

Q&A – BATTERY RECYCLING

Electric Vehicles And Battery Recycling Challenges

Dr. Sayed Hussain, Managing Director, Sayed Metal, highlights various issues related to battery recycling with focus on lithium-ion batteries, particularly in view of the expected growth of the electric vehicle market in the Middle East, in an interview with Swaliha Shanavas.

What is your view on electric vehicles gaining importance in the Middle East?

Vehicle density in the Middle East is highest in the world, with constantly increasing demand consequently building up the volume of waste batteries generated from vehicles. Despite the region being highly industrialised, it lacks robust public transport infrastructure, which leads to the residents being all the more dependent on cars as means of transportation. The effort to substitute polluting petrol and diesel cars with environmentally friendly electric vehicles has recently gained momentum in the region.

Why replace the centuries-old lead acid batteries with li-ion batteries?



Dr. Sayed Hussain

Lithium-ion scores much better than lead acid batteries in terms of environmental performance. Electric vehicles operated with Li-ion batteries do not produce odours or noise pollution. Producing lead acid batteries requires more raw material than lithium-ion, thus largely affects the environment during the mining process. The initial cost of lithium-ion batteries is high compared to traditional lead-acid batteries. However, the real cost of ownership is lesser than lead acid when considering its life span and performance. Rechargeable lithium-ion batteries cycle 5000 times or more compared to just 400-500 cycles in lead acid.

Opting for electric cars is not only ecologically sound, but also practical in the long run. The International Energy Agency estimates there will be around 140m electric cars globally by 2030.

What are the main differences between lithium-ion and lead acid batteries in an environmental and economic context?

From an environmental viewpoint, lithium-ion battery does not contain highly hazardous Pb, As, Cd, H₂SO₄ etc., but Co, Ni, Mn, Al in the form of sulfate and polymer electrolyte, which is much safer than the

components in lead acid battery. The application as energy source for cars is itself leading to a huge decrease of air pollution originated by vehicles.

In terms of economy, lead acid battery has limited storage capacity and is used for just low energy activities such as starting a car engine, ancillary power functions and also electronics which needs less electricity. This type of battery cannot be used for cars like lithium-ion battery due to its heavy weight and low storage capacity. Along with the above mentioned strong points, most of the components in lithium-ion batteries can be recycled like those of lead acid batteries.

What are the advantages of lithium-ion as compared to lead acid in the long run?

There are amazing advantages for Li-ion batteries to be applied to transportation vehicles thanks to the high storage capacity, longer life span (500 times rechargeable by keeping 80 percent of initial capacity, it can be expected to be used minimum 5 years), and light enough for application in cars. On the other hand, lead acid batteries have low storage capacity and are very heavy.

For applications such as stationary electricity storage, lead acid battery is much more cost effective than lithium-ion battery with expensive elements (Co, Ni, Mn, Al sulfate). There is no expectation of cost-effectiveness for lithium-ion battery over lead acid battery.

What are the opportunities and the challenges for battery recycling in this region?



Lead acid battery recycling is of great interest in the lead industry. However, lead recycling facilities are not readily available in the region and as follows these recyclable materials are exported to legitimate recycling facilities, guided and documented by the Basel Convention. Generally, around 47 percent of the total world's lead production comes from secondary lead smelting and some 90 percent of used batteries are being recycled. Waste volumes per Middle East country could not justify the investment cost of setting up a recycling facility. Unless authorities pass a legislation that allows the outsourcing of additional scrap, the recycling process would not be profitable.

Lithium-ion battery production is increasing due to the fast growing energy vehicle sector, and the market is expected to face lithium supply crunch. Lithium and Cobalt are finite, where increasing extraction could run down environmental resources. The batteries used in electric cars are expected to last 8 to 10 years and will account for 90 percent of the lithium-ion battery market by 2025 according to Roskill forecast. Despite

increasing demand of lithium and cobalt, the essential components in producing batteries for electric vehicles, only about 5 percent of Li-ion batteries are recycled globally.

As energy vehicle sales expand in the UAE, with electric cars already in operation in the region, plus various entities fast establishing the necessary infrastructure, what are your views on this development, especially in the context of the environment?

All over the world, many countries like China, Korea, USA, Europe, etc., have announced they would have 20 percent fuel free vehicles over the total transportation vehicle production by 2025. India had revealed plans of having only fuel free transportation vehicles in big cities by 2030. According to this plan, Tesla has started to build its factory in India aiming at sales of electric vehicles in two years.

The world will have the infrastructure of electric vehicle charging stations in the near future with support from governments due to the fact that fuel cars could be prohibited from entering big cities due to the prospective regulations in each country. Current technology allows for 70 percent charging within 25 minutes and the charging speed may increase with time. Even wireless charge system while driving on the roads in big cities has been researched for the last 10 years.

What are the opportunities in lithium battery reuse, urban mining?

It will be the same as lead. Initially, lithium-ion battery has 100 percent LiCoO₂ as its cathode. Recently, cheaper and stable elements like Ni, Mn, Al, etc., have replaced Co (Co is toxic and explosive). In case of Mn, it is second largest abundant element after Fe.

A recent report revealed that while electric vehicles reduce pollution, their discarded batteries would soon become a major environmental hazard in China in the coming years, if not properly treated. What are the implications and key challenges for the Middle East market in this context, especially considering the lack of recycling facilities at present?

Electric vehicles could possibly leave us with a huge battery waste problem. Existing recycling facilities can easily recover many elements, but lithium ends up in a mixed byproduct. It is, however, possible to reclaim lithium from the byproduct, but it will involve additional process and cost-wise it is not economical. Recycling Li-ion batteries being in an infant stage still remains a challenge and there is currently no main recycling infrastructure in the world that treats only automotive Li-ion batteries.