

# Steady growth for lithium-ion, but lead-acid market 'is not dead'

There will be a 'massive upcoming tsunami' of discarded e-mobility batteries, it was declared at ICM's latest international battery recycling conference, held in the Portuguese capital Lisbon. Consumer products are not as simple as they may seem and collection targets remain a far-off goal for some nations, it was revealed. At the same time, battery specialists warned against creating a 'jungle' of information.

Worldwide, the battery market was worth US\$ 69 billion in 2016. 'There has been average growth of 8% per year since 2006,' the 22nd International Congress for Battery Recycling was informed by Christophe Pillot, director of France-based Avicenne Energy. 'This uptrend is hardly surprising considering 2 billion mobile phones, 165 million laptops and

another 195 million tablets were sold last year,' he told delegates in Lisbon.

## A BOOMING MARKET

The global battery market is 'booming' and is offering growing potential for recycling businesses, the analyst pointed out. This recycling sector was worth over US\$ 8 billion last year, according to research

by Markets&Markets, and it is estimated that this figure will grow by 6.5% to more than US\$ 11 billion in the next three years.

Of all the battery sales last year, US\$ 20 billion was spent on start light and ignition batteries for various types of transport, Pillot noted. Sales for automotive and for industrial battery applications both totalled US\$ 15 billion, while the market for portable batteries was worth around US\$ 9 billion. But lead-acid batteries still topped the list with a market valued at US\$ 35 billion last year.

Pillot also reported that the global lithium-ion battery market was worth approximately US\$ 22 billion in 2016. The market for electric cars surged 15% last year while the Chinese market alone witnessed more than 65% growth. And looking at the 10-year period to 2016, the upward trend becomes even more obvious, with lithium-ion demand increasing by 23% per annum in volume terms.

Pillot argued that 'all the lead-acid applications could become lithium-ion applications'. The analyst considers it likely that the lithium-ion market will see 13% volume growth between now and the year 2025. 'However, lead-acid is not dead, ladies and gentlemen,' he emphasised in Lisbon. 'It has represented 90% in terms of market share during the last 10 years - and it will still be a significant market in 2025.'

## 'CHALLENGING, IF NOT IMPOSSIBLE'

These market figures suggest the recycling industry will have its hands full in the years ahead - at least, that is, if collection volumes can be improved, lamented Hans Craen of the European Portable Battery Association (EPBA). Just over a dozen member states were able to meet the EU's 45% battery collection target for last year (see box). However, several countries fell well short of the required quota.

'It will be very challenging - if not impossible - for most member states to reach the legislative target,' Craen argued. That is why the EPBA is proposing that the collection target should be based on what is actually available for collection in each domestic market. 'Every market is different,' he underlined. 'It makes no sense to have one single goal that applies to all EU member states.'

In practice, it was argued, there is 'hardly any enforcement' of the EU Battery Directive. 'Battery laws are not a priority for most member states, so the question is simple: What is the value of legislation if there is no follow-up at all?' Craen asked the audience with a look over his shoulder at fellow speaker José Rizo Martin, representative of the European Commission. Peter Binnemans of the Eucobat collection scheme added that collection rates for lithium-ion batteries are 'considerably lower' than for other battery chemistries.

## COLLECTION TARGETS OUT OF REACH FOR SOME

Approximately 800 000 tons of automotive batteries, 190 000 tons of industrial batteries and 160 000 tons of consumer batteries enter the EU every year, according to the European Commission's DG Environment. And yet while most entrepreneurs across the continent have reacted robustly to the mandatory battery collection target of 45% set for last year, it appears that quite a few member states are nowhere near meeting this objective.

According to Hans Craen of the European Portable Battery Association, 13 member states have achieved the 'ambitious' target: Switzerland (71%), Sweden (61%), Luxembourg (65%), Belgium (55%), Austria (55%) and Slovakia (54%) are the top performers while Germany (46%), the Netherlands (46%), Finland (46%), Denmark (45%), Norway (45%) and Bulgaria (45%) are just hitting the target. The UK managed to achieve a collection rate of around 44%. At just 25%, however, Croatia and Cyprus recorded the EU's lowest battery collection rates while Iceland and Hungary (29%) performed only slightly better. Somewhere in the middle are France (38%), Italy and Portugal (both on 39%), as well as Spain, Poland and Ireland (33%).



Battery Solutions in Michigan, USA, processes around 300 car batteries each month.



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Furthermore, around one-third of batteries are integrated into devices these days. European Commission official José Rizo Martin reflected: 'Products are not as simple as they seem.'

#### NO FREE-RIDING

'Bringing member states that have not met the targets before the EU Court of Justice to demand they pay a penalty is not the right approach,' Rizo Martin emphasised. 'In this industry as in life, punishment does not yield improvement.' Professor Friedrich of Germany's Aachen

University told the conference that 'you will always struggle until you give more of a financial incentive'. In Germany, he pointed out, 'there are no plastic bottles left on the road any more because they are worth 20 (Euro) cents', adding that 'this could work for batteries as well'. Offering a financial incentive for removable and small batteries would be very wise, agreed Meike Ruoff of 1CC Compliance Consulting. As it stands, the EU Battery Directive exempts producers that place very small quantities of batteries on national markets from financing their collection,

treatment and recycling, she noted. 'Bigger producers, however, are required to invest disproportionately, both in terms of money and manpower, in order to set up and maintain compliance,' she added. 'This leads to market distortion and free-riding.'

In her view, a threshold by means of 'simplified registration' locally could be one possible solution. 'All producers would pay a flat fee and only need to share basic data without elaborate contracting obligations,' Ruoff explained. 'Market conditions would be much fairer because in this situation more players are contributing financially.'

#### 'MASS DISTRACTION'

Questions abound when it comes to end-of-life batteries and what to do with them. 'For example, should the energy efficiency of recycling be measured?' asked Partick de Metz of advanced technology battery solutions provider SAFT. 'And how can we properly trace the chain of recycling sub-contractors?'

De Metz echoed the sentiments of many speakers when he described volumes of discarded e-mobility batteries in terms of 'a massive upcoming tsunami'. This 'mammoth topic' raises yet more questions regarding product liability and responsible reuse, it was suggested. At the same time, bending over backwards to find perfect answers could lead to 'mass distraction' rather than improved practices, De Metz cautioned. Having to navigate a 'jungle' of information would not be beneficial, delegates were told.

History can be a great teacher, he continued. 'Hundreds of years ago, the inhabitants of Constantinople were caught up in a heated debate about the gender of angels whilst the Ottoman Empire was invading. Obviously, they should have been thinking about how to defend their city, which was easily conquered. So let us not repeat this never-ending cycle of discussions.'

#### 'SOMETHING HAS TO CHANGE'

Currently, global reserves of lithium amount to around 17 million tons, most of which are in Chile and then China, Bolivia, Australia and Argentina. 'Recycling lithium will make more economic sense once the mineral resources can no longer cater to lithium demand, which as we know is set to surge in the years ahead,' stated Dr

Carlos Nagueira of Portugal's National Laboratory of Energy and Geology. 'Therefore, even though quantities of secondary lithium may be small, this materials flow will be attractive for recyclers in the medium term - not right now,' he concluded.

The constant change in cathode composition is a challenge for recyclers. 'It is not yet clear whether this will result in a new paradigm for battery chemistry,' Nagueira remarked. 'For you and me, it is hard to imagine a future without lithium. And, personally, I don't believe lithium will be replaced just yet. Not for a long time.' 'So, how many Earths do you think we need if we all lived like the people of Australia?' the audience in Lisbon was then asked by Professor Vera Susanne Rotter of the Technical University of Berlin in Germany. 'It's gone up to 5.2 already. We need five planets to sustain the lifestyle of both the USA and South Korea, and about 3.5 planets to sustain Russia's demand for resources.'

Rotter proposed: 'Maybe we can consider

the last series of tropical storms not just as a threat, but as an opportunity to see clearly that something has to change.'


#### 'SHARP CO-ORDINATION'

In terms of threats within the battery sector, fire events relating to lithium-ion have become a focus of debate. 'Back in 2013, we had 25 incidents while handling batteries,' said Peter Coonen of Belgian sorting specialist Sortbat. 'Luckily, we managed to reduce this to six incidents last year.' These figures represent, respectively, one fire (or instance of smoke/gas/heat build-up) per 100 tonnes of batteries sorted versus 0.3 incidents per 100 tonnes. Some 60% of the incidents are caused by lithium-ion batteries and around 95% of incidents occur during or right after physical contact, Coonen pointed out. 'I am glad to announce that almost 70% of these are resolved in under three minutes,' he added. In part, this is due to storing high-risk batteries in a special 'bunker' equipped with automatic carbon dioxide extinguishers. Sortbat has also


invested in tailor-made fireproof blankets with vermiculite filling to cover anything from drums to dismantled e-scrap and entire pallets. Furthermore, the business has added a new sorting line with a reduced drop height and also two fewer drops. 'Overall, we have reduced travel distance on the sorting line by 60%,' Coonen noted.


Any incident is recorded by overhead security cameras and the footage is carefully reviewed and discussed with the facility's crew. Each year, workers receive two days' training from local firefighters to brush up on their first-responder skills. 'Sharp co-ordination is everything,' Coonen asserts.

'It starts with people wearing gas masks and protective gear, and isolating the threat, and ends with pulling away the forklift with reactive material in a way that prevents flames from fanning up and getting to the worker's body,' Coonen explained. 'When it comes to handling batteries, you've got to cover all the bases.' ■



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#### PORTUGAL 'WILL NEED TO BE PREPARED'

'In the last 20 years, Portugal has witnessed great improvements in the waste management sector such as prioritising a smooth transition to a circular economy, as well as decarbonisation, with a special focus on e-mobility in public transport,' the country's secretary of state for environment Carlos Martins told delegates in Lisbon - which counts as one of the oldest cities in the world and houses 552 700 of Portugal's 10 million population. 'At a time of great ambition and great innovation, there are also great challenges,' he urged.

Around 25 000 tonnes (around 39%) of batteries are recycled in Portugal each year; this is below the mandatory 45% target set by the EU for 2016. According to the nation's Green Dot organisation, door-to-door waste collection in Lisbon covers 236 970 households, while there are over 5500 drop-off recycling containers in the capital. It has two sorting centres for recyclables as well as two landfills. To improve on Portugal's recycling statistics, investment in sustainable battery solutions is vital, Martins told delegates. He also called for increasing synergy between the proper management of e-scrap, end-of-life vehicles and batteries.

Electrification is sky-rocketing in developing countries - and it's simple, there is no electrification without batteries,' said keynote speaker Nuno Lacasta, president of the Portuguese Environment Agency. Landfill rates are still high, at 40%. All those sites will need to be mined, the sooner the better. 'Frankly, we are not prepared as regulators - yet. But we will need to be prepared.'