Lithium Batteries for the Mass Car Market?

According to Bob Gell, a leading consultant and considered by many as an authority in this area, Lithium car batteries will only be seen in racing and high performance European marques for quite some time to come.

At this time there is considerable developmental work being done to formulate a cost effective Lithium-ion base chemistry battery system for the mass car market.

Many different chemistries are being tried, with the best currently being Lithium Iron Phosphate - LiFeP04, as this chemistry is the most stable in regard to cell management and has great tolerance for charge and discharge cycles without degradation. Lithium Sulphur is also being tried.

A Lithium-ion battery combination is currently OE in hi line Porsche vehicles.

"The inherent high cost of rare earth metals continues to hold up the prices of Lithium chemistry starter batteries and I do not see Lithium replacing the "standard" Lead Acid (with Calcium) chemistry in the next 5-8 years for mass vehicle manufacture."

Although Lead is very heavy by comparison and not as efficient from a Wh/Kg aspect as the exotic battery chemistries, it is still one of the most readily available raw materials and the "above ground" mine (displaced and recycled spent batteries) is very large throughout the world.

"I do foresee the introduction of Super Capacitors as a "Start-Assist" function being introduced in the next few years as these SuperCaps will allow a smaller, less expensive and cycling chemistry battery to be used in automotive applications."

Developmental work I have already done in using a SuperCap has demonstrated we can deliver up to 8 engine starts at around 300+ amps initial draw from just one SuperCap charge. Re-charging the SuperCapacitor takes just 15 seconds or less.

SuperCaps have an extremely long life - around 500,000 charge cycles, are lightweight and in later designs very safe to manage, charge and handle. When installed in conjunction with a LiFeP04 low Ah battery, the end result would be very high performance for greater times than regular Lead Acid battery designs.

The current cost of the Porsche Li battery is around $1700USD!. This cost will reduce as OE car makers start to embrace the real long term benefits of Lithium-ion replacements for the standard Lead Acid chemistry.

Lithium battery chemistry has been in use for the Mining and Industrial applications as well as commercial bus fleets in Europe and North America for some time. Most systems are 48-56 volts DC. Battery Management Systems - BMS - keep the Lithium

battery well under control in regard to charge regimes, overheating and also stop any tendency to discharge heavily.

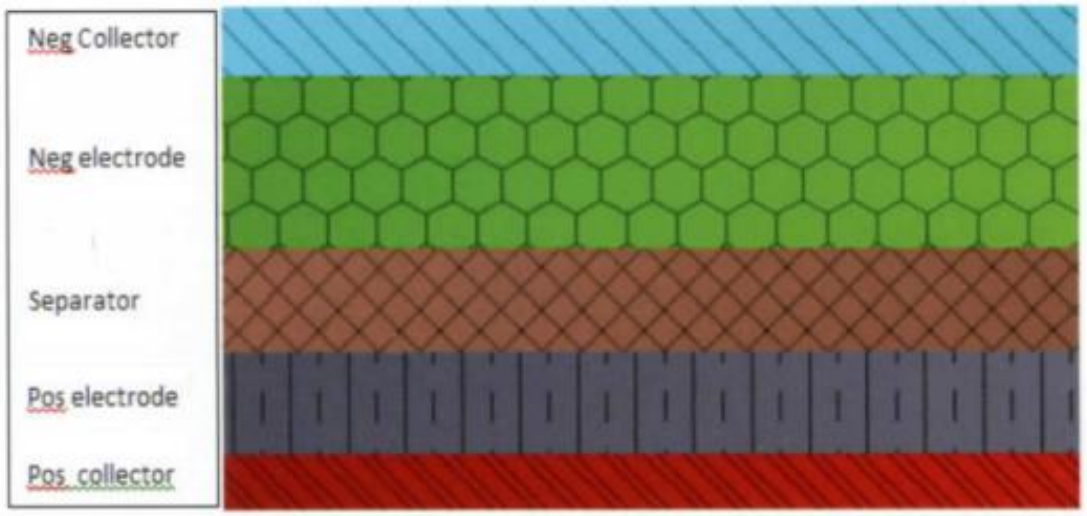
Most high end car manufacturers are continuing to review the growth and development of LiFeP04 and other Lithium chemistries as the great advantage of far lower weight and far higher output capacity of the Lithium battery over the traditional Lead Acid are significant and have obvious Carbon footprint gains.

LiFeP04 4 cell OE battery

Porsche AG, Stuttgart, is the first car maker in the world to offer a starter battery with lithium-ion technology. Weighing less than 6 kg, the new battery is more than 10 kg lighter than a conventional 60 Ah lead battery.

The lithium-ion battery has the same length and width dimensions of the regular battery, but is approximately 70 mm lower. The fastening points, electrical connections and voltage range are fully compatible, allowing simple and quick replacement of the standard lead battery, for example when racing on the track.

The new Porsche battery shows further benefits in the charge process as it is able to charge quicker due to less internal resistance. Other advantages: the lithium-ion battery allows for a significantly greater number of charging and discharging cycles, the self-discharging effect is lower and the service life of the battery is longer.



Construction and chemical composition of LiFeP04 cells (see diagram)

Each cell is divided into five layers: positive electrode current collector, positive electrode, separator, negative electrode, and negative current collector.

Robert (Bob) Gell AFAMI, MIAME, AM SAE-A

Bob has been active in the Automotive Industry for many years. He completed an extended Motor Technicians Apprenticeship, and then joined Chrysler Australia

Research & Development as a Grade 3 Engineer. He later joined BorgWarner Australia in the capacity of Sales Engineer and then National Marketing Manager, based in Sydney.

In more recent times Bob has been involved in the area of Electrochemical Engineering, specifically related to automotive batteries and the rapidly emerging Electric Vehicle battery charging technology. He has successfully Project Engineered in the very first DC Fast Charger for Electric Vehicles in Australia, and has been serving on many State and National EV advisory committees to help establish Electric Vehicles in Australia.

Bob is an Associate Fellow of the Australian Marketing Institute, a Member of the Institute of Automotive Engineers and a Member of the Society of Automotive Engineers - Australasia

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