

R Recycling

International

Recyclers' worst nightmare

Scrap on fire

'Eye-Seal' to counter container theft

Plastics recycling facility 'a first' for Kenya

Ferrous prices climb to three-year peak

'We're about adding value to discarded phones in Africa'

Closing the Loop ceo
Joost de Kluijver
page

18

E-bike bombshell

After dropping it on the floor in our living room a couple of months ago, my younger daughter's iPhone acquired a badly-cracked front screen. She has no insurance covering the phone, and since she's a student living on a tight budget, repair is not a first priority.

'I could not stop myself from imagining her phone exploding.'

I offered to have it fixed for her - I mean, there's not much you can do with a phone on which you can barely read text messages - but she does not want that. 'I'm grown up, dad,' she told me. 'I was stupid enough to drop it; it's my responsibility to get it repaired.'

She was absolutely right, so I paid no further attention to the matter.

But that was until very recently - when I met Frits Stam and Peter-Jan Borghouts of Dutch scrap metal recycler Regelink. This company has been faced with a series of major fires at its main yard in the north of the Netherlands - fires claimed to have been caused by lithium batteries.

Frits and Peter-Jan told me how 'hidden' lithium batteries ending up in their mountains of scrap had spontaneously caught fire. I had heard about smart phones getting overheated when being recharged and then exploding. But now, during a pleasant and interesting conversation with these two scrap experts, I learned first-hand about the serious risk of explosion and fire

when damaged lithium batteries come into contact with air or moisture.

This problem has a specific Dutch angle. Lithium batteries are not only in phones, cars and laptops; they are also in e-bikes, which are enormously popular in a top cycling country like the Netherlands. The first generations of these e-bikes have now reached their end-of-life phase and so an increasing number are being scrapped. If the batteries are not properly removed, the result can be a major headache for metal recyclers like Regelink, as highlighted in this issue's cover story.

According to the company, lithium batteries are like time bombs for scrap recyclers.

And not only for recyclers; also for consumers. Check Google and you will find dozens of news reports of lithium-related explosions. Only a couple of weeks ago in the Dutch city of Utrecht, a man was woken by a major explosion in his garage caused by his e-bike battery.

When I read about this incident, my daughter's damaged iPhone immediately came to mind. I could not stop myself from imagining her phone - which at night she keeps under her pillow - exploding.

I decided to call her and urge her to have her phone repaired as soon as possible. The good news is, in the meantime, she has. ■

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Where there's smoke...

'Fire at scrap yard' is an all-too-familiar headline for those following recycling developments globally. In recent months, massive and sometimes toxic smoke plumes have shrouded recycling facilities in Australia, Canada, the UK, the USA and the Netherlands, to name but a few locations. So what can be done either to prevent, or to minimise the impact of, these unfortunate and costly incidents?

By Kirstin Linnenkoper

It was raining ash and wailing sirens filled the streets of Coolaroo as a large fleet of fire trucks raced towards SKM Recycling. For the Australian recycler, the intense blaze in July was the third time this year that its facility had been largely destroyed.

More than 120 firefighters from multiple nearby units were engaged at the height of the blaze, which started in a storage area for paper and cardboard. The material continued to smoulder for more than four days, with small sparks causing the fire among the pallets to reignite

all over again. According to the police, a 'severe backlog of unsorted waste' was the initial cause.

The biggest threats

One of the most dangerous materials when burning is plastics, confirms the fire brigade called to the V10 Polymers recycling plant in Blackburn, UK, where 100 tons of plastic scrap was engulfed by flames on August 21.

The team was able to prevent 'catastrophic consequences' by arriving on the scene quickly and bringing the situation under control in less than four hours. Fire-

fighters were able to contain the 'highly toxic and corrosive' smoke that hung over the entire facility - roughly the size of a football pitch. A primary concern in such cases is that toxic run-off could have contaminated nearby waterways.

Plastic bags and electric cables can pose another type of problem in that they can become stuck in shredding equipment and cause the motor to overheat.

E-scrap is another waste stream to look out for. Global Electric Electronic Processing in Barrie, Canada, experienced not one, not two, but three fires this August and an explosion last year after the recycler's precious metals shredder overheated.



Fewer fatalities?

In the USA, fire-related deaths have dropped significantly since the early 1980s. Records from the National Fire Protection Agency show that fatalities decreased from 26 per 1 million citizens in 1981 to fewer than 10 per million in 2015. There were over 1.3 million reported fires across America during the period 2009-2013, claiming the lives of 68 fire-fighters.

In more than 37 000 of these cases, the blaze originated on an industrial site, 14% of which were

caused by heating equipment or industrial tools, and 25% by a mechanical malfunction. Approximately two out of every five fires occurred at night, in the 12-hour period from 8 pm to 8 am. Based on population data, it is believed there could be as many as 1500 fires at recycling plants in the USA each year. In the UK, meanwhile, 300 fires occur at the country's recycling plants in an average year, according to the Chief Fire Officers Association. This represents a considerable reduction from 425 in 2011.

new - and fully charged.' This is especially true for car batteries. 'It is still a very new industry, but one that is set for meteoric growth,' the consultant adds. Indeed, market analysts forecast that 150 million electric vehicles could be on the roads in Europe alone by the year 2050.

According to Green, some incidents may occur because battery-containing devices are processed by recyclers without first having their batteries removed. 'One could say the response is patchy in the recycling sector - with some companies taking the battery safety issue very seriously and adopting good measures while others remain somewhat cavalier in their approach,' he comments.

In a time when manual labour costs are being reduced more and more, the consultant abhors the thought that recyclers may opt to shred devices in exactly the form they enter a yard. 'It is of course tempting to take a chance to save money,' he laments.

Mitigating the risks

Enforced by governments and promoted by industry associations, strict worker health and safety standards at recycling plants 'are doing good work to mitigate risks', Green contends. 'In Europe, transport legislation for batteries is certainly catching up.'

The US Institute of Scrap Recycling Industries (ISRI) has a safety-focused channel on YouTube and has developed a day-long training course on hazard recognition based on real-life situations within the recycling industry. It has also published in-depth safety protocols in which the trade body recommends that,

for example, piles of end-of-life tyres should range between 2500 and 5000 square feet in size and should be stored some 50 feet away from buildings, equipment and other piles of scrap. Also, it calls on operators to avoid cutting, welding or grinding at least two hours before the end of the day in order to minimise the chance of sparks or of heat build-up.

In a bid to boost best practice among trained professionals, the US National Fire Protection Agency recently launched a free 1st Responder Connection App for Apple and Android devices. This mobile tool includes a how-to guide for putting out electric car fires following harrowing incidents involving lithium-ion batteries.

Elaborate measures pay off

A large pile of construction & demolition waste stored together with bulk municipal waste caught fire at Baetsen Recycling's facility in the Dutch town of Sol on August 29 - the second fire at the site this year. Employees raised the alarm at 9 pm, and the fire brigade was able to put out the blaze by 7 am without any casualties or without the release of any dangerous substances into the atmosphere.

The materials that were lost in the fire were stored separately as they were considered 'not fit for recycling', Baetsen notes. The waste was therefore scheduled to be sent to a nearby incineration plant.

Luckily, the waste in question was surrounded by thick concrete walls that prevented the fire from spreading. A sprinkler system both inside and outside the recycling plant helped in bringing the blaze under control. At the same time, an onsite water pump installation ensured firefight-

But the 'main threat', reckons Belgian firefighter Kurt Vollmacher, are today's mass-produced electric car batteries. The lack of information-sharing between industry stakeholders, combined with the unsustainable design of an electric vehicle, means that flames can often take 'over an hour' to extinguish, warns the new technology specialist at the International Association of Fire and Rescue Services (CTIF).

'The more volatile batteries are lithium metal and lithium ion units,' agrees UK-based recycling and safety consultant Michael Green. 'The first thing people need to remember is this: any battery can catch fire. How big and uncontrollable it may become will depend on what the batteries are stored in, and what is stored in close proximity.'

'Response is patchy'

As far as golden safety rules go, Green remarks: 'I have always argued that waste batteries should be treated as if they were

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R cover story

ers would not be short of water while on the premises, Baetsen points out. These 'elaborate measures' were taken after consulting local fire prevention experts about fire management best practice.

According to the Dutch company, it is 'wary' of the dangers that can accompany recycling activities, which it calls a 'cornerstone' of the country's society. It argues that quick action by plant workers and close collaboration with first responders are vital in not only reducing risks but also in 'bringing incidents under control'.

'Results within seconds'

When it comes to risk, batteries rank very high up the list of 'dangerous recyclables', Dutch businessman Johan van Peperzeel will attest. Having experienced his fair share of fires on the premises of his battery recycling plant in Lelystad, he has spent the last couple of years assembling industry partners in a bid to come up with a foolproof remedy for this long-standing issue.

The result is a new venture, Battery Safety Solutions, which he launched with battery recycling veteran Huib van Deutekom and Abner Abee. They propose a manual solution for workers to grab immediately after materials on the sorting belt show any sign of becoming a problem. Dubbed the N-EXT fire extinguisher, this contains a 'tried-and-tested' water additive which is free of fluorine and which can be applied to plastics, rubber, batteries

and photovoltaic systems to give 'results within seconds'.

A salvage container fitted with sprinklers is an option now available to recyclers when transporting end-of-life electric cars, discarded lithium-ion batteries and other hazardous products that may 'react badly' when on the move. Instead of water, the sprinkler system will deliver a specially-developed Fire Pro aerosol. Van Peperzeel reveals that the container was acquired by Croatian car manufacturer Rimac after Richard Hammond - former host of UK television's Top Gear programme - crashed one of the company's electric vehicles while recording an episode for the show.

Minimising response time

Indeed, customised sprinkler systems have become quite common in modern recycling plants. But there is a downside, argues Swedish safety solutions firm Firefly AB. 'By the time a sprinkler system is activated, the fire has most likely already caused damage and may have spread into other areas,' observes managing director Lennart Jansson. In order to protect critical machinery, it is 'essential' to minimise the response time of a fire protection system, he contends.

Jansson cites friction, bearing failure and foreign objects as key causes of a shredder going up in flames. The entrepreneur understands that recycling equipment comes with a hefty price tag and also that frequent downtime wastes the recycler's time and money. That's why the



Peter-Jan Borghouts (left) and Frits Stam: 'Even the smallest button cell can be the source of a major scrap fire.'

Stockholm-based company has spent the last 40 years refining its tailor-made fire protection system that detects and extinguishes sparks as well as hot particles and flames in risk areas with the help of fast infrared sensors in combination with a water spray or mist.

Firefly can detect hot particles at a temperature lower than 250 °C and sparks at below 400 °C. As Jansson explains, these values represent the minimum ignition temperature and minimum ignition energy for most processed materials. 'We are setting new industry standards,' he insists. 'This is the first time such a low detection temperature has been FM approved.'

Leading recycling technology brands like Vecoplan, Metso and Andritz have equipped their newest shredders with the patented Firefly ShredderGuard - a system that also helps prevent dust-related explosions. A special set-up is available to handle sludge drying. ■

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Lithium batteries

'These bombs can kill your business'

Recently, lithium batteries have been linked to an increased number of fires at scrap yards in the Netherlands. Dutch recyclers are doing their utmost to prevent such incidents. At the same time, they are calling on producers of batteries, electronics and e-bikes to take their full share of the responsibility.

By Martijn Reintjes

Check out those blackened sea containers over there - that's where we had our last big fire in December 2016,' laments Frits Stam, managing director of Dutch recycling and trading company Regelink which handles some 120 000 tonnes of ferrous and 30 000 tonnes of non-ferrous scrap per year.

'It was a disaster,' he recalls as, accompanied by commercial director Peter-Jan Borghouts, he guides me around the firm's main yard at Kampen in the north of the Netherlands.

In the past three years, the company has been hit by a trio of scrap fires. 'After the first incident, we initially thought the fire was caused by lightning,' says Stam. 'But the more research we did, the more evidence pointed to lithium batteries as the most obvious cause. Various experts have supported this conclusion.'

The 'lithium fires' at Regelink have not occurred in isolation. Recently, broken lithium batteries have been associated with an increased number of fires at scrap metal facilities in the Netherlands. There were seven reported incidents in 2015 and 15 the following year. In 2016, the number soared as Dutch recyclers reported a total of 60 fires. But it has not stopped there: in the first eight months of 2017 alone, there have been 77 scrap fire incidents.

Long-term impact

Damaged lithium batteries can easily catch fire when coming into contact with air or moisture. 'These batteries change into dangerous bombs; they can explode

almost spontaneously and set fire to your scrap stocks,' states Borghouts. But apart from the fire and the loss of scrap, these bombs 'can kill your business in the long term', he adds. 'Insurance companies no longer seem to be willing to compensate us for the damage. We have had to take all kinds of costly precautions and add extra steps in the handling processes to filter out lithium batteries that might have been left behind in the scrap. And still, this is no guarantee it won't happen again. Even the smallest button cell, which we simply cannot 100% guarantee to sort out, can be the source of a major scrap fire.'

The e-bike headache

A related issue, says Stam, is the rapidly growing number of lithium battery-driven electronic bicycles in the Netherlands. The first generations of these devices are reaching their end-of-life phase and so

increasing numbers of e-bikes are ending up at scrap yards. 'Most batteries are removed but this is not yet standard procedure, which again increases the risk of fire,' he says.

Stam and his fellow scrap metal recyclers in the Netherlands would like to see changes on the collection side. 'There should be more added value to lithium batteries which can work as a boost for better collection and separation,' he argues.

Meanwhile, Dutch scrap metal industry body MRF has called on battery, e-bike and electronics manufacturers to make their products in such a way that they can be recycled efficiently and safely. Just as producers have begun incorporating design for recycling into their production principles, they should also work towards 'design for safety', suggests the trade body's managing director Hans Koning. ■



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