

MEDIA INFORMATION

Press Release No. EV-2022-002

Date: 24th August 2022

For release: Immediately

News Source: Mr Michael Hague-Morgan, Executive Director
Tel: +44 (0)1476 581300
Fax: +44 (0)1476 581301
mmorgan@autocraftsg.com

Closing the Loop with Autocraft's REVIVE™ EV Battery Repair Solutions

One of the key goals on the transition to EV across Europe is the establishment of a circular economy for lithium-ion battery production. That is, the recycling of EV batteries once they have reached the end of their useful life, and the reuse of the recovered minerals to produce new batteries for automotive use.

The first question is, “why is this necessary?” Whilst the transition to EV is a necessary and exciting undertaking which will greatly decrease tailpipe emissions, it does come with its own ecological challenges. Typically, the manufacture of an EV produces nearly double the amount of carbon emissions as an ICE vehicle ^[1]. Depending on the EV in question it will take between 32,000 km and 88,000 km of usage to “breakeven” on the carbon emissions generated in production when compared to ICE production ^[2]. This is largely due to the environmental impact from the extraction and refining of the raw materials for lithium-ion batteries.

Chile has more than 50% of the world's supply of lithium and mining lithium typically uses almost 2 million litres of water per tonne. Mining in the Atacama Mine in Chile's desert has so far consumed an estimated 65% of the area's groundwater ^[3]. To put this in context 1 tonne of lithium enables the production of approximately 8167 kWh of EV battery, approximately 136 vehicles. That equates to more than 14,700 litres of water per vehicle, just to mine lithium.

Cobalt, like all mining processes is water-hungry but also poses other concerns. Two-thirds of the world's supply of cobalt is mined in the Democratic Republic of Congo and whilst much of this is from large, well-run mines, the Financial Times estimated that there are approximately 150,000 unregulated mines employing approximately 40,000 children in dangerous conditions ^[4]. These are just two of the raw materials used in lithium-ion batteries, and with such a challenging supply chain it is clear why ensuring that EV batteries are recycled, and the materials repurposed.

The Missing Link

The challenges in production are well known by governments and the industry and this has led to good investment, through grants and policy, for establishing recycling capability in the UK and across Europe. Funded projects are underway to set up lithium-ion recycling centres across the UK, and new legislation is being planned to ensure that new batteries produced have quantities of recycled minerals included ^[5]. This, however, does miss one key part of the circular economy, that is getting the most possible use out of the battery before recycling.

This usage has two key phases: **Repair** and **Repurpose**. Repair is an important part of any automotive experience, from an annual service to MOT maintenance of a vehicle, repair is key in keeping vehicles on the road, and this is still the case with the transition to EV. Maintaining the state of health (SoH) of an EV battery in as high a condition as possible is the main driver of both longevity and value for an individual EV. This offers greater value to the customer, increased approval for the OEM, and finally increases the pool of good condition second-hand EVs.

EV batteries are wired in series, like old fashioned Christmas lights, therefore when one cell or module is failing this brings down the performance of the whole pack. This means that even if an EV is showing a large drop off in range there are solutions to bring the performance back up to a higher level. By replacing underperforming cells and modules in a pack, its usable life can be greatly increased. Repairing battery packs not only extends the range of EVs for their first owner, but it also makes the EV market more accessible to second-hand customers as it provides reassurance of battery pack quality. Replacing the battery system with a new pack should be an absolute last resort as it entirely eliminates the environmental benefits of owning an EV over an ICE vehicle.

Second Life

Another important step is the repurposing of EV battery modules and cells for second life. EV batteries contain high quality minerals in their construction due to their high-power requirements and the need for immediate power and repeat cycling. Therefore, EV batteries degrade at a faster rate than in other applications. This high-quality mineral content means that EV batteries, once they fall below automotive levels, are highly prized in second life applications.

The obvious question is, what are second life applications? Second life in this context is the repurposing of EV battery cells and modules into new applications, two common examples are power walls and static energy storage. Power walls are energy storage devices commonly used in conjunction with solar panels to provide power to a house and reduce its grid energy usage. Static storage is similar but larger, they are used to provide power to areas without good infrastructure or for balancing the grid.

Both second life applications do not need high power or rapid cycling, therefore when an EV battery module or cell reaches the end of its automotive life (at around 70% of its capacity), it is still well suited to that purpose. The low power usage requirements mean that repurposed cells and modules can be in usage for many years past the stage that they might usually be recycled.

How Autocraft are addressing this

Autocraft EV Solutions, part of the Autocraft Solutions Group, already have a variety of solutions available to the market, from triaging packs to identify EV battery faults at the roadside, making safe

damaged (or red) packs in the event of an accident for onward transportation, and mobile and fixed location repair of EV battery packs to return them back to their expected level of performance. Autocraft believe that responsiveness is the key to leveraging the environmental benefits of electric vehicles and helping promote the uptake whilst providing a sound economic basis for OEM and customers alike.

Autocraft's REVIVE™ TRIAGE, MOBILE and local WORKSHOP solutions are easy to scale up as demand increases, and the company services the units all from its UK based Technical Centre. All Autocraft's EV offerings are CE and UKCA marked to give peace of mind to its customers.

AUTOCRAFT REVIVE™ TRIAGE Facility



New to the market in Q4-2022, Autocraft's REVIVE™ TRIAGE trailer facility brings non-invasive (lid-on) triage, testing and repair to the vehicle or battery pack. Many battery faults do not relate to the modules themselves and REVIVE™ TRIAGE quickly identifies the DTC and Autocraft Technicians repair electrical or component faults on-site to get the vehicle back on the road. For those packs with significant faults at module level, REVIVE™ TRIAGE prepares the pack for transport to an Autocraft REVIVE™ MOBILE or WORKSHOP Centre. Red (damaged) packs are also made safe for transport, saving time, cost and to ensure the safety of those handling the battery pack.



AUTOCRAFT REVIVE™ MOBILE Facility



Autocraft's flagship mobile repair and remanufacturing centres bring the EV battery repair technology to the battery pack, saving time and transportation costs. The REVIVE™ MOBILE EV Battery service solution has numerous built-in safety systems deployed within its semi-automated, no-fault-forward process. Its virtual reality technology projects instructions onto the precise areas of the pack to be worked on. Each process undertaken is recorded in the cloud for full traceability. Comprehensive safety systems track the tools through RFID ensuring that every tool is used in the correct sequence and returned to its secure storage location. Camera based systems monitor whether the Technician is wearing the correct PPE, and LIDAR ensures the Technician stays with the safe areas, shutting down all the electrical systems until this is the case.



AUTOCRAFT REVIVE™ WORKSHOP Facility



Autocraft’s new REVIVE™ WORKSHOP EV Battery Service Centre in Grantham, Lincolnshire repairs up to 2,000 battery packs a year for several OE manufacturers. Autocraft also installs and staffs REVIVE™ WORKSHOP Centres at its customers’ facilities or strategic locations, for permanent on-site EV battery triage, diagnostics, repair and remanufacture.



[1] Kelly, J.C., Dai, Q. and Wang, M. (2020) *Globally regional life cycle analysis of automotive lithium-ion nickel manganese cobalt batteries* Mitigation and Adaptation Strategies for Global Change 25, 371–396. Accessed on 13th June 2022. Available from { <https://doi.org/10.1007/s11027-019-09869-2> }

[2] Hausfather, Z. (2020) *Factcheck: How electric vehicles help to tackle climate change. Update 7/2/2020: The lifecycle emissions figures were revised to reflect more recent data on electricity carbon intensity and battery manufacture.* London: Carbon Brief. Accessed on 9th June 2022. Available from { <https://www.carbonbrief.org/factcheck-how-electric-vehicles-help-to-tackle-climate-change/> }

[3] Gersony, L. (2022) *HotSpots H2O: In Chile’s Lithium Mines, Climate and Environment Are Duelling Priorities* Michigan: Circle of Blue. Available from { <https://www.circleofblue.org/2022/hotspots/hotspots-h2o-in-chiles-lithium-mines-climate-and-environment-are-duelling-priorities/> }

[4] Sanderson, H. (2019) *Congo, child labour and your electric car* London: Financial Times. Accessed on 12th June 2022. Available from { <https://www.ft.com/content/c6909812-9ce4-11e9-9c06-a4640c9feebb> }

[5] [EUR-Lex - 52020PC0798 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/eli/dir/2020/798/oj)

Notes to Editors

Autocraft Solutions Group is Europe's largest independent engine remanufacturer and assembler, supplying over 20,000 engines per year to prestige OEMs such as Ford, Jaguar Land Rover, Volvo, Aston Martin, JCB and many more. It is a £70M pa turnover company with over 400 employees across 3 sites in the East and West Midlands in the heart of England.

Autocraft Drivetrain Solutions is situated at the Grantham Headquarters and provides engine remanufacturing and medium volume engine assembly, offering a fully outsourced ICE solution for OE manufacturers wanting to move away from in-house engine production to concentrate on EV. Also based at the Grantham site is Autocraft EV Solutions which specialises in the repair, remanufacture and assembly of EV batteries, Electric Drive Units and Power Electronics through its unique and patented REVIVE™ technologies.

Autocraft Machining Solutions in Wellingborough, Northamptonshire is home to the group's medium to high volume machining capability. AMS specialises in cylinder head & block machining, and complex component machining such as bed plates, ladder frames, gear, EV motor & transmission casings, and structural BIW components. This site also boasts an impressive state-of-the-art assembly and test facility producing high-performance engines for a prestigious UK car manufacturer.

Vertex Engineering Solutions in Birmingham specialises in fixture design & manufacture, prototype machining from solid & castings, low volume & complex machined components, 5-axis machining of large & wide components, 3-axis CNC turning, and manufacture of moulds & dies.

For hi-res images, interviews or more information on any of the content above please contact Lindsay Morgan, Group Marketing Manager at lmorgan@autocraftsg.com or on +44 (0)1455 293026.