The ‘Real’ Secret Sauce for Recycling Lithium Ion Batteries

Mankind has been recycling since the first metal object broke and couldn’t be put back together with glue made from mammoth bones. Pretty soon the metal sphere had morphed into alloys such as bronze and mankind was off to the races. Recycling bronze meant extracting two metals from the mix or at least resmelting the original object back into something from the same metal.

We have heard several times in recent the use of the term “unscrambling the egg” to refer to the process of recycling Lithium Ion batteries. This makes the process sound almost miraculous because as we all know you cannot unscramble an egg. Having been involved in the initial stages of a recycling set-up I know which technology I prefer to extract the metals and it was eerily simple. This makes us wonder at some of the more complex “patented” processes out there and wonder “why reinvent the wheel?’

Anyway, the promoters of recycling of Lithium Ion batteries are somewhat taking it for granted that there is a latent supplies of batteries to supply their plants. We would agree that there is such a supply but the issue that is not addressed is how that latent supply is mobilized and moved to the plant gate. Moreover while numbers fly about as to how much is gained in value of Lithium and Cobalt (and maybe other metals like Copper) from each battery and we are giving numbers on how much such metals might cost to extract, there is zero cost factored in (that we have seen) for how much the inputs cost.

Let’s couch this in mining terminology. It is like producing a

PEA for a mining project and forgetting to add a mining cost. It's sexy to recall recycling "urban mining" but does the actual mining (as distinct from the processing) come free. The batteries (even if free, and they won't be) need transporting to the "mill". Add to that the consideration that the most effective urban mining operation would rapidly "strip mine" the easily available battery stocks and after a certain point the "high-grading" of the Lithium Ion batteries, with a low "strip-ratio" would swiftly become a thing of the past. We all know that high-grading frequently comes back to bite one in the behind leaving the business model untenable in the long term.

Let's look at some other considerations…

Solving Part of the Problem

There is an old expression about "taking care of the pennies and the pounds look after themselves". To some extent this applies to the Lithium Ion battery space. Sure the big prize is the EV/HEV market but that is still off in the future. In the short term though (and recent past) the main game has been the battery market in portable devices.

One of my "party tricks" at metals conferences is to ask the audience to think how many redundant cellphones and laptops (and portable power packs) they have lying around in their house. Usually the answer is a multiple of two or three times the number of devices that they are actively using. This implies on a global scale that the "population" of Lithium Ion batteries in personal devices is enough to replace all the batteries in currently used devices when they "die". This means in a perfect recycling world, zero new demand for Lithium and Cobalt for such devices, indeed there is sufficient metal in extant batteries to more than replace the demand for replacement cellphones/laptops. That leaves some spare for repurposing into other usages (e.g. EV/HEV batteries). Now the other usages are a quantum larger in

their consumption of Lithium and Cobalt but frankly as far as the smaller applications are concerned, then recycling has potentially “got ya covered”.

We might quote one of the best-organized recycling chains, which is that of the aluminium drink can. The Aluminium Association states that 67% of the material in the drink cans is recycled. In cellphone batteries we do not see why something like 95% or more should not be recycled. As we have noted many people can’t bring themselves to toss old cellphones. I personally have my doubts about the breezy statement that “they go to the landfill”. My own enquiries would indicate that many people have a growing pile of quasi-redundant electronics with Lithium Ion batteries that they cannot bear to throw away. And neither should they… There’s “gold in them thar hills” but is it gold for the hoarders of moribund cellphones in their bottom drawer? Recyclers imagine they will be given these cellphones and laptops (or at least the batteries) but if word gets around that the cobalt is 20% of a battery and its worth USD56,000 per tonne then the beady eyes of the consumers will open wide and they will imagine that some of that pile of loot should come their way. Payback time! Or is it?

Storage

There is a non-apocryphal tale about a certain US recycler that set up a plant in British Colombia. One day the plant went up in a fireball. Insurance company paid, company did not do that again. Scuttlebutt would say that they were relatively new to the Lithium Ion battery business and in typical “junkyard” practice made a big pile of received material and much to their surprise something went wrong.

The issue of combustibility of Lithium Ion batteries is a real one and immensely pertinent for the Lithium Ion battery collection chain. Too many Li batteries in a collection bin in a supermarket and, oops, supermarket goes up in flames in

middle of the night. Who would have thought it?

We don’t need to go back too far to the disappearance of the Malaysian Airlines flight over the Indian Ocean. After hijacking was first discounted, the story circulated that there was a pallet of Lithium Ion batteries on board. That idea in turn was discounted but the mere fact that it was mentioned shows that there is an undercurrent of knowledge on the subject of the spontaneous combustion of these items that is not mentioned publicly to “not scare the horses”. However, it is well known now that United Airlines will not take Lithium Ion batteries as freight and the travails of Samsung’s tablets have put them on the “no fly” list.

One thing of course is to manage the “pile” lithium ion batteries in a junkyard (and that doesn’t seem to be entirely under control) and it’s another to have a myriad of lesser collection points springing up around the world with the keepers of these piles unaware of the risks they face or engender.

Conclusion

Unlike my usual conclusions in which I sum up “how to do it” in this case frankly I have my own ideas and I am not going to tell you. Knowledge is power. In the case of battery recycling the ‘secret sauce’ is not how you unscramble the egg of a Lithium Ion battery it’s how you get your hands on sufficient batteries to make your plant viable. If you build it and they (the batteries) do not come then the promoter will end up with serious egg on face.

I have seen a number of battery recycling plans in recent months and frankly none of them have as good a concept of how they will collect sufficient feedstock as my own conception of how it should be done. This is not rocket science and frankly those that are lacking on this front are not failing because its overly complicated instead they are failing because they

have put almost zero thought into how they get the batteries in the front door of the plant. We have often lashed Tesla for relying on the power of prayer to ensure it has ensure battery materials, well might we also critique the putative battery recyclers for the same failing.