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BEATING THE BATTERY BLAZE

PAUL TONG

LITHIUM BATTERIES POSE A SERIOUS FIRE HAZARD FOR MRFS. HOW CAN FACILITIES PROTECT THEMSELVES AGAINST THE GROWING STREAM OF BATTERY-POWERED DEVICES? **BY MEGAN QUINN**

Workers at Rumpke Waste & Recycling (Cincinnati) have seen their share of fires at their 10 materials recovery facilities over the years, including a devastating blaze in 2012 that destroyed Rumpke's original recycling facility in St. Bernard, Ohio. Pool chemicals, propane tanks, and other household chemicals were factors that had led to fires in the past, but a new, increasingly prevalent fire source has become a concern more recently: lithium



A surprising array of everyday objects contain lithium batteries, which can start fires when the batteries become bent or damaged. These items, which can be tough to spot in the recycling stream, may contain lithium-ion batteries, a rechargeable type found in keyboards or cameras, or lithium metal batteries, which are for one-time use.

primary batteries and lithium-ion batteries. In 2017, these batteries started more than a dozen small fires in Rumpke MRFs and in its waste and recycling collection trucks. “That number has continued to climb each year since 2014,” says Amanda Pratt, Rumpke’s spokesperson. The company isn’t alone. Batteries containing lithium—both the rechargeable lithium-ion batteries found in laptops and power tools and smaller, one-time-use lithium primary batteries—have a growing reputation for igniting fires at MRFs and other recycling facilities. Recyclers are trying to tame the flow of these batteries with a three-pronged approach: better customer outreach and education, better source control and housekeeping, and better employee training. A group of experts from across North America also is meeting to collaborate on training and best practices that facilities can use to reduce the risk of fires from these tiny troublemakers.

MORE BATTERIES, MORE PROBLEMS

More and more products use lithium batteries every day. As battery technology gets more sophisticated, “more batteries are being made, they are becoming more diverse” in terms of shapes and sizes, “and they are getting even more powerful with the demand for longer energy storage and greater work capacity, which is endlessly increasing,” says Michael Timpane, president of process optimization and material recovery for consulting firm RRS (Ann Arbor, Mich.). As they enter the

recycling stream in greater numbers, their hazards are becoming more well-known, too. Headline-grabbing examples of lithium battery fires include the popular hoverboard—a device so notorious for catching fire that YouTube has thousands of videos of it bursting into flames—and the Samsung Galaxy Note 7, which the U.S. Department of Transportation banned from all U.S. flights in 2016 after reports of hundreds of battery fires.

While fires ignited by hoverboards or cellphones get the headlines, plenty of other objects, such as laptops, personal fitness trackers, and battery-powered toothbrushes, use lithium or lithium-ion batteries and can pose similar fire hazards if the batteries inside them get crushed or bent, says Anne Germain, vice president of technical and regulatory affairs for the National Waste & Recycling Association (Arlington, Va.). A typical consumer knows some of these products shouldn’t go in the trash, but there aren’t clear rules for how to recycle a FitBit, she says. “The public isn’t sure what to do with them when they’re used up, so they throw them in their regular recycle bin,” she says. Some batteries have a “chasing arrows” symbol on the side that “makes [people] think they can put them in their recycling bins. They would need to take them somewhere where they can be properly recycled—not the curbside,” she says.

Lithium batteries and MRF equipment are a bad mix, Timpane says. The batteries can carry a residual charge even after they seem spent, and the exposed positive end of the battery can create a spark when it rubs against another metal—or another battery. Recycling collection and processing equipment “crushes, compacts, runs over, and exposes the battery to internal damage,” Timpane says. “This can cause an uncontrolled thermal event, like fires and explosions, under pressure. Most lithium-based battery designs are made to vent heat for this very purpose.” Damaged batteries are especially dangerous, adds Randy Ellert, Rumpke’s loss control manager and a former firefighter. One of Rumpke’s recent fires started when a battery got crushed underneath the bucket attachment of a wheel loader; another started when a rechargeable power tool battery got caught in a drum feeder and smoldered on the sorting belt. “The batteries are not so bad in their natural state, but when they are smashed or crushed, they can heat up to 1,000 degrees F,” he says.

BUILDING BATTERY BEST PRACTICES

Lithium batteries are here to stay. So how can MRFs and other recyclers more effectively handle the oncoming flow? Representatives from ISRI and other recycling organizations are putting their heads together for the answers.

The working group, which also includes representatives from the National Waste & Recycling Association (Arlington, Va.), the Solid Waste Association of North America (Silver Spring, Md.), Call2Recycle (Atlanta), the Portable Rechargeable Battery Association (Washington, D.C.), the Corporation for Battery Responsibility (New York), and Keep America Beautiful (Stamford, Conn.), meets regularly to discuss and develop best practices for handling the batteries in recycling and waste streams. Efforts to date include writing a safety training program for MRFs and other recyclers, creating a public awareness campaign recyclers can adopt for their customers, and collecting photos of problematic batteries to make it easier for stakeholders to identify them. The group also is gathering testimonials from recyclers and trash haulers to better understand the challenges each face. “We don’t have all the answers yet, but something is coalescing,” says Terry Cirone, ISRI’s vice president of safety.

The working group is open to anyone affected by the issue. To get involved, provide a testimonial, or find out more, e-mail NWRA’s Anne Germain at agermain@wasterecycling.org.

SPREADING THE NEWS

The problem isn’t just that the batteries can be dangerous—it’s that the public doesn’t know that, Pratt says. That’s why Rumpke and other recyclers are creating outreach campaigns to spread the word that batteries do not belong in household recycling bins. “If more people realized these batteries could cause a fire, it might help reduce the number of batteries we see in the waste and recycling stream,” she says.

Rumpke rolled out a social media campaign with battery-related messages and videos on Facebook and Twitter, and its “Make Your Recycling Count” campaign explains how residents can keep common “problem” items, like batteries and plastic bags, out of bins. Rumpke also has a section on its website that directs customers to the nearest battery recycling locations in their state and county.

Companies like Rumpke hope for positive press from their efforts, but some MRFs have turned negative incidents into educational opportunities. In December, ecomaine (Portland, Maine) posted a video of a lithium battery fire that ignited quickly during work hours. The video shows workers using a wheel loader to scoop up and isolate the burning material from the large pile on the tipping floor. Other employees rush in with fire extinguishers to douse the blaze before it can spread. CEO Kevin Roche told the *Portland Press Herald* he hoped the

video would discourage residents from incorrectly throwing away batteries in the future.

The Brown County Recycling Transfer Station in Green Bay, Wis., used a similar tactic when workers discovered a smoldering laptop battery at their facility. An employee talked to local TV news station WFRV-5 about the incident to remind residents that the nearby hazardous waste recovery facility is the correct place to drop off batteries so they will be properly and safely recycled.

Preventing fires through education is a complicated and ongoing job, says Terry Cirone, ISRI’s vice president of safety. “It’s hard to get people to put batteries in the right place,” she says. Consumers might decide it’s inconvenient to hold onto small electronics until they can find the right place to drop them off, and some facilities charge a small fee for taking them, “so [residents] might decide it’s easier to just throw it away,” she says. Call2Recycle (Atlanta), an organization that coordinates about 30,000 battery drop-off sites across North America, collected 14 million pounds of consumer batteries in 2017—just 5 percent of batteries sold each year, says CEO Carl Smith. That means thousands of pounds of both alkaline and lithium batteries are going somewhere else—perhaps another recycling facility, a junk drawer, or the landfill, “but we know from experience they are going to your MRFs, too,” he says.

SOURCE CONTROL AND HOUSEKEEPING

Influencing consumer behavior is only a small part of avoiding battery fires, Germain says. “We need to keep telling [people] not to put batteries in the bin, but we also have to realize that there are still going to be more in the bin than ever before.” Proper source control is the next step in reducing the risk of fire, Cirone says. Train employees to identify the batteries and separate them from the other material before they get deeper into the facility, where front-end loaders, sorting machines, or other equipment could crush or bend them. MRFs typically tackle this task on the tipping room floor when the material first comes in, but workers and equipment operators throughout the facility should always be on the lookout, says Jerry Sjogren, safety director of E.L. Harvey & Sons (Westborough, Mass.). Yet finding these batteries is sometimes like looking for a needle in a haystack. They can be as small as a button and take on many forms, Smith says. Lithium primary batteries can look nearly identical to household alkaline batteries and come in standard household-battery sizes such as 9 volt, AA, AAA,

C, D, and coin or button cell. They may be marked “lithium” or “lithium cells,” but there is no standard label and they don’t always have a clear marking, Sjogren says. Rechargeable lithium-ion batteries found in laptops, power tools, and cellphones similarly come in various shapes and sizes and may or may not be marked with a symbol that indicates it’s a lithium-ion rechargeable battery. Workers also have to look for devices and small toys and other items that might still have a battery inside. Ellert recommends obtaining or taking photos of items that have lithium batteries and providing hands-on training to help workers identify and pick the hazard out of the recycling stream. Call2Recycle’s Smith says it might be nearly impossible to spy a tiny button battery in the recycling stream, “but my best advice is to look for the

electronics, not the batteries,” he says.

If a battery or battery-powered device does slip through initial inspection, good maintenance and housekeeping can make the difference between an inconvenient plume of smoke and a full-blown structure fire, Sjogren says. “We are constantly doing daily maintenance and housekeeping so we don’t accumulate material around the equipment,” he says. “We clean between bales so there isn’t material on the floor, because one pile can easily ignite the next.” Dust created by processing equipment and oil and fluid leaks can fuel a fire as well.

Keep your safety equipment in good working order, too. E.L. Harvey & Sons hires an outside company to inspect its fire hoses and hundreds of fire extinguishers once a month. Sjogren also recommends regularly inspecting

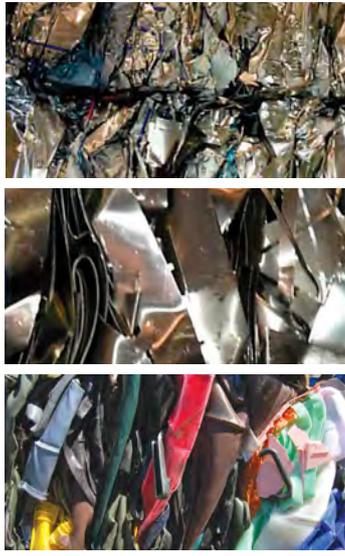
your fire suppression system and making sure it’s up to par every time you renovate or upgrade your facility or install new equipment. “One thing I see industrywide is people making changes to their equipment, but they don’t take the time to upgrade their fire suppression systems to match,” he says. “They’ll put in a conveyor and block the system so it doesn’t end up working when it needs to.”

PREPARE AND TRAIN

A lithium battery safety working group consisting of stakeholders from across the industry, including ISRI, is creating a more comprehensive and specific training program on lithium batteries in the recycling and waste industries, but the project is a work in progress, Cirone says. (See “Building Battery Best Practices” on page 50.)

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In the meantime, some facilities are creating their own lithium battery fire training programs based on their knowledge and experiences. Rumpke drew on the expertise of its safety staff, lessons it learned from previous fires, and Ellert's fire department background to design fire safety training it provides to equipment operators and truck drivers, he says. E.L. Harvey & Sons also requires its equipment operators and front-end employees to have annual fire safety training. In the past few years, that training has had an increased focus on identifying and removing batteries and cellphones, Sjogren says.

Even with good housekeeping and training, well-prepared facilities can still have fires. That's why training also should include instructions on how to handle a fire. Workers need to know what to do as soon as they

see or smell smoke, Sjogren says. Big blazes happen infrequently, but small, smoldering fires can spread fast and become a big problem if employees aren't sure what to do. E.L. Harvey & Sons regularly trains its equipment operators and front-line employees how to use a fire extinguisher, Sjogren says. "Be prepared. You can have a fire and survive a fire, but if you're not prepared, that fire can go up pretty darn fast," he says.

Workers might need to react differently depending on where the fire occurs in the facility. For E.L. Harvey & Sons and some other MRFs, "the tipping floor is the biggest problem area for these kinds of fires," Sjogren says. "A battery gets caught on the front end of a loader or cut on the edge. It gets dragged across the concrete floor and causes a spark as it's pushed

up against a big pile of recyclables." Both Sjogren and Ellert say it's crucial to separate the source of the fire from other materials as quickly as possible, usually by scooping it up with a front-end loader or another piece of equipment, then using fire extinguishers or hoses to douse it once it's dumped on a hard surface. "Employee safety is priority one. It's important to evacuate the facility, and then focus on taking necessary steps to separate the fire from the source and extinguish it. Separating the material from the fire source is one of the best ways to minimize material and equipment damage and loss," Ellert says.

Drivers use a similar technique if the fire starts in a truck. Ellert says Rumpke drivers are required to pull over on a "hard surface, away from buildings or structures, and never

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under power lines." The driver must eject the load, pull away a safe distance, and call the fire department. Rumpke hires its own cleanup crew to come out after the fire is extinguished.

If a battery starts sparking on a conveyor or sorting line, Rumpke and E.L. Harvey & Sons use low-tech solutions to quickly remove and isolate it. Workers use grabber tools—the kind used for reaching things on tall shelves—to pick the offending battery off the sorting line, then deposit it into a metal can filled with sand and seal the lid to cut off the oxygen supply. If sand isn't available, the battery industry also recommends submerging the battery fully in water, Timpane adds.

While workers focus on putting out the fire, always also call the fire department, even if you think you can handle the situation yourself, Sjogren and Ellert say. "Early notification is key. People try to put the fire out themselves, and that delay might mean the fire grows out of control. Nobody wants to see the fire department, but call early," Ellert says. He and Sjogren also recommend building friendly relationships with your local fire department and offering to give them a tour of your facility. The next time they need to rush to the scene of a fire, they will know their way around and will be more familiar with the hazards specific to the facility.

Despite their best efforts, both Sjogren and Ellert say they'll probably get more visits from the fire department in the future. As more lithium batteries enter the recycling stream, MRF operators and other industry experts need to share information and improve their techniques for identifying and removing the batteries before they cause fires. "This is a growing and evolving issue, and we are only going to receive more and more of this material," Pratt says. "Our employees are No. 1, and anything that puts them at risk is a priority for us." ■

Megan Quinn is reporter/writer for Scrap.