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# Seismic shift

The shift in people's attitude over the past year towards reducing their carbon footprint through the use of renewable energy and battery power has been astonishing. TV programmes such as Sir David Attenborough's *The Blue Planet* has forcefully identified the problems the world faces and together with Swedish environmental activist Greta Thunberg and the global movement of Extinction Rebellion, not to mention the wildfires in Australia, have all helped strengthen the environmental argument resulting in increased Government action around the world.

Driving this change is the reduction of emissions from petrol and diesel vehicles, with auto manufacturers at the forefront of battery and hydrogen technology in an effort to offer a realistic alternative. Government legislation is also forcing development in this area. The UK for example, has just brought its ban on the sales of petrol, diesel and hybrid cars forward from 2040 to 2035, in order to stand any chance of achieving its target of zero carbon by 2050.

The policy was announced as part of a launch event for a United Nations climate summit - COP26 - to be held in Glasgow, Scotland in November with UK Prime Minister Boris Johnson saying 2020 would be "a defining year of climate action for the planet". Most people now agree that the longer the delay, the worse it will be.

Research carried out by three

specialised, independent research companies - Climate Neutral Group, CE Delft and SGS Search - concluded that the more efficient use of current construction equipment can also play a significant role in reducing the total carbon footprint. The European Rental Association estimates that even if end users were to use current equipment more efficiently it could lead to reductions of between 30 and 50 percent, simply by using the right equipment for the job, minimising transportation, improving utilisation and maintaining the equipment properly.

However to emit zero carbon emissions the only solution is to switch from internal combustion engines to electric or hydrogen power. Across the sectors we cover the biggest move towards battery and hybrid power has been self-propelled aerial lifts. They have the advantage in that slab electric

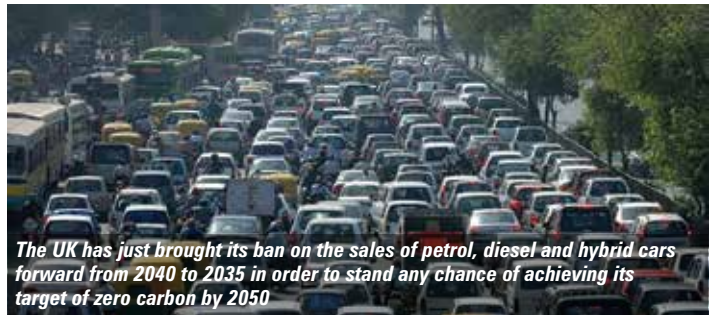


*Niftylift has led the way with hybrid booms.*



C&A

batteries



*The UK has just brought its ban on the sales of petrol, diesel and hybrid cars forward from 2040 to 2035 in order to stand any chance of achieving its target of zero carbon by 2050*



*A lithium ion battery pack for a BMW i3 car*

scissor lifts have always been battery powered, with most using the traditional lead acid battery pack made up of four, six volt batteries. But to work efficiently they need to be kept well charged and regularly maintained. The use of lithium ion batteries has also grown significantly over the past year or two, initially with spider lifts, but is rapidly becoming more widespread. They offer superior performance and charging capabilities as well as being smaller and lighter for the same power output. The downsides are they are expensive, difficult to recycle and can be unstable, leading to overheating.

## Battery growth

Lithium ion batteries have become the dominant battery technology in the consumer market, from portable electronics to automotive and energy storage systems, ousting other battery technologies such as lead acid, nickel metal hydride and nickel cadmium. However the supply of the raw and refined materials needed for their manufacture is becoming as strategic as oil supplies.

According to figures from Roskill Information Services between 2015 and 2018 shipments of lithium ion

batteries have increased by 24 percent a year dwarfing demand for nickel metal hydride or nickel cadmium batteries. There has been significant investment to meet demand, with major battery producers planning to invest a further \$50 billion in expanding manufacturing capacity over the next five years in China, the USA and Europe.

Whilst portable electronics formed the first wave of demand and remain an important market for lithium ion batteries, the main growth is driven by hybrid and electric vehicles - mainly cars - but growth is also coming from commercial and off road vehicles which includes telehandlers and aerial work platforms and even cranes. Automotive applications accounted for more than 70 percent of all lithium ion battery shipments in 2018 compared to just 43 percent in 2015 and six percent in 2010. Over the next 15 years it is expected to grow at an annual rate of more than 30 percent.

## Alternatives?

While some aerial work platform manufacturers have used lithium ion batteries for more than 10 years - Hinowa spider lifts for example

*Hinowa has been using lithium batteries in its spider lifts for more than 10 years*



- many are only now 'jumping on the lithium bandwagon' thanks to a reduction in price, availability of off the shelf products that can easily replace the six volt lead acid unit and customer demand of course. While the cost remains high compared to lead acid batteries, it could be argued that fewer are needed. JCB for example use two, 12 volt lithium ion batteries instead of four, six volt lead acid units on its scissor lifts. Other benefits include being maintenance free, having a longer operational life and being cleaner, yielding significant savings in manpower. Also customers no longer need to concern themselves with battery maintenance or being careful about where they recharge them.

Given the costs of lithium ion another maintenance free alternative that is becoming more popular is the AGM or Absorbed Glass Mat battery originally used as a less expensive alternative to Gel

batteries for applications in food preparation areas and clean rooms etc. Its main negative was that for a given size the AGM battery only achieved 90 percent of the run time as the equivalent lead acid battery. Back when scissor lift battery life was a pressing issue, this was significant - however in subsequent years everything has changed. AGM batteries now offer more storage capacity than lead acid, they have the maintenance free benefits of lithium ion and offer a real alternative to both. When combined with machines featuring direct electric drive, they offer enough life to manage two shifts of intense use without the concerns of lithium overheating or their recycling challenges.

### A battery revolution

Self-propelled work platforms generally require short bursts of high power to move or elevate and then remain still while work is carried out, so selecting the best batteries for the job is essential. Older batteries which use flooded technology have been around for years but are only as good as the charging regime.

A process of 'opportunity charging' allows batteries to be topped up during the work cycle, allowing almost perpetual use where power outlets are plentiful. However, during opportunity charging, some batteries (including flooded) can suffer and fail from Partial State of Charge, Sulphation and Acid Stratification. The high rates of charge needed to increase the battery's temperature can also dry out the plates.

This is where new technologies such as Hong Kong-based Leoch Battery's Superior Lead Carbon AGM Gel (SLCA) battery - a combination of Lead Carbon, AGM

*Leoch Battery's Superior Lead Carbon AGM Gel (SLCA) battery.*



### Lead Crystal batteries

Another emerging alternative are Lead Crystal batteries which are said to deliver a similar performance to lithium ion, partly due to the fact that they can be discharged to almost zero without

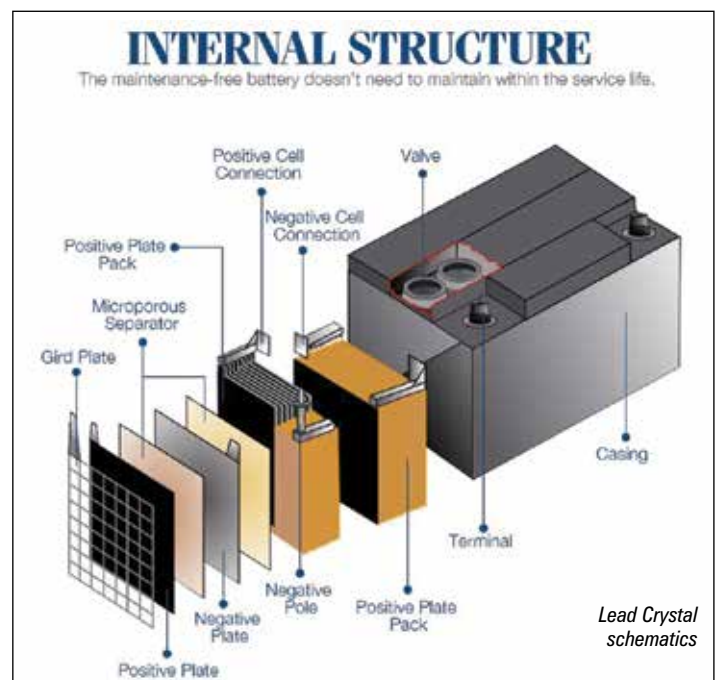
stressing the battery. Claims suggest they can recharge in half the time of lead acid. They also do not 'leak' charge when stored, do not suffer from 'memory' and are said to last up to 18 years - all at a lower price. They are also 99 percent recyclable through traditional channels and classified as non-hazardous goods for transport. The technology uses pure lead, high purity calcium selenium plates and a safe silicon dioxide electrolyte solution that solidifies into a white crystalline powder when charged/discharged. It also contains less acid, no cadmium and no antimony.

### Batteries for larger equipment

Converting aerial work platforms which are not constantly moving, to hybrid or electric power is relatively easy compared to larger machines, such as cranes or telehandlers that are both heavy, travel greater distances and are often used for cycle work. That said manufacturers such as Spierings - with its City Boy mobile tower crane - and Manitou, Faresin, JCB and Merlo with their telehandlers have all developed battery powered machines.



*Hiab's lithium powered ePTO crane for working indoors or unsociable hours*



*Lead Crystal schematics*

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*It is much harder converting larger machines such as this hybrid Spierings City Boy to electric power*



*The 45ft Genie Z-45 FE hybrid*



*The new Manitou 200ATJ battery powered boom*

The benefit of battery packs with a greater power to weight ratio than lead acid is that larger battery powered boom lifts are becoming practical alternatives to diesel. Battery powered booms up to 86ft are now finding favour, with JLG offering an all-electric version of its 800 series of telescopic boom, although it currently uses a very large traditional battery pack. The same applies to the electric powered JLG boom lift conversions developed by Riwal, which now range from the 66ft JLG 660SJ to the 135ft 1350SJP. Most of Niftylift's 86ft HR28 articulated boom lifts have been sold as hybrids, with a complete battery pack alongside a small diesel. When it comes to 60/66ft boom lifts the choice is wider still, with Genie's all electric Z-60/37DC and hybrid FE version launched in 2017.

Both units use four electric wheel drive motors which can outperform the regular 4x4 diesel powered Z-60s in the rough. Genie has since unveiled the 45ft Z-45 FE - a smaller version of the 60ft Z-60 FE - with the same concept and similar operating systems. It uses four AC wheel motors and oscillating axle, with an additional Stage V/Tier 5 diesel powered generator to top up/recharge the battery pack or boost performance. The Z45 FE has two modes of operation full electric - which can handle a full shift on a single charge - or Hybrid which combines the two and can run for a week on a single tank of diesel. Haulotte unveiled its new HA20 LE Pro Pulseo in 2018 and went further, stating that it will cease manufacturing internal combustion units over the next few years as part of its Blue Orientation strategy -

essentially Haulotte's environmental policy with plans for the entire company to become carbon neutral and as environmentally friendly as possible within the time frame. As well as its work on electric telehandlers Manitou launched a 60ft all electric Rough Terrain articulated boom - the 200ATJ - last year as part of the company's new 'Oxygen' range of environmentally friendly machines. The all new drivetrain uses two heavy duty telehandler type axles, powered by one large inboard mounted AC drive motor.

#### Battery theft

We have been running a long-term online poll regarding the theft of batteries from electric powered work platforms and can now confirm that with more than 1,100 individuals responding, 69 percent admitted to having had batteries

stolen in the past year, while 31 percent said they had suffered frequent thefts. One thing that came from comments received was the need for manufacturers to work more closely with rental companies to make the batteries more difficult to steal. Skyjack immediately responded highlighting a lockable bracket kit that can be retrofitted to the battery trays on its slab electric scissor lift range. This is a subject we plan to follow up on during the year.



*Skyjack's lockable bracket kit*

## Gel batteries for Antarctica platform

Antarctica is the highest, driest and windiest continent on Earth creating extraordinary challenges for construction projects. Reliable equipment is of utmost importance, while the climate is not the best for battery performance.

Dutch company HDW supplied a custom modified Genie Z-45XC to BAM Construction and swapped the starter battery to a gel one, as they are more resistant to cold temperatures and have a longer lifespan. In spite of the limited space, it squeezed in a larger capacity battery with a peak capacity of 1100Cca. The battery is also connected to a trickle charger, ensuring maximum battery power at all times.

The project is part of a seven to 10 year partnership to modernise the UK's Antarctic infrastructure, with construction work taking place during the Antarctic summer, where ambient temperatures are down to minus 15°C. The first phase of the project on the Rothera Research Station will take five years, during which time the Z-45XC will have clocked up 2,000 hours.



*The Genie Z-45XC has a larger capacity gel battery and connected to a trickle charger*



*Ambient temperatures are down to minus 15°C during the Antarctic summer*

## Riwal electric JLGs for Sørby

Norwegian rental company Sørby Utleie has taken delivery of two all electric battery powered 66ft JLG 660SJ boom lifts, sold and converted from diesel power by Riwal Scandinavia.

They are the first units of this new model sold by Riwal to an outside rental company. The machines incorporate a 230 volt integrated battery charger and feature non-marking tyres. Owner Lars Sørby said: "With the focus on sustainability, we believe the JLG 660SJ electric will be a fantastic addition to our fleet together with our recently delivered 135ft JLG 1350SJP electric also from Riwal.



*Sørby Utleie's new JLG 660SJs*