RECYCLING ELECTRICAL VEHICLES BATTERIES

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INTRODUCTION

By 2030, the EU hopes that there will be 30 million electric cars on European roads. While electric vehicles (EVs) may be carbon neutral during their working lifetime, recycling the used batteries is a concern.

While most Electrical vehicles, EV components are much the same as those of conventional cars, the big difference is the battery. While traditional lead-acid batteries are widely recycled, the same can't be said for the lithium-ion versions used in electric cars.

RECYCLING ISSUES

EV batteries are larger and heavier than those in regular cars and are made up of several hundred individual lithium-ion cells, all of which need dismantling. They contain hazardous materials and have an inconvenient tendency to explode and catch fire if disassembled incorrectly.

Recent proposals from the European Union would see EV suppliers responsible for making sure that their products are not simply dumped at the end of their life.

Nissan in Japan is reusing old batteries from its Leaf cars in the automated guided vehicles that deliver parts to workers in its factories.

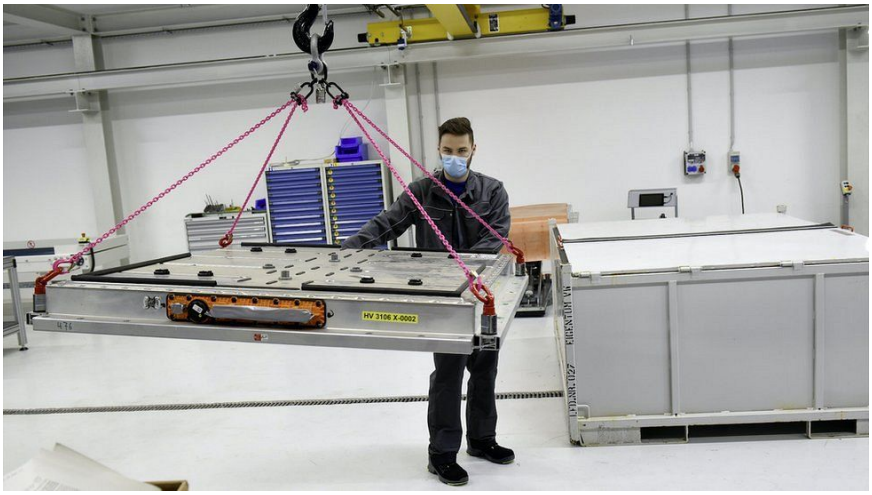

Figure 1. Volkswagen pilot recycling plant in Salzgitter, Germany. Source: Lars Landmann.

Volkswagen in Germany opened its a recycling plant, in Salzgitter, Germany, and plans to recycle up to 3,600 battery systems per year during the pilot phase. In the recycling process, many different materials are recovered. A first step focuses on cathode metals like

cobalt, nickel, lithium and manganese. Then dismantled parts of the battery systems such as aluminum and copper go through established recycling streams.
Renault in France recycles all its electric car batteries amounting to a couple of hundred a year through a consortium with French waste management company Veolia and Belgian chemical firm Solvay. The goal is not to recycle only Renault batteries but all batteries, and also including production waste from the battery manufacturing plants.

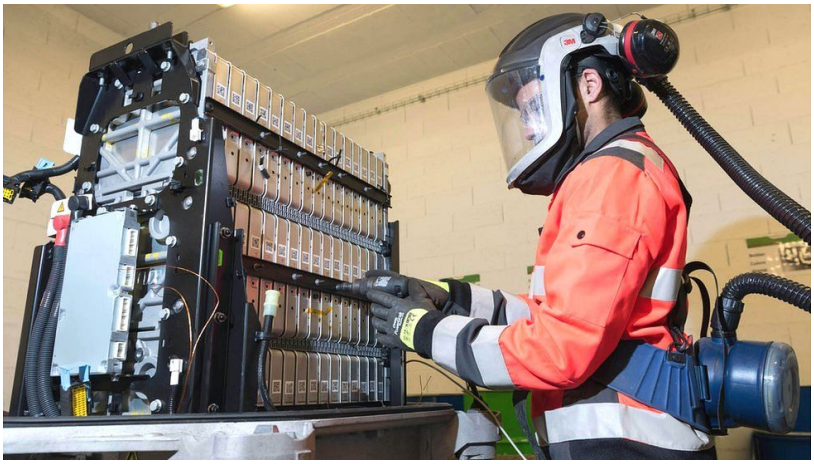

Figure 2. Safety features used in the dismantling a Renault electrical vehicle battery. Source: Olivier Guerrin.

The issue is receiving attention from scientific bodies such as the Faraday Institution, whose ReLiB project aims to optimize the recycling of EV batteries and make it a streamlined process. Currently, much of the substance of a battery is reduced during the recycling process to what is called black mass; a mixture of lithium, manganese, cobalt and nickel, which needs further energy-intensive processing to recover the materials in an usable form.

DISCUSSION

Manually dismantling fuel cells allows for more of these materials to be efficiently recovered but brings problems of its own. In some markets, such as China, labor is relatively cheap and health and safety regulation and environmental regulation is lax and working conditions would not be accepted in a Western context.

Automation and robotics can pull some of the danger out of the process and make it more economically efficient. There are powerful economic arguments for improving the recyclability of EV batteries - not least, the fact that many of the elements used are hard to come by in Europe and the UK. From a manufacturer's point of view, recycling old batteries is the safe way to ensure a ready supply of new ones.

REFERENCE

1. Emma Woollacott, “Electric cars: What will happen to all the dead batteries?”, BBC News, April 27, 2021, https://www.bbc.com/news/business-56574779