Green Hydrogen through Electrolyzers

Power-to-gas applications, or PtG in short, are widely regarded as an important element in the climate-neutral energy economy of the future. The conversion of electricity by water electrolysis into a gaseous or liquid energy carrier makes it possible to link the energy, steel and chemical industry, mobility and heat sectors. Intermediate storage in form of hydrogen also makes it possible to compensate for the fluctuating availability of renewable energies from wind and sun. Replacing fossil fuels with green hydrogen helps to reduce greenhouse gas emissions from the mobility and materials economy. The expected demand for power-to-gas energy storage therefore promises a growing market for electrolyzer systems. Water electrolysis offers a sustainable solution for hydrogen production and can be coupled with alternative energy sources such as wind and solar. Growing demand for green energy has increased interest in electrolysis and related systems and components.

Sustainable and cost-effective series production of electrolyzer components

The Fraunhofer IPT develops and evaluates different types of electrolyzers such as PEM or alkaline electrolyzers (AEL) in various research and industrial projects and works on the manufacturing processes of the essential electrolyzer components such as bipolar plates (BPP) and catalyst coated membranes (CCM). Other projects in this area include the development of new materials and manufacturing processes for porous transport layers (PTL) and the assembly of the entire electrolyzer stack.

The focus of development is on manufacturing processes that are suitable for high-volume production and scalable sizes. In order to expand the fundamental understanding for further developments, current manufacturing technologies are being systematized and evaluated. The aim is to significantly reduce the high manufacturing costs of stack components and the costs of hydrogen production and system technology, which currently exceed € 1,000 per kilowatt, through economies of scale. By further developing and automating the production steps, it should be possible to meet the growing demand for electrolyzers and make large-scale production of stacks efficient. The influence of different component designs and stack layouts is also investigated.

Virtual planning of production concepts and lines

Depending on the application and development scenario, different production lines can be virtually planned, set up and commissioned together with the Fraunhofer IPT, both for individual components and for the entire stack production. The virtual concept allows the simulation of production times, clocking, costs and efficiency of a production line. The basis for this is the Fraunhofer IPT's comprehensive technological understanding of the individual processes. In addition to pure simulation, real plants and test benches are available for the essential process steps, so that the digital models are always based on a valid database.

Economic evaluation of electrolyzer production

The Fraunhofer IPT is currently developing a model to investigate costs and performance in the production of different electrolyzer designs. The results, values and experience of project partners from industry and research are incorporated into the investigation model in the form of data input. Also the Fraunhofer IPT has the corresponding production capacities to collect real data for individual process steps. The cost model then makes it possible to evaluate the influence of selected manufacturing technologies and production scenarios for different system concepts with a view to overall system costs. The cost model provides performance and cost summaries that can be used to determine the most efficient options for manufacturing PEM electrolyzers. By considering new technologies and materials, the manufacturing and materials cost model continues to be updated. Based on the cost model, the Fraunhofer IPT is able to support its partners and customers in the selection of manufacturing technologies or materials to achieve the production and cost scenarios in electrolyzer manufacturing.

__Fraunhofer__ is one of the world's largest applied R&D organizations, with nearly 80 research units in all sectors of industry, 30000 employees and an annual outlay of Euros 2.9 billion. Of this sum, 2.4 billion euros is generated through contract research. Our global footprint is very strong, with offices and research centers in the Europe, USA and Asia. Some of our renowned innovations are the MP3 format, the white LED, the smallest of cameras. Fraunhofer covers the entire spectrum of energy (Renewables, Storage, E-Mobility, Grid, Hydrogen…) across the value chain from materials to testing and certification. Fraunhofer has been active in India since the past several years, bringing innovative technologies and research competence to India. Fraunhofer in India is the chosen R&D and innovation technology partner of some of the major players in the field of Energy, Environment, Automotive, Electro-mobility, Materials, Production Technology and Smart Cities working with Industry, Government and Public Sector. >>CLICK HERE<< to receive more info on this TechFlash.

Kindly get in touch with us if you are interested in this technology or require further information.
Thanks and Regards,

Ms. Anandi Iyer
Director, Fraunhofer Office India

Mr. Sanmati Naik
Sr. Manager - Energy (RE), Fraunhofer Office India
405-406, 30 MG Road, Bengaluru – 1
E-Mail: sanmati.naik@fraunhofer.in
Tel: +91 80 40965008/09
www.fraunhofer.in www.fraunhofer.de