

# Lithium Ion Batteries in the Solid Waste System

SBWMA MRF Survey



Michael R. Timpane  
Vice President/Principal



# Lithium Batteries are Part of Us

*Compared to 2010, Lithium Batteries Are...*



**60%**

more powerful



**55%**

lighter



**40%**

cheaper



Growing  
at a rate of

**1.63**

per person,  
per year

# Lithium Batteries Solving Storage Riddle for Green Energy



- Wind, sun, tides can't be turned on and off at will
- Excess energy goes to waste during production
- Batteries collect and store energy to be used in between production
- Reliability during disruption
- May reach household use within 10 years

# Lithium Batteries: Calculated Risk

*Power & Convenience vs. Unleashing Power*



“The li-on (battery) is the backbone of the mobile electronics revolution, with some calling its impact as big as the transistor’s.”

— *Fortune*



“Lithium-ion battery technology is not intrinsically safe. Short circuit, overcharge, over-discharge, crush, and high temperature can lead to thermal runaway, fire, and explosion.”

— *UL Laboratories*

# Lithium Batteries: Calculated Risks

*Power & Convenience vs. Increased Risk of Failure*



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“Lithium ion batteries have **significant advantages...highest electrochemical potential and the flattest discharge curve.**” *Oregon RFID, Battery Mfr.*

“The mobile world depends on **lithium-ion batteries** —ultimate rechargeable energy store.”  
Supplying “...power-hungry laptops, cameras, mobile phones and electric cars”, *Nature*

“It is the **best battery technology** anyone has ever seen,” *George Crabtree, Director of the US Joint Center for Energy Storage Research (JCESR)*



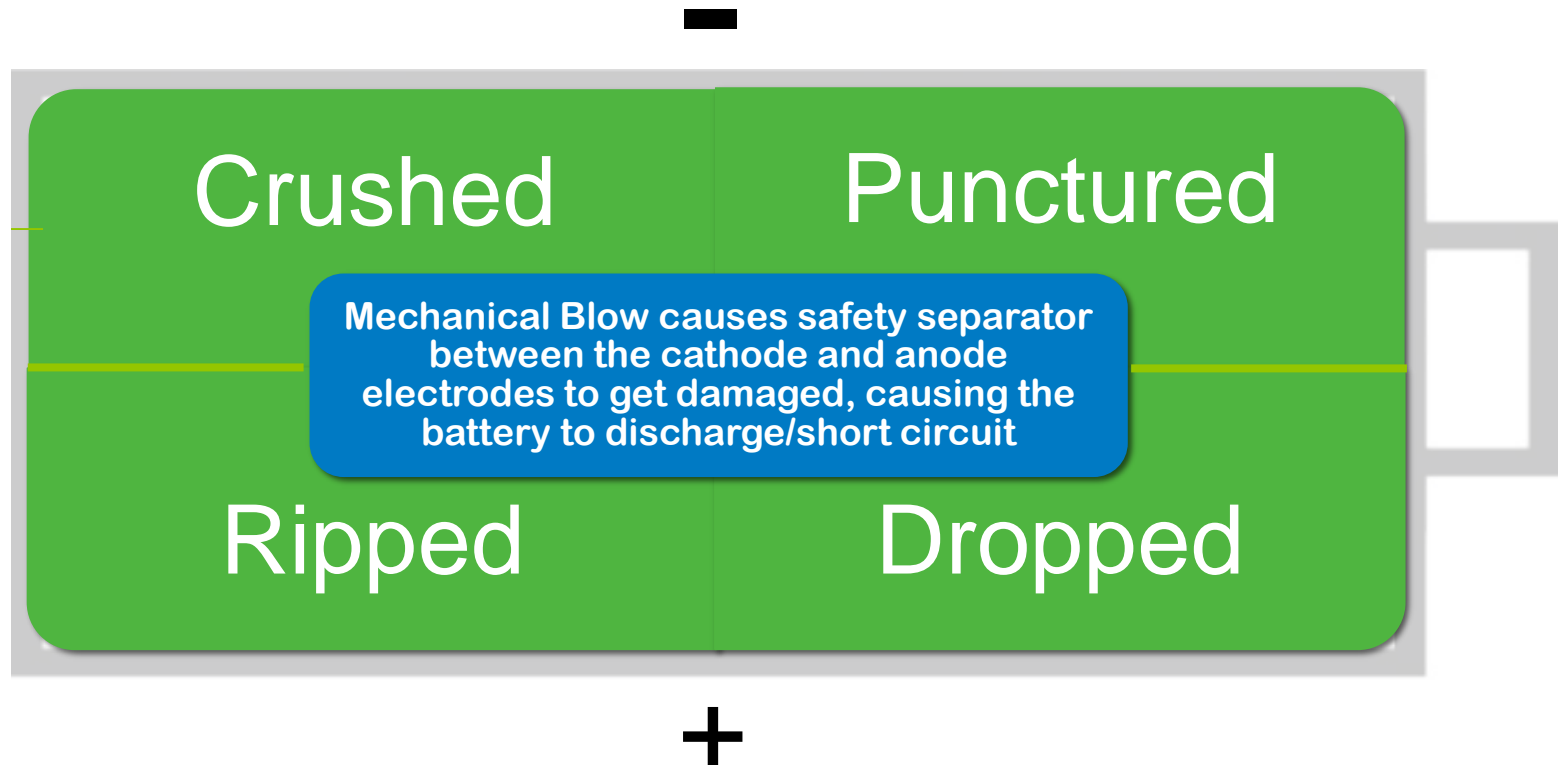
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“**Battery technology has outpaced thermal protection...**”  
*Jabil Circuits, Inc., \$18.3 B manufacturer for HP, Xerox and IBM (WSJ, July 22, 2017)*

“**Six months ago, none of us had ever heard of this. Now we're hearing about it over and over and over again (about Lithium Battery Fires)**” *Nitash Balsara, University of California, Berkeley*

“**Lithium-ion battery technology is not intrinsically safe. Short circuit, overcharge, over-discharge, crush, and high temperature can lead to thermal runaway, fire, and explosion**” *UL Laboratories*

# Potential for Lithium Batteries Fires in the Residential Recycling System



The International Air Transport Association (IATA) calls lithium batteries “dangerous goods... requiring special handling”.  
**Reported Fires 400°-1300°F. Explodes under pressure.**

# Lithium Batteries are easily damaged in the Residential Refuse and Recycling System



## Collection

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- Dropping
- Blade Scraping
- Crushing +1,800# PSI compression ram
- Puncturing by sharp objects, glass, metal
- Unloading and running over with tires
- Push material with container bodies



## Material Recovery Operations

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- Pushing into piles
- Scraping with Blade
- Puncturing by sharp objects and metal
- Running over with tires
- Loading onto conveyor belt
- Dropping through screens
- Dropping to storage

# Video of Brown County Lithium-Based Fire

The image is a screenshot of a news video player. At the top, there is a navigation bar with icons for News, Weather, Sports, Community, and What's On?. Below this, the breadcrumb path reads "Home / State / Article". The main headline is "This is why you should dispose of your lithium batteries prop...". The video content shows a news anchor in a red top on the right side of the frame. On the left, a large pile of discarded lithium batteries is shown. Overlaid text on the video reads: "HOW? WELL LUCKILY BROWN COUNTY- RECYCLABLES IN". At the bottom of the video frame, there is a blue banner with the text "NEW AT 10:00" and "DISPOSING OF LITHIUM BATTERIES PROPERLY". The "abc 2" logo is visible in the bottom right corner of the video player. Below the video player, there is a weather forecast for Fond du Lac, showing 8am (36 M Clear), Noon (47 Sunny), and 5pm (49 M Sunny). The video player interface includes a progress bar, a "01:58" timestamp, and a "CC" icon.



# Battery Industry – LI batteries will cause hot fires in MRFs

*Problem is only going to grow*



Batteries collected  
at curbside ... “is  
..asking for trouble”  
- 2017



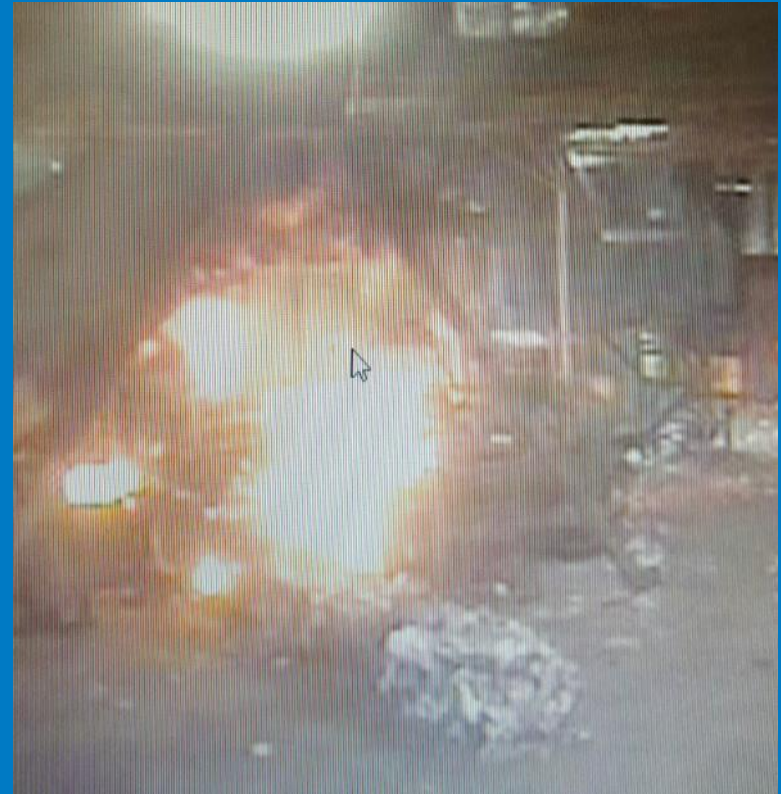
Batteries “should  
be banned from  
the curb”

# Fires in the Solid Waste System directly linked to LI Batteries



## **Recycling Truck Explosion**

East Northhampton  
Mar. 2017



## **Baler Chamber**

Li-based battery contained explosion  
Northern Calif  
Feb. 2017

# Recent Other Media Reports

## Waste Management urges public to 'recycle right' this holiday season

On Monday, December 19, the Materials Recovery Facility (MRF) in Little Rock were able to extinguish a fire caused by a lithium ion battery. The

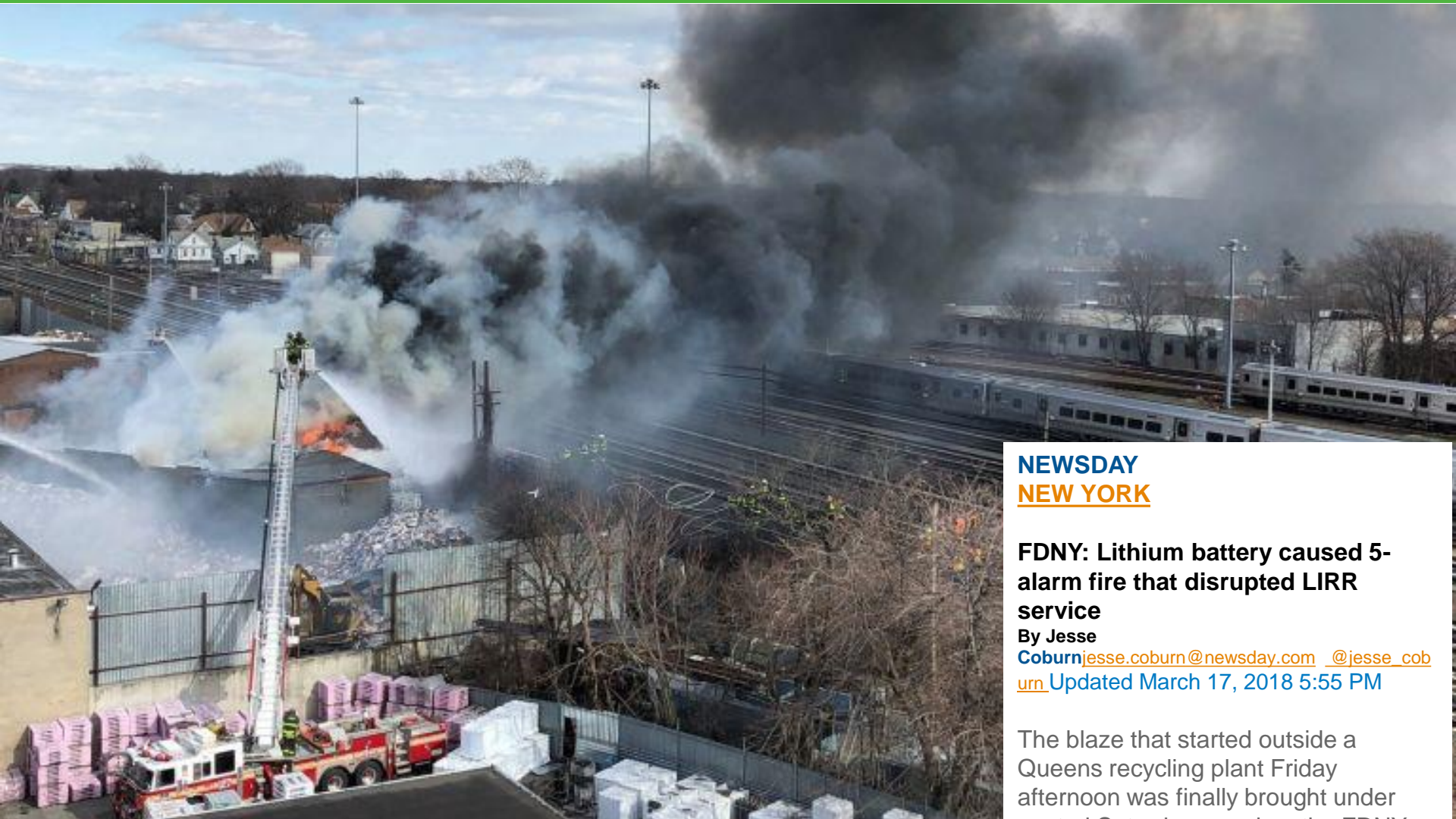
## Fires Continue to Threaten Recycling Center

CINCINNATI – Oct. 3, 2016 – Since the beginning of the year, local fire departments have responded to six fires at Rumpke's Cincinnati Recycling Facility in St. Bernard. The cause is likely something that many residents continue to toss into recycling containers – lithium ion batteries.

## Plano Resumes Recycling After December Recycling Plant Fire



# Recent Other Media Reports



**NEWSDAY**  
**NEW YORK**

**FDNY: Lithium battery caused 5-alarm fire that disrupted LIRR service**

By Jesse

[Coburnjesse.coburn@newsday.com](mailto:jesse.coburn@newsday.com) [@jesse\\_coburn](https://twitter.com/jesse_coburn)  
Updated March 17, 2018 5:55 PM

The blaze that started outside a Queens recycling plant Friday afternoon was finally brought under control by firefighters from FDNY.

# Secondary Glass Plant - Colorado



- Solely MRF 3-mix glass feedstock
- 5 minute test revealed two LG batteries in mixed glass in metal recovery bin

# Battery Sort: Shoreway Environmental Center MRF

*June-August 2017*



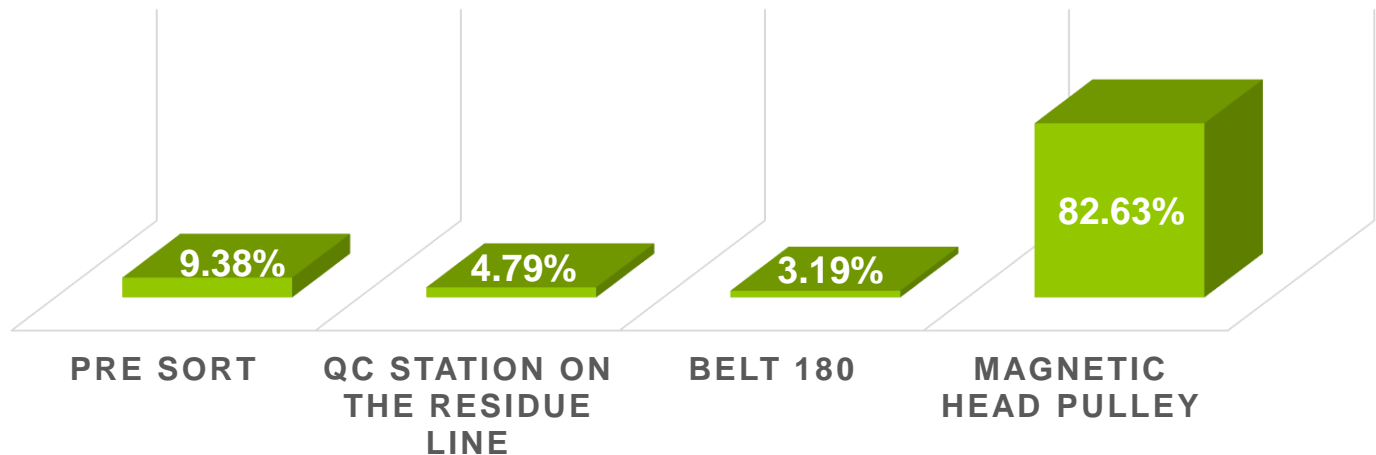
1. Initial test Over 1000 Lithium Batteries captured in <5 weeks
2. Only reported batteries are those captured



# LI Batteries Mixed with Recyclables

## *RRS/SBR Preliminary Study*

# 5.48 Batteries/Hr.



# LI Batteries Mixed with Recyclables

*Continuing Audit and “Hardening the Facility”*

## Hilary Gans to Report at Waste Expo 2018

- Continuing Data-build from counts
- Train on identification, KPI's
- Increased Fire Watch
- Suppression System
- Causes Counting of Incipient Fires



# RRS/SBWMA National MRF Survey

Line Management  
Perceptions

*Spring/Summer 2017*



RRS   
recycle.com



*Batteries collected at East Coast MRF- Li and Lead Acid; Pouch type batteries separated- July 2017*

# Industry Value Chain Surveys

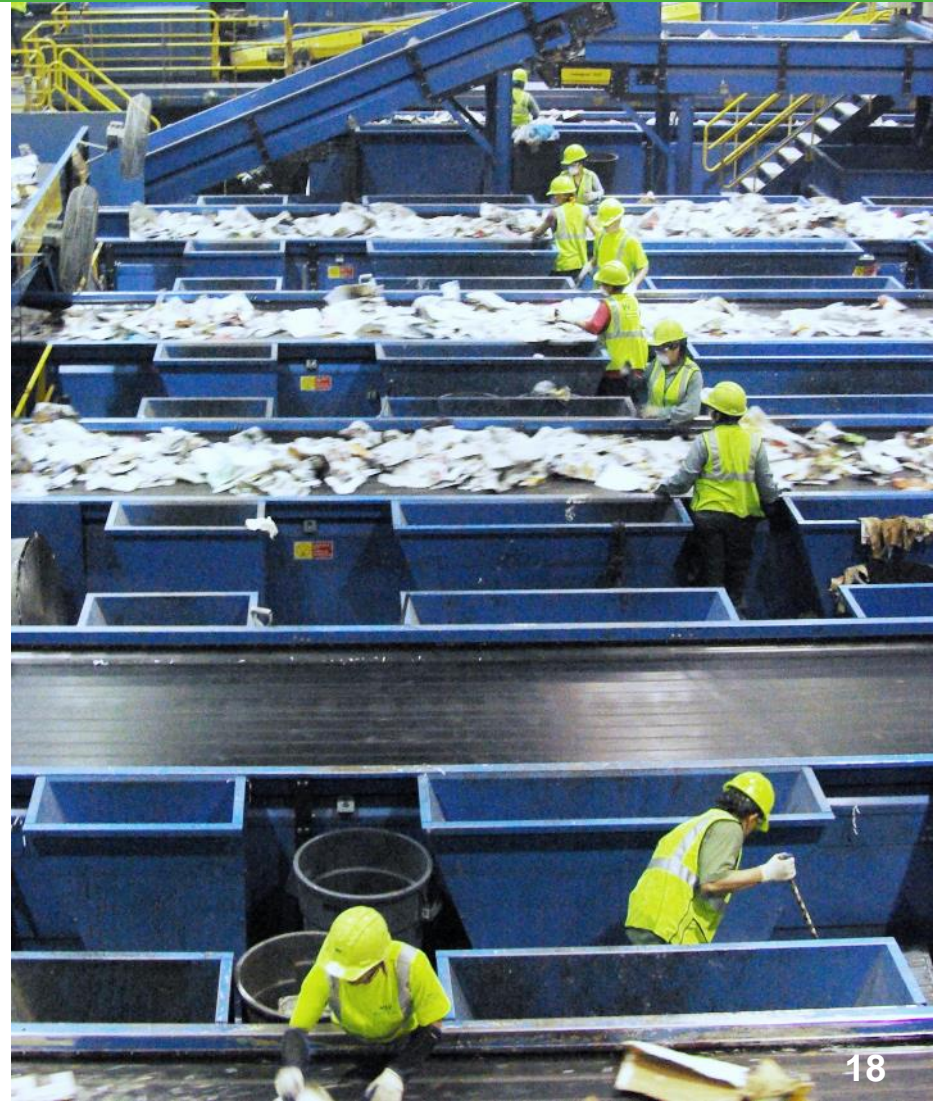
## MRF Survey

**Purpose:** To gain insight LI issues & current preventative measures

**Target Audience:** Public and privately-owned, single-stream MRF operators in CA and across the U.S.

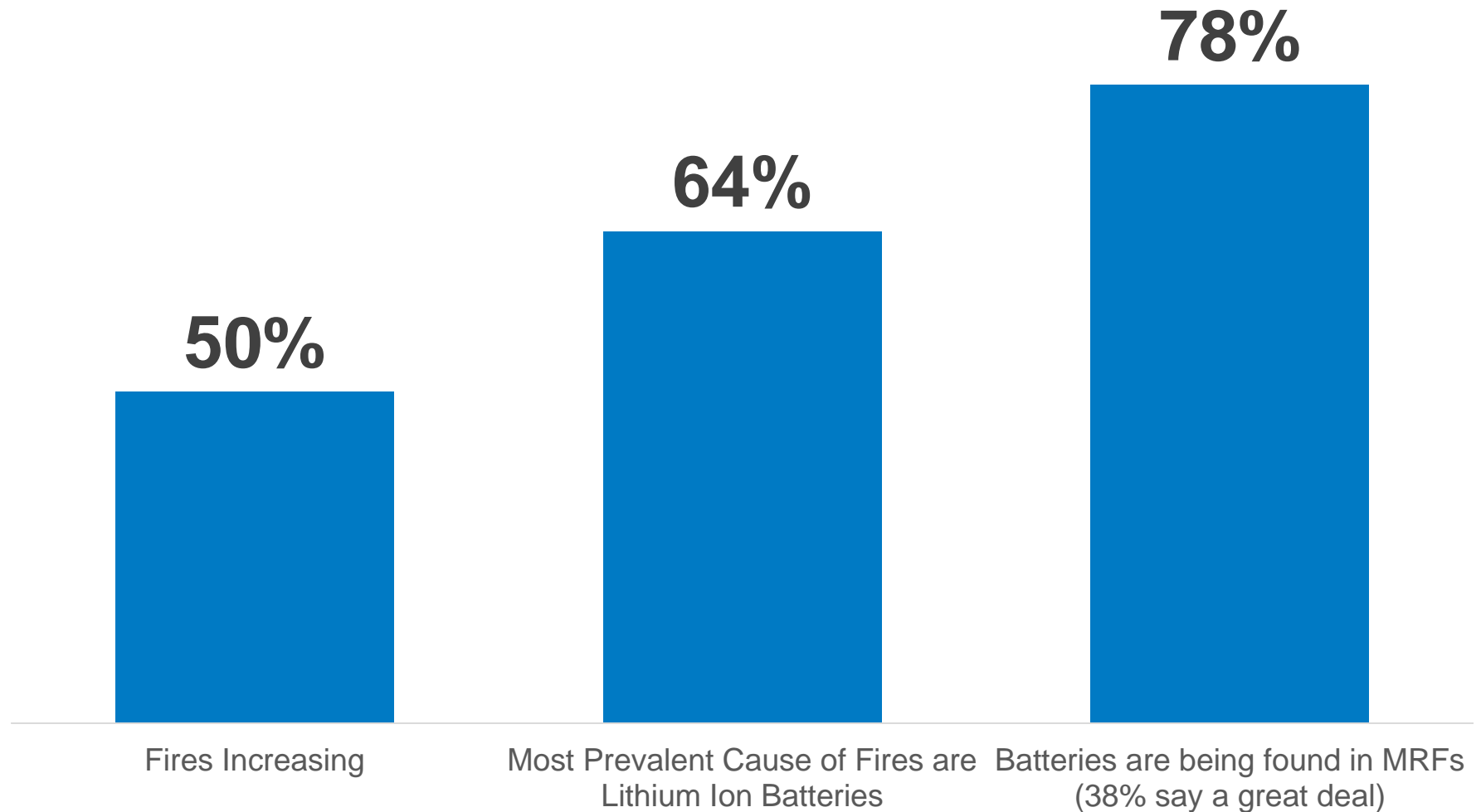
**Process:** Telephone qualitative interviews with MRF operators – 5 questions

**Survey Results:** Serves to create an effective SOP including best practice & resource recommendations



# National MRF Survey

*Lithium Ion Batteries are Causing Fires*



# RRS/SBWMA National MRF Survey

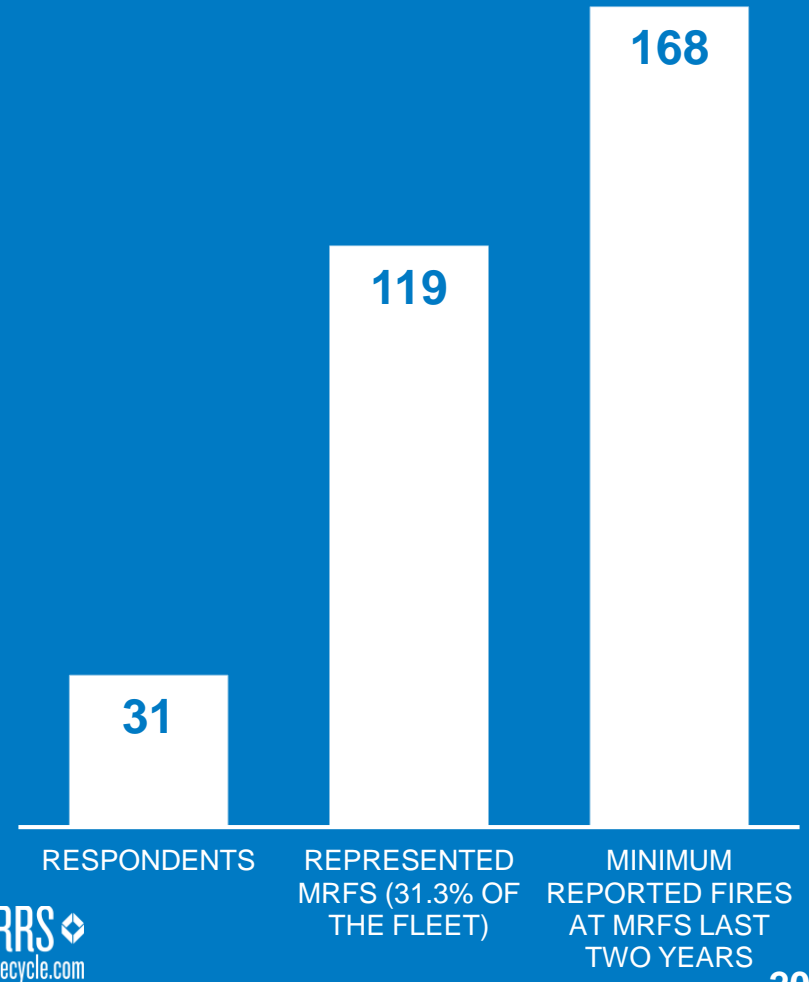
## *Line Management Perceptions*

**81%** do not accept batteries in their curbside collection

**50%** Customer Municipalities who advertise other disposal programs for batteries

**58%** Suggested that a lack of education on battery recycling caused Lithium batteries to enter MRFs and collection vehicles

*Attitudinal; needs deeper, repeated look in the future*



# RRS/SBWMA National Survey

## *Interviews on Executive Perceptions*



*Pouch lithium polymer battery is favored for its lightness but is damaged easily.*

- Executives representing over 429 Residential MRFs, including Dual Stream and Single Stream
- Publishers of Recycling Today & Resource Recycling
- SWANA, ISRI, NWRA
- WM, Republic, Pratt, Rumpke, Casella CalWaste, Emterra

# RRS/SBWMA National Survey

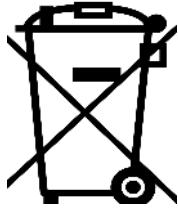
## *Interviews on Executive Perceptions*

### **Confidential Responses – Remarkably Uniform**

- Batteries, Propane tanks & unspecified Truck “hot loads”, which could be battery-ignited, biggest cause of fires in MRFs
- Not as big an issue as field operators say, concern was muted
- Over the years fires have increased
- All except 1 had personal experience with a fire in the last 12 months. All had personal experiences over 2 years
- Recycling Symbols on batteries very confusing, Needs work

***“What we know is tip of the iceberg. Many fires are never reported. It will take a major event to sway folks to seriousness”***  
– National Recycling Executive

# Labeling on Batteries Confusing



Could be construed as 'do not put in the garbage but instead put battery in the recycling bin.'



**Li-ion**

Appears more prominently than other warnings on many batteries. And sometimes without No Garbage Can Symbol. Users may mistakenly put batteries in recycling bins.

1. 31,000 configurations and sizes
2. European symbol for don't put it curbside does not work here
3. Recycling Symbol plus no can symbol leads to confusion

# Washington, DC

## *Working LI Battery Recycling Response Group*



- Anne Germaine's (NWRA), PRBA organized a national working group of industry executives
- Surveys, Webinars, Outreach through ISRI, ANSI, SWANA, CRB, PRBA, CALL2Recycle, and NWRA garnered interest
- New Call2Recycle Training (released day of meeting)
- Workgroups gathering best practices and uniform communications plan



# Washington, DC

## Working LI Battery Industry Communications Draft



Sector	Issue	Remedy	Stakeholder
Municipalities/ Solid Waste Authorities	Batteries are showing up in curbside recyclables because of confusing symbols. Batteries collected at curbside are not properly prepared or placed in appropriate location for recycling.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Educate households on how to identify, and properly prepare all batteries for proper disposal (bag and tape).</li> <li><input type="checkbox"/> If curbside already in place, place their lithium-ion batteries for curbside collection properly.</li> <li><input type="checkbox"/> If curbside not already in place, municipalities provide promotion of existing battery depots within range of household (through either Solid Waste or Public Health depending on city).</li> <li><input type="checkbox"/> Municipalities should consider not establishing curbside program for lithium-ion batteries.</li> </ul>	<ol style="list-style-type: none"> <li>1. Recycling Coordinator, Public Works Department, Solid Waste Department</li> <li>2. Solid Waste Authority</li> </ol>
Collection Companies	Batteries collected at curbside and placed in the truck, may catch the truck on fire.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Educate households on how to identify, and properly prepare battery.</li> <li><input type="checkbox"/> Enforcement tool for hauler use if batteries are found in curbside recycling or improperly packaged batteries found on top of cart.</li> <li><input type="checkbox"/> For existing curbside battery programs, POS tools for placing lithium-ion batteries for curbside collection on top and not in the cart (if the contractual responsibility of the hauler).</li> <li><input type="checkbox"/> Municipalities should consider not establishing curbside batteries-promotion or public</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Corporate Safety Managers</li> <li><input type="checkbox"/> Field District Managers</li> <li><input type="checkbox"/> Route Managers</li> <li><input type="checkbox"/> Drivers</li> <li><input type="checkbox"/> Public Sector managers for private</li> </ul>
Material Recovery Facilities (MRF)	If the residential recyclables placed on the MRF sort line contains lithium-ion batteries, it increases the probability of a fire that can cause significant damage. This	<ul style="list-style-type: none"> <li><input type="checkbox"/> Educate households on how to identify, and properly prepare and place their lithium-ion batteries for curbside collection.</li> <li><input type="checkbox"/> Municipalities should consider not establishing curbside</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Corporate Safety Managers</li> <li><input type="checkbox"/> MRF managers</li> <li><input type="checkbox"/> Sorters, loader and forklift operators, and baler operators</li> <li><input type="checkbox"/> Public Sector Managers</li> </ul>