simple—residents throw everything into one trash bin. Then, that waste is transported to a remote facility, where AI-powered cameras and robots sort it, diverting items that can be recycled.

“The real goal is to have a system that’s more circular, that can reuse and recycle things more,” says Carlo Ratti, an architect and engineer who is director of the Senseable City Lab at MIT, which uses science and design to fuel urban innovation.

Many large municipalities in the U.S. including Chicago, San Francisco, Denver and Los Angeles are already using a single-stream system—though only for recycling and not other waste.

AI can also identify items such as electronics that contain hazardous or valuable materials—including copper, silver, gold and rare-earth minerals—and send them on for disassembly and harvesting before they enter the waste stream.

But not everything can flow into this stream. Compostables such as food scraps and yard waste must remain separate, Ratti says, or they will contaminate other materials as they decompose.

To offset this issue, municipalities could mandate small in-home composting containers, which can be emptied in larger curbside composting bins, says Lojan, whose department has already launched such a program in New York.

Separating out organic material in this way allows it to decompose while aerated, and has the added advantage of making all of our trash less stinky.

Individual garbage bins or piles of plastic bags aren’t only an all-you-can-eat buffet for rodents—but also malodorous, leaky and inefficient, requiring endless noisy stops from garbage trucks on collection day, says Lojan.

To solve these problems, cities are moving toward containerization: large, centralized bins shared by a street or neighborhood. In New York City’s West Harlem neighborhood, the Department of Sanitation is already piloting a program of such containers, with plans for citywide expansion in the future.

“This is going to transform the way waste is picked up in New York City,” says Lojan, who started his career as a sanitation worker.

To ease the burden of schlepping your junk to these central bins, machinery manufacturers such as Wisconsin-based **Oshkosh Corp.,** are developing small self-driving battery-powered robots. They could be ordered on demand, like an Uber. Oshkosh recently unveiled such a concept, called Harr-e.

“It can come to your house, it will wait while you load it up,” says Jay Iyengar, Oshkosh’s chief technology officer. “Then it can offload [the refuse] in a central location, and from there a big truck can come pick it up.”

Of course, such mobile bins will also monitor what you're disposing of. "If there are items in there that shouldn't be—batteries, paint, compostables— it could automatically divert them," Iyengar says. "And bill the household accordingly."

Smart bins could even ping dispatch offices when they are ready for pickup. Large collection vehicles could be used more sparingly, and with fewer stops—thus decreasing noise, pickup time and pollution.

"Today, trucks basically go around and collect everything on a route, every time, regardless of how filled the container is," Ratti says. "But in the future, the parameters that we use could be, 'Is it full? Or is it smelly?' If you could monitor this with sensors in the bin, then collection on that bin can take place only if the contents meet those conditions."

Garbage trucks' rumbling machinery and persistent backup warning bleeps routinely interrupt our sleep, and their idling gas engines make a racket while producing hazardous emissions.

Electric-powered garbage trucks could solve many of these problems, says Iyengar of Oshkosh, which introduced its electric Volterra ZFL truck concept this year.

AI-optimized routing and trash-loading technologies could also help make pickups shorter, less frequent and less disruptive. The technology could also make the job safer for sanitation workers, who will no longer have to hop on and off.

"Once the operator gets to a stop, the cameras and sensors tell them where they are supposed to stop, and sensors extend the arms, pick up the bin, lift it up and empty it into the truck," Lojan says.

Another idea is to enlist delivery vehicles to help make refuse pickup more efficient, MIT's Ratti says. But there would be limitations to this concept, he added.

"You can't deliver your groceries from Whole Foods together with garbage from your neighbor," he says.

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