Clean Hydrogen Partnership

Supply Chain

The shift to gigawatt-scale fuel cell manufacturing

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The large-scale deployment of hydrogen technology for low- or zero-carbon transport and energy use requires massive fuel cell production. A project funded by the Clean Hydrogen Partnership developed innovative manufacturing techniques to lower costs and achieve volumes to help meet an anticipated surge in demand for fuel cells from 2025.

Turning up the volume

Clean hydrogen technology can play a leading role in meeting EU targets to decarbonise the transport sector. To achieve this, fuel cells and their parts have to be produced in large volumes, while meeting strict quality standards, and cost-effectively enough to give European manufacturers a competitive edge. The MAMA-MEA project focused on production of catalyst-coated membranes (CCM), that part of the fuel cell stack critical to its efficiency and performance.

MAMA-MEA scaled up the production volume of CCMs from over 50 megawatts per annum (MW/a) to over 3 gigawatts per annum. The power density of 0.8 watt per cm^2 (W/cm^2) achieved exceeded the target of 0.67 W/cm^2.

Taking it to the next layer

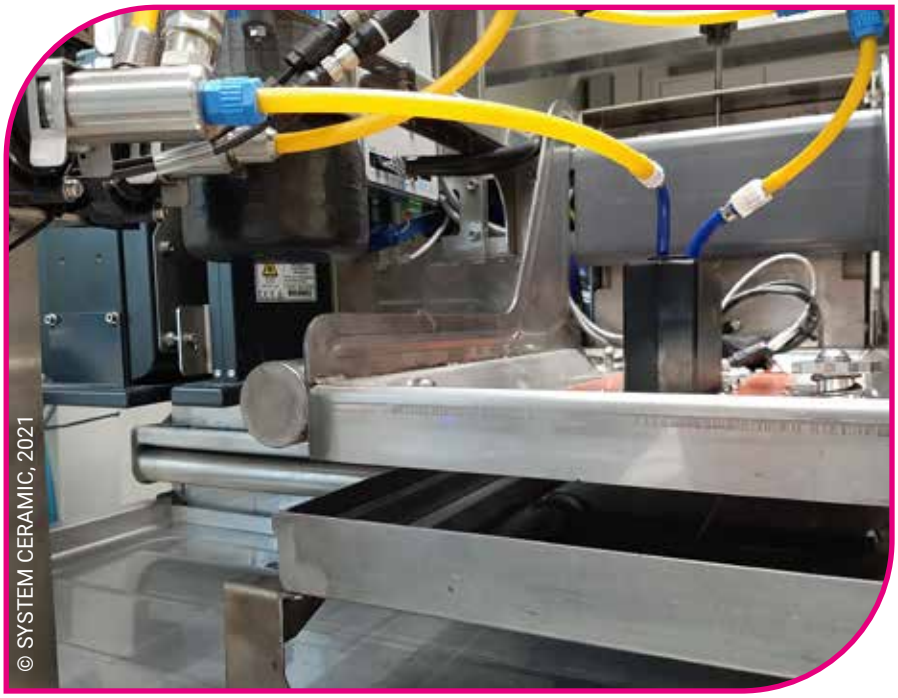
MAMA-MEA made use of innovative additive layer manufacturing to deposit CCM components – anode and cathode catalyst layers, ion-conducting membrane and edge seals – onto the membrane. With high precision and speed, each component can be laid down in thin layers, exactly where needed. The project consortium developed a single, uninterrupted manufacturing process for the CCM components. The process advanced from manufacturing readiness level 3 (proof-of-concept) to 6 (prototype system). Further improvements to production will include reducing waste of materials and better control over the placement of layers and their quality.

POWER AND RELIABILITY

The production of fuel cells and their parts must increase from tens of thousands to hundreds of thousands of units per year, while maintaining a level of quality that ensures they can provide the required power, reliably, over thousands of hours of operation.

A BLUEPRINT FOR SUCCESS

A consortium of industrial, institutional and academic partners with expertise in coating technologies and process design, from within and outside the fuel cell industry, funded by Clean Hydrogen Partnership, is bringing about innovation in manufacturing CCMs. **The goal?** To disrupt the emerging fuel cell market by reducing the time and cost of CCM manufacturing, without compromising on quality and fuel cell stack performance. **Key results?** The project increased the manufacturing rate more than 10 times compared with the state-of-the-art, and increased material use to 99 %. Material and manufacturing costs were reduced by up to 58 %.



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KEY ACHIEVEMENTS

10-FOLD
improvement in manufacturing rate of CCMs compared with the current state-of-the-art

99 %
material use thanks to additive layer manufacturing

3 GW/A
manufacturing volume per production line

0.8 W/CM²
power density achieved

4 000 HOURS
expected lifetime of CCMs under real-life conditions

IMPACTS

HIGH PRECISION
placement of CCM components thanks to innovative manufacturing techniques

SIMPLER
and scale-able production line developed

GIGAWATT
production scale achieved

COST REDUCTION
of materials and manufacturing by up to 58 %

FIND OUT MORE

Clean Hydrogen Partnership
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