

# analyst view

## Fuel Cells: From Demonstration to Mass Production

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*Dan Carter and Jonny Wing viewing Ajusa's fuel cell electric vehicle and hydrogen filling station. Source Fuel Cell Today*

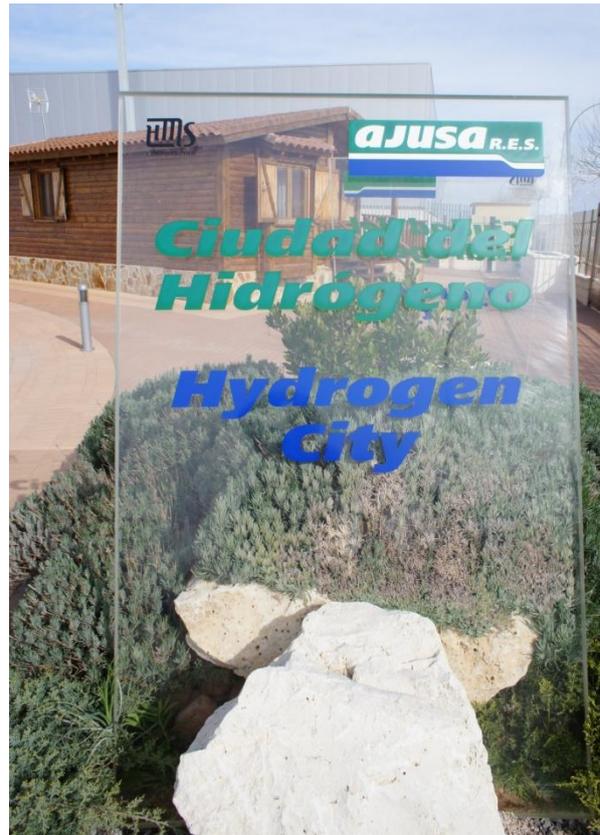
Successful demonstrations of fuel cell products can be seen all over the world, and a small number of key markets, such as for residential CHP in Japan and materials handling in the USA are beginning to produce units on a commercial scale. Establishing a supply chain for mass production of fuel cell components will be vital to the future of the technology; and by mass production I am talking hundreds of thousands to millions of units. Modular processes are believed to be the solution with current manufacturing methods scaled-up and automated to leverage the necessary economies of scale. Practical examples of this are rare, but one company we visited recently is developing both fuel cells and components with a view to mass production and is transferring established techniques from elsewhere in its business to make that a reality.

Ajusa, located in the Spanish city of Albacete, is a manufacturer of gaskets, bolts, camshafts, hydraulic lifters and related components for the automotive industry. There are many similarities between the materials involved and production of these components and those of PEMFC: laser cutting and embossing sheet metal, moulding, sealing components (such as MEA) to bipolar plates, and much more. Ajusa is in an advantageous position in that it already has the know-how and capability for full-scale mass production, using similar techniques to its automotive division, as well as the knowledge of components and materials very similar to those used in PEMFC. The company

prides itself on its reproducibility, high QC standards and flexibility and considering it manufactures over 100,000 different types of automotive gasket these attributes are vital.

Ajusa formed its Hydrogen Technologies division in 2002 and produced its first PEMFC stack two years later. Since then it has developed a range of products from mobility scooters, auxiliary power units and backup power units to retrofitting a battery electric car with its fuel cell. In 2012 the company opened its own 350 bar hydrogen refuelling station, suitable for both fuel cell cars and buses and has plans to introduce 700 bar fuelling in the future.

The hydrogen station is located in what Ajusa calls its Ciudad del Hidrogeno, or Hydrogen City which also contains a house powered by a 10 kW fuel cell where two of the company's employees have lived since 2007. Its recently launched 1 kW backup power system is also running in the City, undergoing continuous testing. Ajusa is working with Iberdrola, a Spanish electricity utility ranked in the top 5 worldwide, to demonstrate its backup power fuel cell system. The modular system ranges from 1 kW to 3 kW in a standard 19" rack, and using 6 bottles of hydrogen the unit can provide remotely operated autonomous power for up to 48 hours, in temperatures ranging from -20 °C up to +40 °C.



Looking to the future, Ajusa began a CHP project in 2012 to develop a natural gas reforming, grid-connected PEMFC with 750 W output; as in Japan, the system will be hot-water led. Conservative calculations rate the planned system at an electrical efficiency of 28%, a thermal efficiency of 47%, and a total efficiency of 75%; Ajusa hopes to reach 80-85% total efficiency before launch. Prototypes are planned from September with a provisional commercial launch by the end of Q1 2013.

Being able to see mass production processes in use by companies such as this provides confirmation that the materials and techniques necessary for fuel cell mass production are not so vastly different from those used to manufacture hundreds of millions of parts for the global automotive industry each year. Manufacturing quality and experience are also important and companies like Ajusa are well placed to exploit their knowledge and experience and apply it to fuel cells.

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