



NEED TO SCALE UP FUEL CELL PRODUCTION WITHOUT COMPROMISING QUALITY? WE ARE THE IDEAL PARTNER TO HELP YOU REALIZE YOUR GOALS.

The transportation industry is a key player in the global commitment to cleaner, hydrogen-based energy sources. The mobility sector is 85% of the entire fuel cell market, making it the largest contributor. Fuel cell manufacturers right now have the chance to play a major role in transforming this area. GORE® Fuel Cell Technologies can help to seize this opportunity. Read on to learn how our consistent product quality contributes to your success.

A Massive Opportunity for the Fuel Cell Industry

Hydrogen fuel has the potential to become a serious **low-carbon competitor to conventional internal combustion engine (ICE)** vehicles by 2030. Increasing viability and cost-effectiveness due to global investments leads to reduced production costs of fuel cell vehicles (FCVs) and paves the way for future success. To build trust and credibility in FCV technology, it's vital for the first commercialized systems on the market to match ICE quality right away.

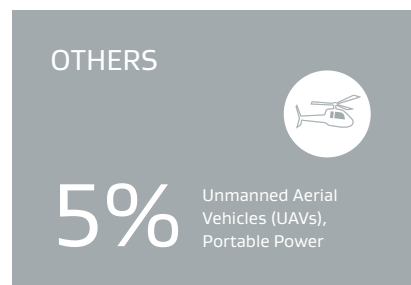
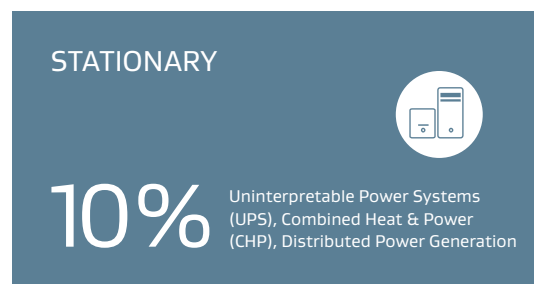
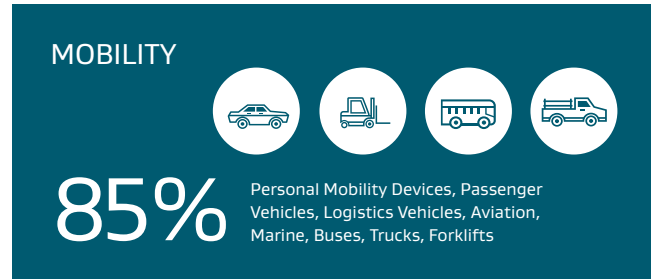
But upholding the high product quality is not an easy task when confronted with the challenges of scaling up your fuel cell production. Every constituent of the fuel cell, particularly core components like the proton exchange membrane (PEM), need to provide consistent and reliable quality. Small sample batches of high performing products don't cut it anymore.

Challenge: Quality Consistency at a High Volume

'Quality' is a result of many factors and is determined by the amount of defects found in components as well as the technical definition of 'reliability' – which can be described as the **probability that a component will be fully functional for a specified period of time.**

The immanent failure rate of a system is the summation of all the failure rates of its components. Thus, the reliability of a system is limited by the component with the highest failure rate. This means, choosing a tested and proven PEM allows you to focus on other challenges with peace of mind.

Although measuring product attributes cannot entirely prevent failures, it's a good indication for **product uniformity and process consistency.** Uniformity and consistency in turn enable you to have more control and



less deviations in your processes, leading to a lower probability of failure. It's essential in high-volume production environments to **reduce the risks of low process yields and incurred downstream costs** related to your product quality.

To master these challenges, you need more than a PEM supplier. You need an experienced partner to rely on. And that's where Gore comes in.

Solution: With Gore, You Consistently Produce Optimal Results

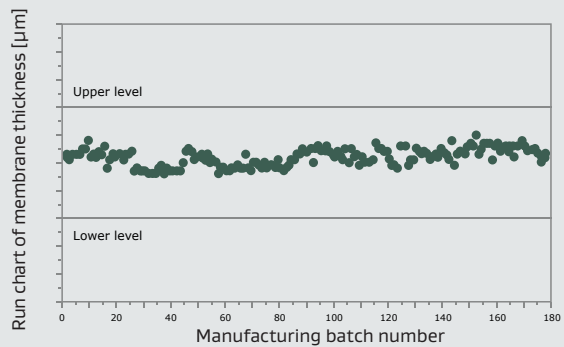
As your partner for PEM manufacturing, we ensure large yields of high-performing products with superb quality and a minimized failure risk. Thanks to our experience, process stability, and overall capabilities – as well as our proven quality assurance standards – Gore strives to meet your overall product requirements.

The Benefits of Using Gore's Proven PEM Design at a Glance:

- **Thorough Monitoring:** With the help of production-related tests, we screen membrane thickness through plane resistance, tensile strength (MD/TD), backer adhesion strength, ion contamination, and Ce mitigation.
- **Process Capability:** We reach a cpk higher than 2.0 within each measure of production by conducting tests for the recent time frame of over 12 months. For example, for the M788.12 membrane thickness, the cpk is >4.
- **Low BOL Ion Contamination:** Our membranes exhibit a BOL ion contamination of less than 1ppm over the last 12-15 months. This reduces the risk of chemical degradation induced by the membrane.
- **Visual Inspection:** We conduct a 100% visual inspection of defects down to 0.5mm length difference for the longest dimension. This includes an examination of dark and bright defects like particles and holes.

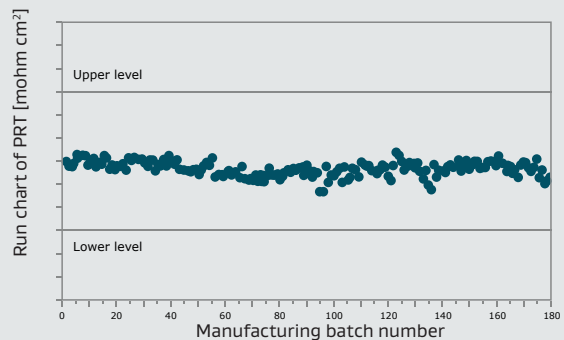
Average thickness by manufacturing batch

Test condition: 23 °C 50% RH



Average through-plane resistance by manufacturing batch

Test condition: 23 °C 50% RH



Gore PEM mass production data over 180 lots and 8 months of production. For M788.12 over the last 12-15 months, Gore achieved a cpk > 2.5.

- **Certified Quality Control:** Our fuel cell manufacturing facilities have undergone audits for quality management and environmental management systems and have been certified ISO 9001 and ISO 14001. We strive to be compliant by 2025 and completely IATF 16949-certified by 2027.
- **Unparalleled Uniformity:** Our expertise in precise coating technology enables minimal cell-to-cell variability and ensures high product uniformity and quality during production. This gives you holistic control with regard to the overflow and heat distribution,

ensuring stack performance consistency and a longer-lasting lifespan. Recent process development efforts have enabled the rapid production of GORE-SELECT® Membranes with greater width and even higher uniformity.

Let's Push the Boundaries of Hydrogen Fuel Cell Design Together

Gore's outstanding PEM design sets new standards for power density as well as membrane durability, yielding high performance over a longer life cycle – **giving you the freedom to push the boundaries of hydrogen fuel cell design.**

Consistently delivering high quality parts is only one of the many benefits that arise from working with Gore. We have much more to offer: As an experienced global player in the fuel cell industry, **we continuously drive innovation forward, offer technical service and support, help to reduce total cost of ownership, and closely collaborate with the suppliers to meet the market demand.**

That's what we call 'The Gore Advantage'.

[Learn more about the Gore Advantage](#)



But if you ask us, the most important thing is close collaboration. Contact us to find out how working with Gore can help you on your road to success. Get in touch!

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