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Electric vehicles

***Huw Hampson-Jones**, Chief Executive Officer of OXIS Energy, sets the scene for the next generation of electric engines.*

Electricity versus oil, the early years

Believe it or not, at the beginning of the 20th century a great debate took place between the advocates of electric power and those who favoured the internal combustion engine (ICE) powered by petrol. History tells us which technology was adapted to widespread acclaim and the making of millions of dollars for the oil-producing countries of the world. One hundred years later, the debate is again being aired, and this time with a difference: with the knowledge of the finite nature of petroleum resources, and the desire to move towards cleaner energy to limit pollution in our metropolitan cities on a worldwide basis.

In October 2009, over 2,000 cars a week were entering Beijing city roads. Both India and China, in comparison with Europe and the United States, still have a considerable amount of growth left in the market for new vehicles. In April 2010, the price of petrol in the UK reached £1.20 a litre, and the same trends can be seen in Europe and the United States. What are the implications for the future of electric-powered vehicles?

Enter new compounds

In the early 1970s a relatively unknown commodity was being studied, in the 1980s a prototype was developed, and in 1991 Sony launched its first commercial product based on this new commodity. The commodity was lithium, and throughout the 1980s and early 1990s lithium was combined with other chemicals to create what is now

known as lithium-ion rechargeable batteries. Throughout the world millions upon millions of batteries have been produced using lithium-ion. The use of this battery in personal computers is extensive, and in the last few years it has been looked at for use in the automotive industry, but there is a significant problem with its use – that of safety. Additionally, there is the extensive use of cobalt in these batteries. Cobalt, which is expensive as well as being carcinogenic, presents problems for pollution as well as safety.

Simply put, the current lithium-ion rechargeable battery technology has run its course and, in the long term, is not suitable for use in the automotive industry. Its energy capacity is limited, which is a severe restriction when powering vehicles for several hundred miles or more. A typical lithium-ion battery for cars is limited to about 100 miles. In addition, because it is made up of a specific combination of compounds, it is volatile. Its volatility gives rise to considerable risk of explosion. The use of so many compounds leads to low energy capacity at considerable expense and toxicity. Thus, there is considerable consumer anxiety regarding lithium-ion-powered vehicles.

Battery technology for electric vehicles: its changes, potential and economics

Over the last 10 years, with the rising demand for vehicles in the newer economies of the world, in particular India and China, countries that are dependent on imports of oil to fuel their vehicles, there has been a growing trend globally to evaluate new sources of renewable energy to power vehicles.

Cars have already been powered by hybrid engines, a mixture of petrol and electricity. However, there is a move away from petrol to full electric engines powered by rechargeable batteries. For example, Mercedes-Benz have a car known as the Smart ForTwo Electric Drive. The car is capable of being powered by an electric engine for up to 84 miles. Few people realize that electric vehicles are quite nippy; this is because electric motors can deliver their torque (pulling power) instantaneously. However, the key advantage of this kind of car is that it can be recharged using overnight electric tariff for under £2. Try filling your current petrol tank for that amount!

The potential for electric vehicles is widespread. Take China, for example: currently there are over 100 million electric bikes (e-bikes) in use, with over 20 million new bikes sold each year. Each e-bike battery, on average, has 9 kilograms of lead and lasts for only one year. Every year approximately 600,000 tons of lead are used to power e-bikes.

If a new battery can be created that is capable of generating long-distance travel for cars, is lighter in weight and is cleaner in its use, the applications for the use of such a technology are likely to be widespread in the automotive, two-wheeled vehicle and defence sectors. If this battery technology can be provided at a much reduced cost compared with petroleum or the current chemical compounds used in existing lithium-ion, then we believe there is a case for widespread use of this battery technology for the electric vehicle market globally.

Next generation of rechargeable batteries – powering the future

Since 2005 OXIS Energy, based in the UK, has been spearheading the development and creation of a new lithium rechargeable battery. OXIS believes that vehicles powered by the use of its battery will be able to travel in excess of 300 miles, thus allowing electric vehicles to go further than current lithium-ion technology. Now this provides a very different proposition to the man or woman on the Clapham bus!

Not only has OXIS developed this technology, but it is also moving towards mass production to ensure that two-wheeled and four-wheeled electric vehicles will be able to take advantage of this technology throughout 2010–13. This is when OXIS expects mass production of electric vehicles to take effect in the world market.

The technology has been developed in the UK by a group of international scientists and is in the process of being rolled out. Empirical evidence proves its energy density is at least four times greater than that of the old lithium-ion battery technology. In addition, since the OXIS battery uses only ordinary chemical compounds, it has been proven to be inherently safe – so safe it satisfies the automotive sector's strict requirements for safety on the roads. It is also biodegradable, and therefore much safer for the environment, unlike lead acid, cobalt and old lithium-ion batteries.

OXIS has embarked on discussions with the world's leading automotive manufacturers for the uses of OXIS technology in the modern pollution-free electric vehicles. OXIS is also working with two-wheeled electric vehicles (disabled scooters, golf buggies, scooters and motorbikes) manufacturers to raise the awareness of the OXIS battery. This increased energy power, coupled with its lightness of weight, is an important development in the next generation of electric vehicles. An electric vehicle may come off the production line weighing 2.5 tons but, at present, in order to power it, it will currently need another 1 ton of battery.

In summary, OXIS has developed the next generation of lithium battery technology, which is extremely safe for consumers to use. It is non-toxic, does not cause pollution and is recyclable. Moreover, it has the necessary energy to power electric vehicles for long-distance travel. It does all this at a fraction of the weight needed for current battery technology.

OXIS will establish its own production resources in the UK, and it is export led. Over 20 million electric bikes are sold in China alone. In Taiwan, where there is a population of 23 million, there are 11 million scooters and only 12,000 are electric. The global market for electric vehicles is large and rapidly growing, and current forecast estimates for the battery market globally is *circa* $60 billion by 2020.

In undertaking these tasks, OXIS is already employing highly trained graduates with skills in chemistry, physics and mechanical and electrical engineering. The future is bright; the future is electric.

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