CHARGING TO VICTORY

Potentially dangerous and traditionally very heavy, batteries have been ripe for improvement. Fortunately, as **Alan Stoddart** finds out, some companies are continually refining their offerings

THERE are areas in motorsport engineering which are the perpetual focus of companies and suppliers, areas to which new innovations are constantly sought and improvements eked out. Two of these, lightweighting and safety, are particularly pertinent to the batteries used on race cars, since they are both relatively heavy and potentially volatile thanks to the chemicals they depend on. However, several companies are working hard to ensure that the batteries they produce meet the demands of teams and race car builders.

This is the case at DMS Technologies, owner of the Varley Red Top brand. Varley Red Top batteries have been used across many levels of motorsport thanks to them being compact, relatively lightweight and built using an absorbed glass matt (AGM) construction. This allows them to be fitted anywhere to suit a racing car's packaging requirements, whether that necessitates them being behind seats or in sidepods and installed either upright or on their side.

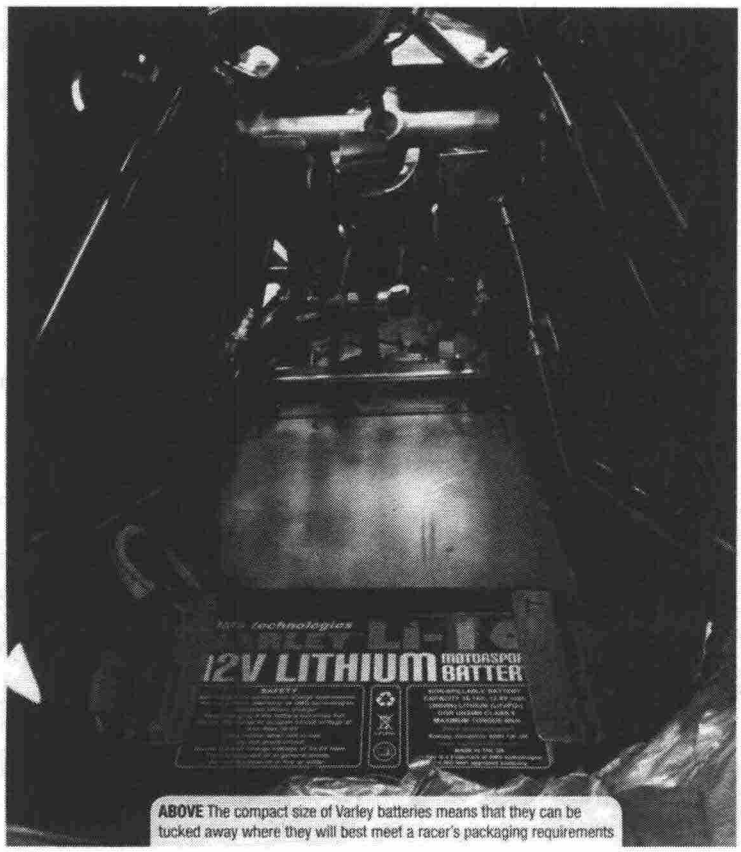
However, with the increased prevalence of lithium ion cells in mobile phones and laptops, and the higher power densities available from those cells, it wasn't long before motorsport engineers turned those technologies to their advantage. Up until the lithium battery was widely available, a race team could spend thousands and thousands of pounds just to save a kilogram. Now the same savings can be had for just a couple of hundred.

The team at DMS spent a lot of time researching the different cell type possibilities, whilst also keeping a watchful eye on changes in legislation concerning the use and transportation of the potentially volatile battery chemistry. In the end, the company decided to aim for the smaller capacity end of the market and subsequently created and tested three different variants.

The smallest of the range, the 12V 2.4Ah Li-3, was successfully tested on 600 cc motorcycles, with one of the British Army riders winning his class in the national motorcycle combination (sidecar) championship.

A 5.5Ah 12V battery meanwhile was tested in FF1600 by Cliff Dempsey Racing and soon proved popular in that series, in which entrants run a total loss system instead of using an alternator. It is also the battery of choice for a leading supplier into British Hillclimb, and even performed well in the Race of Remembrance endurance race at Anglesey in the cold, wet and dark!

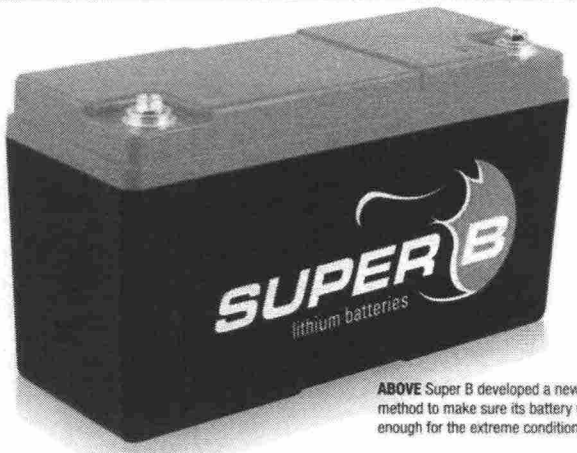
The largest of the batteries in the range, a 12V 16.1Ah variant, has been proven in both modern and historic touring cars, as well as in historic Formula 1. The battery has the same cranking capability as a Varley Red Top 30, but weighs only 3.2 kg instead of 10.1 kg, and is the size of a Varley Red Top 15 – a massive gain in terms of both weight and ability to be optimally placed.



ABOVE The compact size of Varley batteries means that they can be tucked away where they will best meet a racer's packaging requirements

THE FULL PACKAGE

Similarly, Dutch motorsport battery specialist Super B has also been honing its lithium batteries for 10 years, after it was inspired ▶



ABOVE Super B developed a new production method to make sure its battery was safe enough for the extreme conditions in motorsport

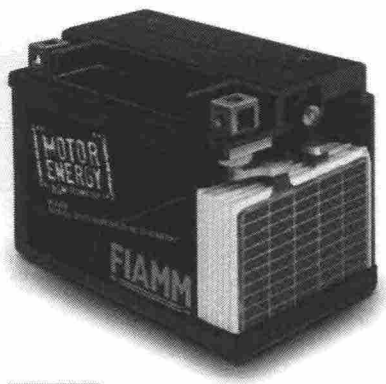
by the challenge of creating a new type of battery that could outperform the traditional options in all areas. That led to the creation of its first lithium battery in 2007, which met its brief of being lightweight, high-performance, safe and reliable, and suitable for use in extreme environments.

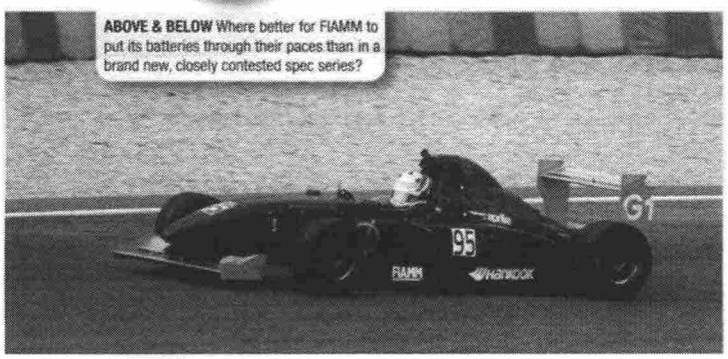
One of the things that carried through from then to now is Super B's use of lithium iron phosphate technology (LiFePO4) – the safest chemistry available today. Super B says that this technology has two important advantages over the lithium ion alternatives: thermal and chemical stability, both of which improve battery safety.

Safety and reliability are obviously qualities a motorsport battery must possess, with the thermal stability of these cells perhaps the most important of several parameters that determine their overall safety. However, as energy levels increase, designing safe battery packs and cells becomes more difficult. To meet this challenge, Super B used a new and innovative production method, at its own production facilities in the Netherlands.

One of the goals for the Super B battery was to ensure that it had high passive safety, which means that even without electronics the battery should be safe. To this end, the company takes great care in its choice of materials, and in the construction of the batteries. Every batch produced by Super B is copiously checked and thoroughly inspected, and then optimised to provide maximum safety and performance. The casings are especially designed for the type of extreme environments and abuse they will be subjected to in motorsport, and are so strong that even in the extremely unlikely event of a cell failure there will be no visible damage, only a top cover lifted by 2 mm to relieve the internal pressure.

All these considerations have resulted in a motorsport battery that offers consistently high performance, while being safe and long lasting. The batteries offer high energy density, and crucially for racing, are very lightweight, weighing 80 per cent less than conventional batteries, while taking up less space and charging quickly.





ABOVE & BELOW Where better for FIAMM to put its batteries through their paces than in a brand new, closely contested spec series?

PROPER TESTING

One of the ways another battery manufacturer, FIAMM Energy Technology, is putting its motorsport batteries to the test is through a tie-up as technical partner to the brand new G1 Series. The championship is a single-make series for Griiip single-seaters powered by 201 bhp, Aprilia V4 motorbike engines. The cars weigh in at less than 400 kg including fuel and have high downforce bodies, meaning that the G1 is a pretty serious racer.

For this demanding application, FIAMM used its FT12A-BS battery, from its MotorEnergy range, which features AGM technology to guarantee maximum power at start up, no maintenance and high resistance to vibration – crucial in a taut single-seater. The AGM gas-recombination technology employed by the battery stops the dissociation of water into hydrogen and oxygen, and their subsequent release through the caps as happens in traditional batteries. This means that when the battery is recharged, the level of electrolyte gradually decreases.

In FIAMM's batteries, this is prevented with the use of a very fine separator, the absorbent glass matt, which is steeped in a controlled amount of electrolyte. This means that during charging, the oxygen released from the positive plate due to the dissociation of water can migrate to the negative plate where it is fixed, and can recombine with hydrogen to form water again. As such, in principle at least, a closed electrochemical cycle is created which avoids gas emissions and the consumption of water.

FIAMM says it is a simple system in theory, but in practice it requires high constructive accuracy and the very careful selection of components to ensure that it can reliably work without issue – exactly what is needed when beating another G1 to an apex on the last lap of a tightly fought race.