

Day 4 at Hannover Messe 2007

We spent the fourth day of the Hannover Fair 2007 mainly visiting our fellow exhibitors. There are a good range of fuel cell types and systems on display. One difference from the FC Expo in Tokyo in February is the relative dearth of fuel cell testing equipment on display. Another, as has been noted on our coverage of Day 1, is the lack of fuel cell vehicles from the major car manufacturers. We have been sounding out opinion on why this is, and the general feeling is that the manufacturers no longer feel the need to exhibit at fuel cell shows as they already have their suppliers and partners lined up. Instead, they will concentrate their efforts on exhibiting at mainstream car events. If this is the case, it could be interpreted as a positive signal that they are now embarking upon early market preparation in anticipation of real sales. This is, however, debatable, and many have remarked that it is a shame that they did not show up.

Our first exhibitor visit of the day was to H2Gen. H2Gen, specialists in onsite hydrogen generation, were spun out of Directed Technology in 2001 and have since concentrated on bringing to market a variety of onsite hydrogen generation modules. The company currently has 57 employees and is looking to expand by 30% in the next year. Industries from steel to food processing benefit from recovering hydrogen generated or wasted as a result of their operations. H2Gen's range of Metallurgical Atmosphere Recycling Systems (MARS) allow the efficient recovery of clean, high purity hydrogen which would otherwise be burned or vented. MARS are turnkey operations that can achieve payback on recycling hydrogen in less than two years.

Since 2001, steam reformer technology has been their main focus, and remains so today in generating hydrogen from natural gas and LPG. Their HGM generators, including the new HGM 2000, demonstrated on the stand today by means of a computer simulation, can generate 53 normal cubic metres of pure hydrogen (at least 99.9%) per hour, weighs 4.5 tonnes and consumes 23 normal cubic metres of natural gas per hour. Frank Lomax, Vice President of Technology, explained that H2Gen's reformers can generate hydrogen from bioethanol and biogas - important technologies if hydrogen and fuel cells are to be truly emissions-free. H2Gen, whose existing customers include Air Products and Tokyo Gas, also plans to produce refinery-scale 'mega PSA' units capable of producing up to 6000 normal cubic metres of hydrogen per hour. Several units sharing the same platform can be installed in series to produce even greater volumes of hydrogen. Clearly, such high-volume production will eventually be needed to meet the demands of fuel cells and associated technology.

Next we visited Baxi Innotech. Innotech is the new product development company of the Baxi Group, the third largest boiler manufacturer in Europe, and has been developing fuel cell CHP systems since 1997. The natural gas-fuelled Beta 1.5 Plus system, on display at the fair, employs a PEM stack to provide 1.5kW of electricity and 3kW of heat with a 3-15kW back-up heating boiler. The 'plus' in the name denotes changes made over the past year to simplify the balance of plant in light of data collected during field trials and to replace components suitable only for small production volumes with components from suppliers with the potential to deliver mass market quantities by 2015.

Baxi Innotech noted that there are approximately twice as many suppliers required for a fuel cell system as for a conventional boiler and that managing the development of these suppliers is a significant challenge. The support of the German government's supply chain development grants has greatly helped small suppliers to make the long term investment required to enter the market. Another long term challenge Innotech are tackling is the training of field engineers and technicians, a key component of which is familiarising them with the necessary changes in the non-fuel cell components so that when the fuel cell system is eventually released there is a manageable amount to learn.

On the interview stage, Marie Jaén Caparrós from the Spanish Hydrogen Association (today representing the European Hydrogen Association) was one of the first interviewees. The EHA is the only group present at the Fair representing at a European level. The organisation is composed of national hydrogen associations from 12 EU member states, and its dual purposes are to represent the interests of groups working in the field of hydrogen at various political levels (essentially lobbying activities), and coordination of national efforts for the furtherance of common goals. The EHA organises European Hydrogen Energy Conferences every two years, with the next being in Maastricht in the Netherlands in June.

The State of Massachusetts has one of the many regional pavilions present at the Fair. Massachusetts claims the highest number of companies working in the fuel cell sector of any State in the US. We spoke first to Gary Simon of Acumentrics, a tubular SOFC developer. He talked us through the company's 2kW unit called AHEAD, targeted at the residential market. The unit has an integrated condensing boiler which effectively allows for the separation of the electrical and thermal output, one of the perpetual challenges facing fuel cells in combined heat and power (CHP) mode. In addition, a battery array allows for electrical storage as well as providing an additional 2 kWe for periods of up to 20 minutes of peak load. This flexibility raises the possibility of peak levelling, a feature which is (or should be) valued by utilities. There are, of course, also benefits for residential users too - in some parts of the US, utilities trying to minimise demand spikes impose "super-peak" hours, where the cost of electricity rises to around 80c/kWh. The Acumentrics systems would neatly sidestep this cost.

Acumentrics have signed partnership agreements with major Italian appliance company Elco, who will be their distributors in Europe. The AHEAD is carefully designed to fit the requirements of mass market users: it hangs on the wall in the same way as a conventional boiler, and has a simple control unit which will be placed in an accessible location in the house. From a cold start it begins to operate after just 15 minutes, which is an impressive achievement in itself. Acumentrics hope to begin installing around 100 demonstration units in Germany and the UK, starting in September.

Also from Massachusetts are fellow SOFC developer CellTech Power. Jeff Bentley, CellTech's CEO, took us through his company's background and market strategy. CellTech is privately owned, and was established in 1998. They specialise in liquid tin technology and (for the time being) are targeting military markets. As such, they can run off standard military fuels, namely JP-8 diesel and kerosene with an extremely high sulphur tolerance. They have accrued over 2 million hours of testing on 6000 cells, and power density has improved from 20 mW/cm³ in 2004 to 120 mW/cm³ in 2007.

One of the things that is most impressive about CellTech as a company is not just their technology, but their highly focused business plan. As a small company, they will focus all of their efforts and resources on cells and stacks, and not get involved with proprietary balance of plant equipment, for which they will look to partner with a high temperature integrator. Also they do not intend to stay in the military market in perpetuity – but instead will attract military funding for the development stage before attempting to branch into mainstream markets in order to achieve volume sales and bring costs down. The choice of fuel is also significant: the thinking is that whilst running fuel cells on natural gas is an easier technological prospect than it is to run them on JP-8 and kerosene, the market place for gas fuelled plant is already crowded not only with other fuel cell developers, but more importantly with conventional gas and electricity companies. Instead, they will look to place their products in more remote environments where gas or grid electricity is scarce but liquid fuels are available. CellTech have a genuinely novel technology, as well as a clear vision not only of their goals but also of their core competencies. On this sound footing they have every chance of making inroads into their chosen market.

Oxford Catalysts is working to commercialise technology which they state, with some trepidation, could revolutionise the clean fuels landscape. They have two catalysis platforms; one of which is "as good as, if not better than, precious metal catalysts at a fraction of the cost (in a range of petrochemical applications)", and a second which can "instantly generate hydrogen or steam, starting at room temperature".

The first platform is based on metal carbides and has applications in the reforming and desulphurising of hydrocarbons, a key application being the Fischer-Trope process which is used to create synthetic liquid fuels. The cost reduction the new catalysts offer could have a dramatic effect on the economics of bulk synthetic fuels and thus on global fuel supply logistics.

The second catalysis platform is the, so called, peroxide reactions which have never been identified before and which can be applied to the production of hydrogen or water from alcohols, such as methanol. The ability to instantly and cheaply generate hydrogen or steam could have a similarly dramatic effect on the choice of energy vector for portable and small stationary fuel cell applications.

Both platforms were developed at Oxford University and will be commercialised with the help of \$30 million raised through listing on AIM. The company currently numbers 20 and this is likely to reach the desired 25-30 by the end of this year.

Representing the Greek hydrogen and fuel cell industry, we spoke to Helbio, a company spun out of the University of Patras in 2001. They make multifuel hydrogen generators, which like other reformers on the market can use natural gas, LPG, propane, methanol, and biogas. However, Athanasio Fatsikostas told us that their unique selling point is the ability to steam reform ethanol without the need for costly PSA units. Their units supply PEM fuel cells in the range of 1-20 kW, though they estimate that they have the possibility of scaling up to around 100-150kW in the future. The company is off to a good start - Helbio has attracted a degree of interest from prospective clients which exceeds their current production capacity.

Finally we spoke to the only exhibitor from China at the Fair-PR, Tianjin Highland Energy Technology Development Co. Jimmy Huang, manager, described his company's metal hydride canisters. Tianjin is the leading manufacturer of metal hydride tanks in China, and they have already a number of supply contracts with companies in the wider world. They mainly use two storage alloys, AB₂ and AB₅, and make (amongst others) the smallest storage canister in the world, the size of an AA battery. The city of Tianjin, which is located around 120km from Beijing, is the centre of China's electric bicycle industry, and this is not surprisingly one of the company's target markets. They are also looking to diversify their activities, and have received this year from the Chinese government funding to develop a portable hydrogen generator. Although Tianjin are the only exhibitor from China at the Fair this year, we can expect to see much greater Chinese involvement at event like this in the years to come.

This is the end of a busy fourth day of the Hannover Fair. More company visits to report tomorrow, together with final observation on what we have seen here, and what the implications are for the state of the fuel cell industry as a whole.