



February 27, 2024

To: Maryland House Economic Matters Committee

Re: HB468 Commission to Advance Lithium-Ion Battery Safety In Maryland

I'm Kitty McIlroy, President of Maryland Recycling Network (MRN), in support of HB468. I bring my experience managing electronics recycling contracts, including lithium-ion battery recycling, over the last 10 years at the Northeast Maryland Waste Disposal Authority. I am not speaking on behalf of the Authority.

Maryland Recycling Network members include municipal recycling managers, private sector and non-profit recyclers and individuals. We have direct experience operating recycling and composting programs at the private sector and municipal government level. We know the ins and outs of recycling in Maryland. Our experience informs our comments.

The Maryland Recycling Network promotes sustainable reduction, reuse and recycling (the 3 "R's"), to ensure that the use of virgin materials is minimized, materials otherwise destined for disposal are reused or recycled and strong demand exists for buying products made with recycled material content. We achieve these goals through education programs, advocacy activities to affect public policy, technical assistance efforts, and the development of markets to purchase recycled materials and manufacture products with recycled content.

We thank Delegates Love and Boyce for sponsoring this bill.

Lithium-ion batteries are found in a variety of electronic products including hearing aids, cell phones, e-bikes, scooters, laptops, tablets and vaping devices. When punctured, a chemical reaction can cause a fire or explosion. Chemical reactions during the fire make them burn longer and hotter and make them difficult and hazardous to extinguish.

Unfortunately, many people put these batteries in their recycling and trash bins. A recent National Solid Waste & Recycling Association (NWRA) [report](#) estimates more than 5,000 fires a year at recycling and waste facilities and in collection trucks. While many recycling processing facility fires can be quickly contained, several facilities have been damaged so badly they had to be closed and rebuilt. The loss to the facility owner can be more than \$50 million dollars. In addition, local recycling programs relying on those facilities are forced to scramble to find new processing facilities for their recyclables. Insurance companies are also [backing away from insuring](#) these types of solid waste and recycling facilities due to fire concerns.

Maryland Recycling Network
c/o Mariner Management • PO Box 1640 • Columbia, MD 21044
Phone: (443) 741-8740 • www.MarylandRecyclingNetwork.org

A survey of our members reported fires on tipping floors at recycling processing facilities, fires in trash collection trucks, fires at waste transfer stations and landfills, and even overnight fires in separately collected and stored electronics containment areas for electronics recycling contracts. Fortunately, none of these events caused serious damage. However, a [2022 fire](#) at a recycling processing facility in York, Pennsylvania, which is used by some Maryland communities, caused it to shut down.

This Task Force gives Maryland a chance to investigate the current issue statewide, recommend best practices for increased public education, comprehensive protocols with local fire departments, heat spot and fire detection and suppression equipment, as well as report on [emerging technologies and industries](#) transitioning away from liquid state to solid state electrolyte-based batteries, which are less susceptible to fires. These efforts will ensure that these batteries, so essential to so many products, can continue to be useful without causing fires and destabilizing our critical infrastructure.

The waste and recycling industry has released a [guide](#) to best management practices regarding lithium-ion batteries. But the best guide is keeping them out of the recycling stream and the trash. After all, the most effective education and enforcement efforts to improve our recycling programs come to naught if the collection truck or processing facility burns down.

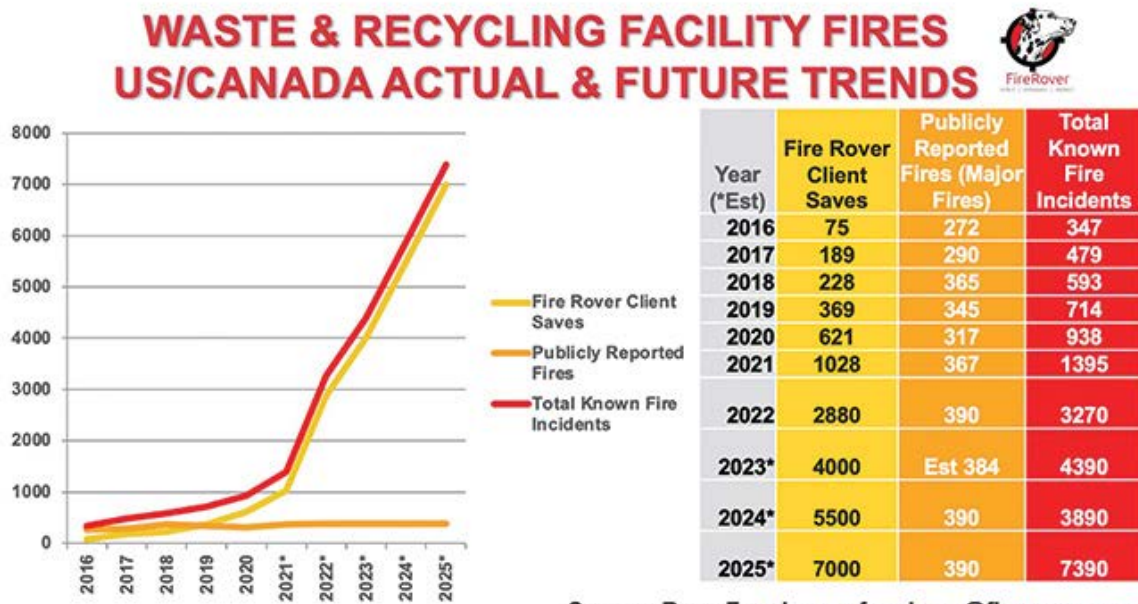
The Maryland Recycling Network stands ready to serve as a sounding board and resource for legislators and others interested in pursuing our mission. Please do not hesitate to contact MRN via email phoustle@marylandrecyclingnetwork.org, phone 301-725-2508 or mail - MRN, PO Box 1640, Columbia MD 21044 if you have any questions or would like additional information regarding the above.

Sincerely,



Kitty McIlroy
President
Maryland Recycling Network

Attachments



“Then came the lithium-ion battery threat that revealed itself in 2018 in the form of increased fire incidents across the globe... This problem is not going away. In fact, the number of lithium-ion batteries forecasted to enter the waste and recycling streams is only growing along with hotter and dryer environments, which leads to a breeding ground for increased fire incidents... The goal is not just to catch a fire when there are flames, but also to understand that there are situations where hot spots can be cooled before they flame. The goal is to set the tripwire as early in the process as possible. This can be done through top-grade thermal detection in combination with smoke, optical flame detection, and advanced data analytics—all coupled with a highly trained agent who is able to weed through false positives to fight only the incidents that need fighting... 2022 was (and 2023 is forecasted to be) the worst year for reported fire incidents ...we are heading down a path where investments in solutions like the Fire Rover are considered ‘critical’ to successfully responding to the fire hazards that continue to hit our waste and recycling streams. We need a funding mechanism like the government or the battery manufacturers to help pay for the costs they have created... Investing in proper equipment for the fire department to use onsite can be a huge timesaver and lifesaver. Even going as far as having attached and rollout hoses so the firefighters can immediately start applying suppressant to the affected area can make a huge difference”

Source: [Keys to Building a Successful MRF: Before, During, After - Waste Advantage Magazine](#))

For facility operators, insurance is now ‘a wild ride’

Published: August 14, 2023
Updated: August 14, 2023

by [Marissa Heffernan and Jared Paben](#)



An April 2021 battery-sparked fire at a MRF in Tulsa, Okla. resulted in a \$10 million loss and ended the city's recycling program for a time. | Tulsa Fire Department

Recycling companies say property insurance has become significantly more expensive and difficult to find as providers shy away from fire risk and other complications.

Resource Recycling spoke to MRFs and other operators across industry segments to understand cost implications and how companies are adapting.

Fire suppression and monitoring tools were the top suggestion, with many facility managers noting that without those safeguards at a recycling site, insurers won't even entertain providing coverage. Long-term legislative policy solutions are also on the minds of some managers.

Harder to solve is the ongoing drift of insurers away from the recycling sector, leading to less competition and higher rates.

Premium increases of 40%

Kristin Poffenberger, senior vice president at Eureka Recycling, a mission-based hauler and MRF operator in Minnesota, said, "There's a gap in what carriers have the capacity to cover and what industry needs are, and that's also increased premium rates for everybody."

She noted Eureka had enjoyed steady rates and small yearly increases for a long time, but despite the lack of major incidents, experienced a substantial surge in premium.

Eureka's insurance broker has been seeing 30% to 40% rate increases on properties that have not had a claimed insurance loss in the last five years, Poffenberger said. Eureka has also been seeing rate increases on insurance for its fleet of trucks.

"It's been a wild ride," she said.

Millennium Recycling runs a MRF in Sioux Falls, S.D. A sister company, called Secure Enterprise Asset Management (SEAM), provides IT asset disposal and electronics recycling services in the area.

"Premiums are high and there's only a few carriers to choose from," said Shannon Dwire, president of Millennium Recycling.

"Those who have had fires tend to lose their coverage," she said.

Jake Anderson, owner and CEO of both Millennium and SEAM, said he doesn't yet "have a firm handle on how significantly it will impact us at Millennium, but we are expecting our rates to jump substantially."

Long-term impacts of fire

Danny Edwards, an agent with BancFirst Insurance Services who works with Tulsa, Okla.-based American Waste Control, said fire concerns are at the center of the trend toward higher premiums for recycling firms.

"If you don't have a narrative around fire and risk in general, it's going to be really challenging" to get insured, Edwards said.

That's a situation American Waste Control knows well.

A 2021 fire at the company's recycling facility and transfer station, sparked by a lithium-ion battery that fell into a belly pan below a conveyor line, destroyed one line and caused over \$2 million in electrical damage.

It took nearly a year for the site to get back up and running, and the incident upended Tulsa's recycling program in the meantime.

Edwards added that as more insurance companies reevaluate coverage options, some providers are asking MRFs to pay to bring in a specialist to conduct a risk assessment before offering insurance terms. MRFs are also layering insurance, buying policies from different companies to cover different aspects of the business.

This strategy spreads out the burden on any one insurance company in the case of a loss, but it brings its own set of complexities.

"That leads to more cost, higher deductibles generally, and then come claim time, you've got six insurance companies to deal with instead of one, and that is a little bit cumbersome," Edwards said. "It tends to result in a longer payout process."

Interruption coverage, which would cover a MRF's losses when it cannot operate, is also becoming less common, Edwards said, both because insurers are leaning away from it and because of the price point. He said some facilities "are just taking the risk because that's gotten so problematic and expensive."

The problem doesn't just affect MRFs handling residential or commercial recyclables.

Batteries, the source of so many recycling fires, are inherently a concern for electronics recycling companies. As the electronics ecosystem evolves, more and more device types contain batteries, and they can sometimes be hard to identify and remove without damaging.

FCM Recycling, a Montreal-based electronics recycling company with seven facilities across Canada, saw premiums in Canada skyrocket before COVID-19, with some big insurance companies exiting the Canadian recycling market entirely.

FCM's premium more than tripled, according to Andrew Rubin, president of FCM Recycling.

"The second you said 'recycling,' they wanted nothing to do with you," he said.

Poffenberger of Eureka in Minnesota estimated that around 80% of insurers that had covered the waste and recycling class left the sector in the last five to seven years.

"There's a lack of competition in that space and there have been some really big losses in the industry," she said, "so the rates are increasing."

Rumpke Waste & Recycling, a large privately owned garbage and recycling company based in Ohio, has noticed rising insurance premiums for a variety of reasons, said Amanda Pratt, director of corporate communications.

"It's happening nationwide, as natural disasters such as hurricanes, tornadoes and wildfires are definitely impacting costs, along with the risks associated with our industry," she said.

Edwards, the risk management advisor, has been in the insurance space for almost 24 years. He said over the last several years, property in all industries has become more difficult to insure, and he also pointed to severe weather.

It's the smaller companies that truly struggle, he added, as larger companies usually have enough resources and reach to still secure coverage. But the issue remains a challenge for all operators.

"If a facility does not have and has not invested in some proactive measures to mitigate fire risks, they are probably not buying insurance or are paying a lot more for it," Edwards said.

Proactive steps

All the companies reached by Resource Recycling said they've found success by taking preventative measures and showing insurance companies they are prepared to handle fires and other incidents.

Edwards said in Tulsa, American Waste Control installed fire suppression systems that remove oxygen from small electrical rooms when a hot spot is detected. That can stop a fire while protecting the circuitry from damaging water or foam.

American Waste Control also decided to install Fire Rover, a system that remotely monitors for hotspots using infrared cameras and can target a blast of either foam or suppression liquid to the base of a fire, once detected.

"Those two steps were the keys for us to overcome having a 10-plus million dollar loss and insurance claim," Edwards said.

The MRF is also investing more in prevention, and it's checking all electrical components regularly, preventing material from piling up and distributing handheld infrared cameras so employees can check for hot spots.

Poffenberger said Eureka also has a Fire Rover system installed.

"There's just more capacity for carriers to look at you if you have Fire Rover," she said. "There are some that wouldn't look at you if you didn't have it."

The technology is expensive to install, however, and Poffenberger said that can be a barrier to smaller businesses who need it to be considered for coverage.

In terms of fire risk, Rumpke works closely with fire departments, fire suppression and alert system manufacturers, and its own team to be aware and prepared to mitigate fire risks, Pratt said. Rumpke also conducts extensive outreach to the public to educate residents about proper battery disposal.

"Fortunately, Rumpke's robust and proactive investments in fire suppression technology and training have positioned us well and we continue to evaluate technology to reduce fire risks," she said.

FCM, the electronics recycling company, also found that investments in fire protection technologies brought insurers back to the table.

The company invested hundreds of thousands of dollars in technologies, including heat-detection cameras that are connected to a computer and can automatically shut down the processing line if it detects heat over a set temperature.

FCM also installed sprinkler lines along the conveyors, as well as large Class D fire extinguishers throughout the building. For areas that aren't easily accessible, the company installed a system that dumps carbon dioxide into the room, smothering fires but forcing all workers to evacuate as well.

Finally, FCM installed a trap door in the roof that automatically opens and limits smoke damage during a fire. That "was a really big one that [insurers] liked," Rubin said.

Those investments, coupled with the fact that FCM hasn't had any fire claims, opened up insurance options and lowered premiums noticeably, he said. But the bigger financial benefit is simply avoiding lost operating time that would come in the wake of a major blaze.

"I would say our return has been far more on the lost time savings than the insurance premiums," Rubin said.

Addressing the root issues

Preventative measures help, but they don't address the overall problems plaguing the recycling insurance industry.

That's where policy could help, Poffenberger suggested. She's keeping an eye on various legislative options.

One of those is a bill Iowa recently passed that caps non-economic claims for commercial trucks at \$5 million. By offering insurers the certainty they would not be required to pay out a massive claim, it would theoretically allow for lower premiums.

Poffenberger would also like to see legislation aimed at curbing the influx of lithium batteries into MRFs. Robust regulations that mandate responsible disposal methods, stringent labeling requirements and comprehensive recycling programs would collectively contribute to minimizing the volume of lithium batteries entering these facilities, reducing potential hazards.

"We might see some changes in legislation saying what coverages have to be offered, but that's more on the vehicle side, not as much property," she said. "I think it's going to get so smaller organizations can't afford it, and you'll see more group collaboration or buying out each other if you can't self-insure."

Edwards said he hopes more education can reduce fires and that "the fire suppression technology that we're all investing in will hopefully pay some dividends in less fires, or fires that get extinguished."

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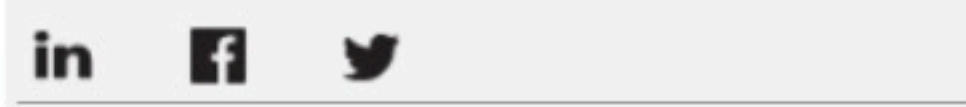
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The latest recycling industry news

EPA to launch battery recycling work sessions in March
Battery manufacturers, nonprofits, local governments and others can share their experiences with and insights into battery recycling with the U.S. EPA during work sessions that are set to begin in March.

Lawsuit over brand's recyclability claims continues
A lawsuit over Colgate-Palmolive marketing its Tom's of Maine and Colgate brand toothpaste tubes as recyclable is moving forward.

Corrugated box producer closes three facilities
North American fiber packaging giant Cascades announced that a recycled paper mill and two corrugated converting plants have closed permanently, citing a handful of factors including market conditions.

Stakeholders respond to California recyclability report
California regulators released a preliminary report on which commodities the state might consider recyclable, with promising results for many materials but a handful of low scores that drew criticism from manufacturers and others earlier this month.

Textile recycling is at a pivotal moment, experts say
Textile production is among the world's least sustainable industries, but that could change if brands, governments and investors supercharge and interweave recycling systems that already exist in isolation, experts said during a recent webinar from Europe.

AMP rebrands with a focus on supplying entire facilities
After 10 years helping materials recovery facilities retrofit with innovative robotics equipment, AMP Robotics has dropped the latter part of its name, reflecting an emerging focus on building recycling centers from scratch with AI-equipped sorting systems.

Paper and plastic grades push upward
OCC prices increased for the 14th consecutive month in February, reaching a high they haven't hit since summer 2022. Prices for other curbside fiber and plastic grades also either increased or remained steady.

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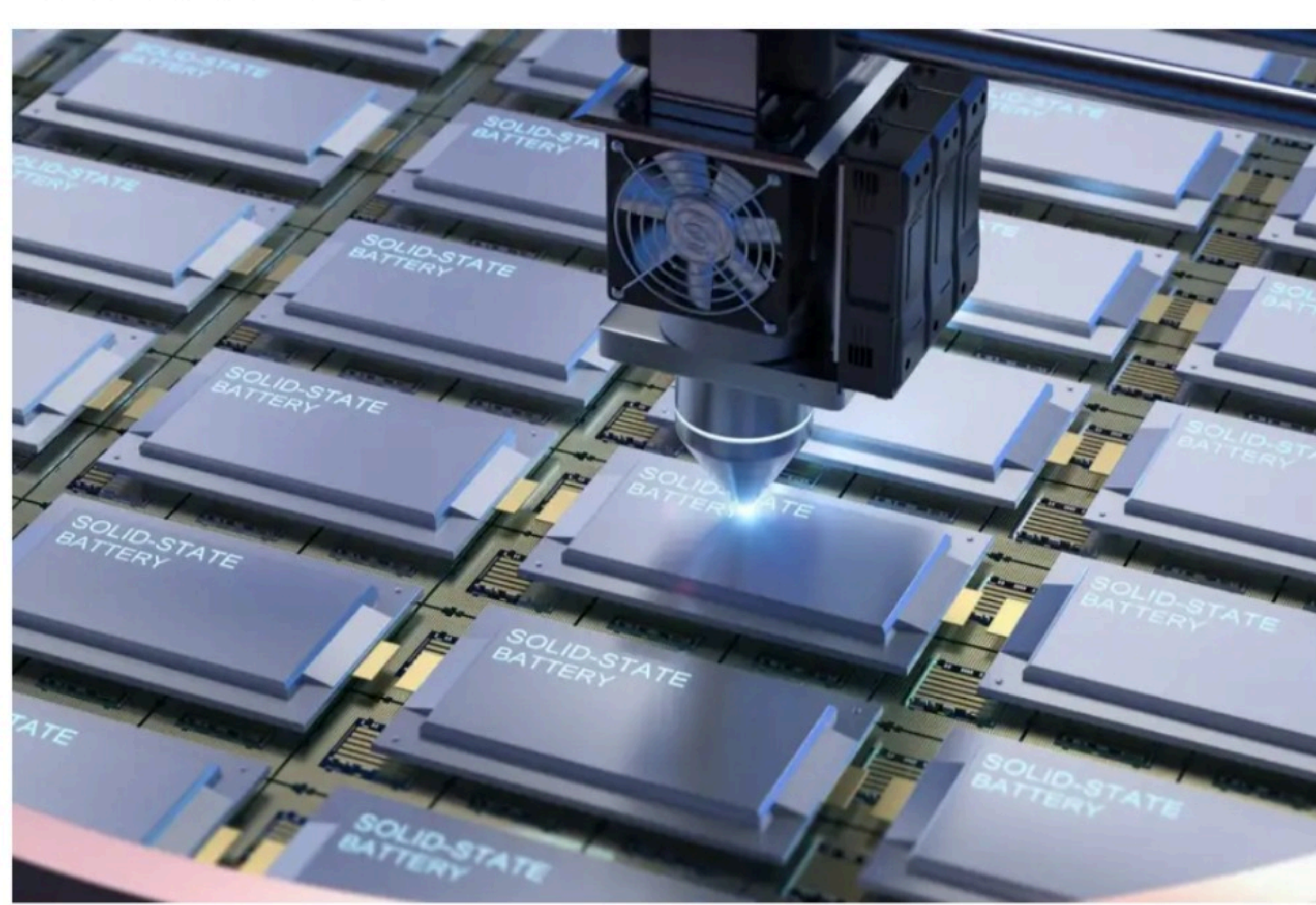
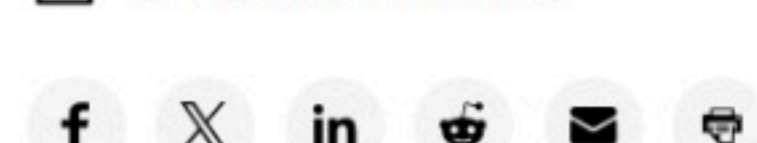
Technology

What are solid-state batteries and why do we need them?

Batteries containing solid electrolytes have many theoretical benefits, but a technique to manufacture them cheaply has been elusive

By Matthew Sparkes

24 October 2023



Computerised illustration of solid-state battery production. These devices could be lighter and more powerful than current batteries

Phonlamai Photo/Shutterstock

Toyota says it has made a breakthrough that will allow “game-changing” solid-state batteries to go into production by 2028. These devices will be lighter and more powerful than current batteries, giving electric cars a range of 1200 kilometres with a charging time of just 10 minutes. But should we pin our hopes on them?

What are solid-state batteries?

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liquid electrolyte, through which ions flow in one direction to charge the battery and the other direction when it is being drained. Solid-state batteries, as the name suggests, replace this liquid with a solid material.

A lithium-ion battery will typically have a graphite electrode, a metal oxide electrode and an electrolyte of lithium salt dissolved in some sort of solvent. In solid-state batteries, you might find one of a whole host of promising materials replacing the lithium, including ceramics and sulphides.

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Why is ditching a liquid electrolyte useful?

Although some solid-state battery prototypes still use it, one big advantage of cutting out lithium is that it is in short supply and [environmentally damaging to mine](#). The shortage is only likely to worsen as the world shifts away from fossil fuels towards using more renewable electricity stored in batteries.

There are also technical advantages to solid-state batteries, as well as logistical and economic ones. Removing the liquid electrolyte makes batteries [less susceptible to fires](#), for example. And while conventional lithium batteries quickly charge up to 80 per cent of their capacity, they charge slowly from there to 100 per cent. Solid-state batteries can be fully charged more quickly.

Crucially, though, solid electrolytes are less dense, so a solid-state battery can be smaller and lighter than its lithium-ion competitor. This could, in turn, make electric cars smaller and lighter, or give them a greater range for the same size and weight. The increased energy density and lower weight could even make [electric aircraft a viable proposition](#).

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How far away are they?

Solid-state batteries are nothing new – solid electrolytes were created in the 1800s by Michael Faraday, and they are currently used in medical implants. But a technique to manufacture them cheaply has been elusive.

The obvious benefits have seen car companies pouring cash into research. Ford and BMW have invested in a company called Solid Power that has previously said it will manufacture enough cells for 800,000 cars a year by 2028, while Mercedes-Benz has put money into another firm called Factorial Energy.

Toyota's claims come after [signing a deal earlier this month with Japanese petroleum company Idemitsu Kosan](#), which says it has been working on a sulphide solid electrolyte. The companies hope to start manufacturing a solid-state battery for cars in either 2027 or 2028, with production ramping up at a later date.

Read more [Inside the gigafactory producing the greenest batteries in the world](#)

Results from industry are less likely to be transparently published because of industrial rivalry, but academia has also had its fair share of success. Earlier this year, a team at the Chinese Academy of Sciences in Beijing managed to [recharge a solid-state lithium-sulphur battery 1400 times](#), proving that these types of devices can have a long lifespan.

NASA has also developed a battery made of solid, stacked cells of sulphur and selenium, which it says can cut battery weight by up to 40 per cent while also [tripling the energy density](#).

But these bold claims haven't yet translated into real-world products. For now, Toyota's announcement puts it on a growing list of companies betting on solid-state battery technology. Time will tell which company will get there first and how much of a boost new battery designs can offer.

Topics: [Batteries](#)

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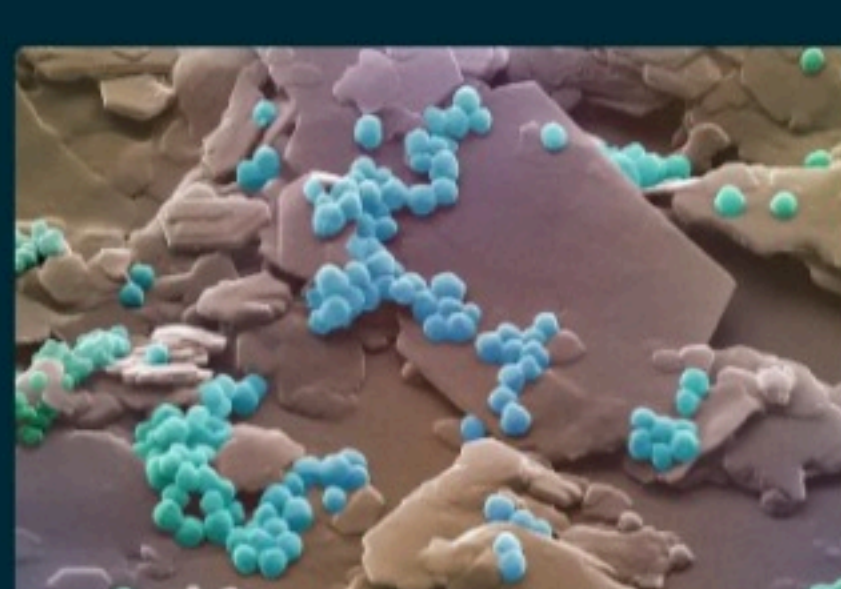
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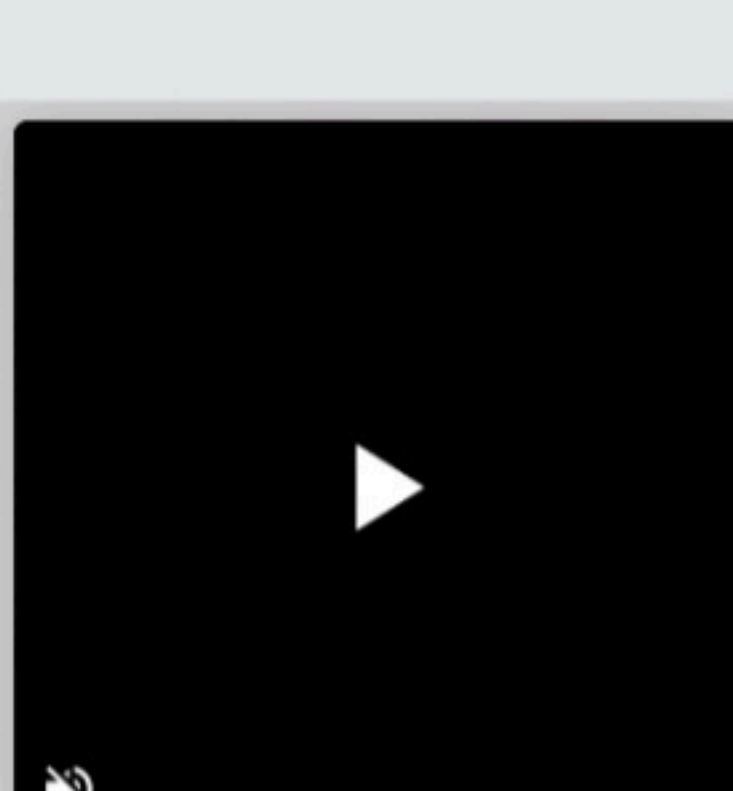
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Guide for Developing Lithium Battery Management Practices at Materials Recovery Facilities

Final 6/26/2020

Introduction

As the number of annual fire incidents at waste and recycling facilities continues to rise, one of the main reasons highlighted is the increase in the popularity of lithium-ion batteries (LIB) as they become cheaper commercially.^[1] Lithium batteries are found in everyday items such as phones, tablets and hearing aids, among other products. There is a lack of awareness and education between consumers and battery recycling.^[2] Labeling is not standardized and can be very confusing. Thus, they are appearing more frequently in the municipal waste stream and are often incorrectly placed in blue recycling bins as well. Lithium batteries may unknowingly catch fire and sometimes explode, causing injuries to workers and equipment and potentially destroying an entire facility.^[3]

To lower the risk of potential fires caused by lithium batteries, this guide has been written to assist materials recovery facilities (MRFs) in developing management practices to properly manage and dispose of lithium batteries when spotted, to take precaution in case of a fire and to manage a fire if one does break out. Guidelines to help better educate consumers also are provided.

➤ **Contractual Language**

Issues and points to consider when developing contracts include:

- Clear language that batteries, especially LIB, are not accepted in a residential waste or recycling bin, or from trucks delivered to the facility.
- Responsibility and ownership for batteries found during the unloading of trucks (i.e., MRF, municipality, truck operator) and the protocols for proper management and removal.
- A material classification system (i.e., household hazardous waste, hazardous, damaged) for LIB found in inbound recyclables.
- Responsibilities for the removal and proper recycling/disposal of LIB found in inbound recyclables, as well as information on who will bear the cost.
- Roles and responsibilities for a curbside education program and inclusion of LIB as unacceptable and/or handled separately.
 - Fliers
 - When batteries are found or improperly packaged on the curb
 - Website, including information on where to recycle/dispose of batteries and phone numbers
 - Public engagement
- Language requiring a monthly report on batteries found, in inventory and disposed (i.e., count, tons or pounds for documentation of issue).

➤ **Inbound Material Control**

When developing operational procedures and controls, companies and facilities should consider the following principles:

- At earliest detection, establish a program for identification of LIBs for drivers so they are sensitized while unloading full trucks and when on routes (if not automated).
- Develop a program and training for material inspection upon arrival at the MRF that includes battery identification, safe removal and proper storage. Typically, this program would include:
 - Training for employees who are engaged in the inspection and acceptance of inbound materials on how to identify and properly handle batteries
 - Availability of safe removal supplies (i.e., storage, terminal tape)
 - Scheduling and rotation of battery management in regular toolbox safety meetings
- Develop metrics to raise awareness and identify potential trends such as periodic battery counts (found batteries per hour).
- Manage batteries between sorting and proper storage. For example, consider placing batteries in 5-gallon metal buckets containing vermiculite or sand on the line from which materials are being pulled, similar to an ash bucket.
- Employers should make available plastic tongs, welding gloves and heat/spark masks to all employees handling batteries.
- Develop a written list of materials that are prohibited at the facility and materials that will be accepted but require special handling procedures. Ensure language is consistent with contracts (see Contractual Language above) and includes consequences for what happens when prohibited materials are brought to the facility.
- Establish dedicated temporary short-term and long-term storage options for batteries—include signage, barriers and painted identification of areas (demarcations).

➤ **Battery Recovery Locations**

Based on industry experience, batteries are most often recovered at MRFs from the following locations:

- Inbound stream
 - Tip floor
 - Manual sorting (i.e., pre-sort, quality sorts, aluminum and glass sorts)
 - Magnet
 - Baling

➤ **Battery Identification: Soft-sided Battery**

Certain batteries produce their own oxygen.

Lithium Primary (button, cylindrical)

- Chemistries: Li-MnO₂ (CR), lithium iron sulfide.
- Uses: AA/AAA, medical devices, security, backup power, watches, hearing aids, calculators, non-consumer uses.
- Sizes: Including but not limited to 9v, AA, AAA, C, D, coin/button cell.
- Markings: It may be marked “lithium” or “lithium cells;” it may be marked as (CR###); it may include a recycling symbol.

Lithium-ion

- Chemistries: Lithium cobalt oxide (Li-cobalt or LCO), lithium manganese oxide (Li-manganese or LMO), lithium nickel manganese (NMC), lithium iron phosphate (Li-phosphate or LFP), lithium nickel cobalt aluminum oxide (Li-aluminum or NCA), lithium titanate (Li-titanate or LTO).
- Uses: Grid storage, electronics, e-bikes, e-cigarettes, hoverboards, power tools.
- Markings: It may be marked “rechargeable;” it may have a battery chemistry name (Lithium ion) or abbreviation (LI-ION, Li-ion, LiPo (lithium polymer)); it may have a button/coin cell (LIR#####); it may just have a battery seal or other mark. See below.



➤ **Removal**

Once identified, frontline employees should inspect and extract any batteries from the inbound material stream.

- Tip floor: Secure tip floor and idle all rolling stock while employees remove the battery.
- Sorting stations: Idle the conveyor system.

The employee should inspect the battery for damage. If undamaged:

- The employee should tape the battery terminals and place it in a dedicated temporary storage container (typically a metal, 5-gallon ash can).
- Once placed in the can, the employee should scoop vermiculite on top of the battery.

➤ **Damaged Battery Protocol**

Damaged batteries should not be stored with other undamaged batteries.

- Batteries that are swelling, smoking, leaking or overheating should be treated with extreme caution.
- Immediately place them in an absorbent, non-flammable material in a cool, dry place.
- Store outdoors away from structures, vehicles and equipment.
- Store in a noncombustible structure.
- Recommended storage materials include sand or vermiculite.

➤ **Material Storage**

At the end of each day, batteries should be moved to a long-term storage location from their temporary location.

- Must be stored in a remote location.
- Must have a stormwater plan, where required. (See: www.epa.gov/npdes/stormwater)
- Battery terminals must be protected or isolated to avoid spark or heat from a residual charge.
- The positive (raised) terminal must be protected either by packing, duct or electrical tape. Alternatively, each battery can be placed in its own clear, sealable bag.
- Batteries that have been individually taped or bagged can be stored in a UN Rated steel drum (1A) with a plastic liner or a UN Rated polyethylene drum (1H).
- Batteries must be stored in a cool, dry location.

➤ **Facility Inspections and Maintenance**

- Maintain fire suppression for inspections.
- Dry system inspection.
- Ensure you have the right quantity and size of fire extinguishers.

➤ **Fire Suppression**

Hopefully the measures taken above reduce the potential for fires to a minimum. However, in the event of a fire from a LIB, review the following items.

➤ **Housekeeping**

- Regularly inspect unprocessed and processed material storage (i.e., tip floor, bales, loaded trucks), handling and transfer areas.
 - Have an action plan and time frame for completion
- Conduct routine preventative maintenance of equipment.
- Use checklists to maintain a consistent inspection program.

- Be sure that fire extinguishers and suppression systems are adequate and in proper working order.
- Access and egress routes must be clearly marked and kept clear at all times.
- Follow fire safety and watch requirements during all hot work procedures.
- Ensure all fire suppression systems are maintained to National Fire Protection Association standards.
 - Manage low point drains in dry systems in cold climates
- Ensure fire extinguishers are the proper size and type for the area.

➤ **Facility Operations**

- The employer should have written plans and training in place to identify and mitigate battery fires safely in conjunction with their emergency action plan and fire prevention plan based on the circumstances, while obtaining the appropriate level of outside assistance.
- Consider designating responders in your emergency action plan and providing them with specific training to implement your site-specific response procedures to battery incidents. These designated responders should have quick response availability to identified areas of concern for the ignition of batteries.
- Consider monitoring daily operations for potential hot spots, keeping fire prevention measures in mind at all times.
- Areas of concern for ignition of LIB are:
 - Waste reception area
 - Shredder
 - Truck load dumping
 - Tipping floor storage
 - Feed conveyor and drum
 - Paper screens and glass breaker impact points
 - Loose storage bins
 - Baler
 - Bale storage
 - Truck storage
 - Secondary fires
 - Off-gassing
- Any point where materials come into contact with machinery or friction can be an area of concern, including being moved by a front end loader, being loaded onto a conveyor belt, dropping through screens and dropping to storage.
- Have a stormwater program in place, especially for response, where required.
- Develop a “one fire extinguisher” attempt, call 911 and evacuate.
- Train employees in the PASS (pull, aim, squeeze, sweep) fire extinguisher method.
- Be aware of the batteries off-gassing and the dangers of smoke inhalation.
- Ensure evacuation plans are written and communicated with employees. Then, ensure training is provided to all employees.

➤ **Response Plan: Properly Labeled Storage Location**

- Have a written fire prevention and response plan in place.
- Ensure the “meeting point” is clearly communicated and signage is posted at the facility.
- Try to identify the following evacuation types:
 - Shelter in place
 - Move to another structure onsite
 - Onsite outdoor evacuation locations
 - Offsite evacuation locations for large events
- Consider inviting first responders to your facility for familiarization purposes.
- Have a Knox Box or similar device in place to hold an entry key to the facility.
- Educate and train employees on the fire prevention and response plan, and ensure they have proper personal protection equipment, non-flammable gloves (all leather), safety glasses, appropriate cotton long-sleeved shirt, etc.
- During the extinguishment of a baler fire, there is the possibility of another flash fire as the baler pushes the material out, flammable cans are crushed and the heat of the baler acts as the ignition source.
- If a battery is observed beginning to react, it can be pulled out using tongs, placed into a lidded metal container containing sand and then taken to an isolated location.
 - Certain batteries produce their own oxygen
 - Quantity of batteries
- Fire response should conform to the [Emergency Response Guidebook](#).
 - Lithium Primary Battery Fire Response – Emergency Response Guide (ERG) 138
 - Lithium-Ion Battery Fire Response – Emergency Response Guide (ERG) 147

Consumer Awareness Messaging

Batteries are not safe in residential solid waste or recycling systems

- Special handling for disposal is required to eliminate health and fire threats.
- It’s hard for consumers to tell the difference between batteries.
- It’s hard to enforce lithium-only bans.

Power comes with responsibility

Spent batteries aren’t dead and can be dangerous

- Used lithium batteries can often maintain 80 percent-plus of their original charge.
- Other chemistries also cause fires.

Don’t remove non-removable batteries

- Lithium polymer batteries, without hard cases, are susceptible to damage.

- If it's hard to get out, leave it in.

Tape or bag

- The positive (raised) terminal or the charging terminals must be protected either by packing, duct or electrical tape. Alternatively, the whole battery can be individually placed in a clear, sealable bag.

Batterywise: Curbside is seldom wise

- Most municipal governments lack a battery management plan; however, more local governments are beginning to mitigate safety issues.
- Engage your local officials about improving the safety of the waste stream.
- Find a dedicated collection container or site in your area.
- Note: The U.S. and Canadian Special Permit allows for no more than 4.4 pounds (2 kilograms) of lithium cells and batteries to be contained in a single package. However, a single cell or battery may be shipped within one package provided the cell or battery has a mass of 5 kilograms or less.

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