BRIEF

HYDROGEN PRODUCTION INSIGHTS

Innovate, manufacture and future-proof electrolyzers for green hydrogen production.

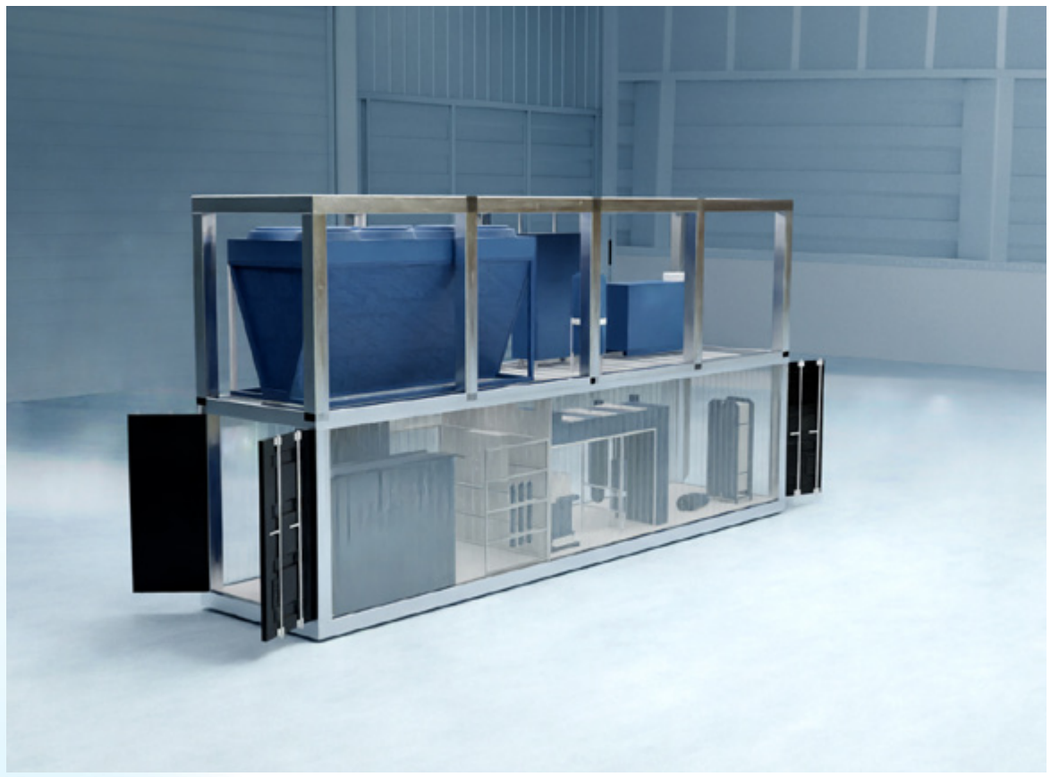
DASSAULT SYSTEMES

TRANSFORM ELECTROLYZER DEVELOPMENT

The renewable energy transition is driving green hydrogen production and the need for safe, cost-effective and innovative electrolyzers. To capture demand, you must increase the competitiveness of your hydrogen production equipment.

It’s time to enhance your product development from every angle.

This brief is a supplement to the **Hydrogen Production Insights** video series. Review key takeaways from industry experts as they reveal how you can transform design, production and after sales.



MEET OUR EXPERTS

Clara WILTBERGER
Hydrogen Business Strategy,
Industrial Equipment, Dassault Systèmes

Clara Wiltberger is responsible for the clean hydrogen segment within the industrial equipment industry at Dassault Systèmes. She works closely with customers, sales and engineers to drive success in clean hydrogen projects. Clara Wiltberger specialized in the management of innovations and new technologies at Grenoble School of Management.

Jean-Yves TRESSON
Renewables Business Consultant,
Industrial Equipment, Dassault Systèmes

With over 17 years of business sales experience, Jean-Yves’s expertise stems from the industrial equipment industry. Since 2012, he has driven business development for the renewables, power and fluidic equipment sectors. Today, Jean-Yves Tresson defines and executes go-to-market strategies for equipment manufacturers and their supply chains.

EXPLORE MORE:

1

PIONEER INNOVATIVE DESIGNS

2

SIMULATE FOR SAFETY AND EFFICIENCY

3

OPTIMIZE MANUFACTURING OPERATIONS

4

REDUCE SERVICE OPERATING COSTS

1. PIONEER INNOVATIVE DESIGNS

> “The more optimized the design, the greater the efficiency.”

Clara Wiltberger
Hydrogen Business Strategy, Industrial Equipment, Dassault Systèmes

Disconnected data and siloed processes make it harder to answer the tough questions — such as how to streamline workflows, enhance electrolyzer designs and speed up development time. In part one of **Hydrogen Production Insights**, the experts explore how to overcome these challenges.

Key Takeaways

1.

Increase value network collaboration

Need to revise design parameters before moving into production? By integrating all data and processes into the **3D**EXPERIENCE® platform, your stakeholders and partners in the ecosystem can collaborate and exchange data in real time and make more informed decisions.

2.

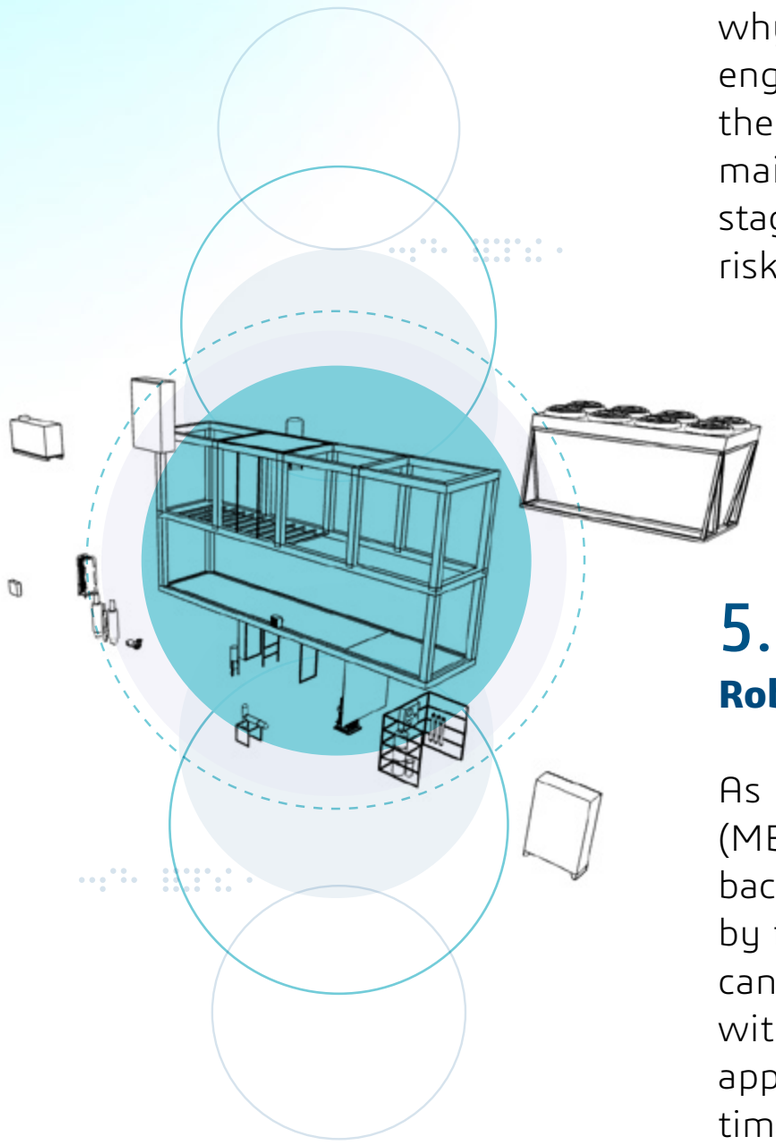
Strengthen reactivity and lifespan

How reactive is your electrolyzer to renewable energy sources? Can your designs bridge the gap between intermittent renewable power production and grid demand at different time horizons and scales? With insights from the virtual twin and **3D**EXPERIENCE platform, your teams can compare different materials and configurations while prioritizing equipment reactivity and lifespan.

3.

Improve thermal, chemical and mechanical stability

Pressure and temperature are critical to be determined during the design stage because the slightest miscalculation can have severe consequences. Thanks to the data-driven virtual twin, your teams get to analyze and identify the optimal electrode structure for gas diffusion, increase the conductivity of water and insulate your equipment for cost-effective fabrication.



4.

Start maintenance engineering early

Your customers must rely on equipment that can withstand routine and unexpected conditions during field operations. This is why it's important to start maintenance engineering early. Use the virtual twin and the **3D**EXPERIENCE platform to incorporate maintenance engineering into the design stage to lower downtime and corrosion and risks of failure.

5.

Robust integration and interoperability

As part of model-based systems engineering (MBSE), concurrent engineering forms the backbone of future electrolyzers. Supported by the **3D**EXPERIENCE platform, your teams can integrate design and simulation processes with multiple engineering tasks. This approach speeds up product development time, increases productivity and reduces costs.

Watch part one

Learn more:
Concurrent Equipment Engineering

2. SIMULATE FOR SAFETY AND EFFICIENCY

“Identify issues faster by performing complex simulations on the virtual twin. This way, you can focus on optimizing designs.”

Jean-Yves Tresson
Renewables Business Consultant,
Industrial Equipment,
Dassault Systèmes

Are your electrolyzer designs protected against potential failure scenarios like membrane degradation? Skim through part two of **Hydrogen Production Insights** and explore how to reduce the risks of leakage and component malfunctions through simulation with the virtual twin.

Key Takeaways

1.
Innovate with virtual prototypes

Physical prototypes are costly to produce and may limit the number of tests your teams can do. Opt for virtual prototyping powered by the virtual twin on the **3D**EXPERIENCE platform. This allows your teams to perform multiple simulations to test structural, aerodynamic and thermodynamic parameters from an equipment or system level.

2.
Simulate and optimize designs

With complete visibility into equipment engineering through the **3D**EXPERIENCE platform, your teams can simulate different failure scenarios and quickly identify areas with low flow rates. By focusing efforts on design optimization, your teams can resolve structural performance issues, locate optimal contact pressure points and compare durable metal options for the storage tanks.

3.
Optimize cell stacks for thermal management

Electrochemical systems can achieve optimum performance, but only within a narrow range of temperatures. Through virtual simulations, your teams can ensure that designs enable highly transient operations at high temperatures with high storage efficiencies. Improve the lifespan and thermodynamics efficiency of the equipment by designing cooling channels to improve the temperature distribution in the stack.

4.
Understand flow performance

Thanks to the advanced rendering capabilities of the virtual twin, your teams gain deeper insights into the flow performance of the electrolyzer. This includes realistic visualizations of hydrogen solubility, diffusivity and the pressure differences between the flow channels, which can affect equipment reliability and safety.

5.
Improve lubrication workflows

It can be challenging for your teams to physically test and measure the velocity fields of the bipolar plate designs and calculate potential windage loss. This is where simulation can add value by providing quantitative predictions into all aspects of product development, including system performance.

Watch part two

Learn more:
Concurrent Equipment Engineering

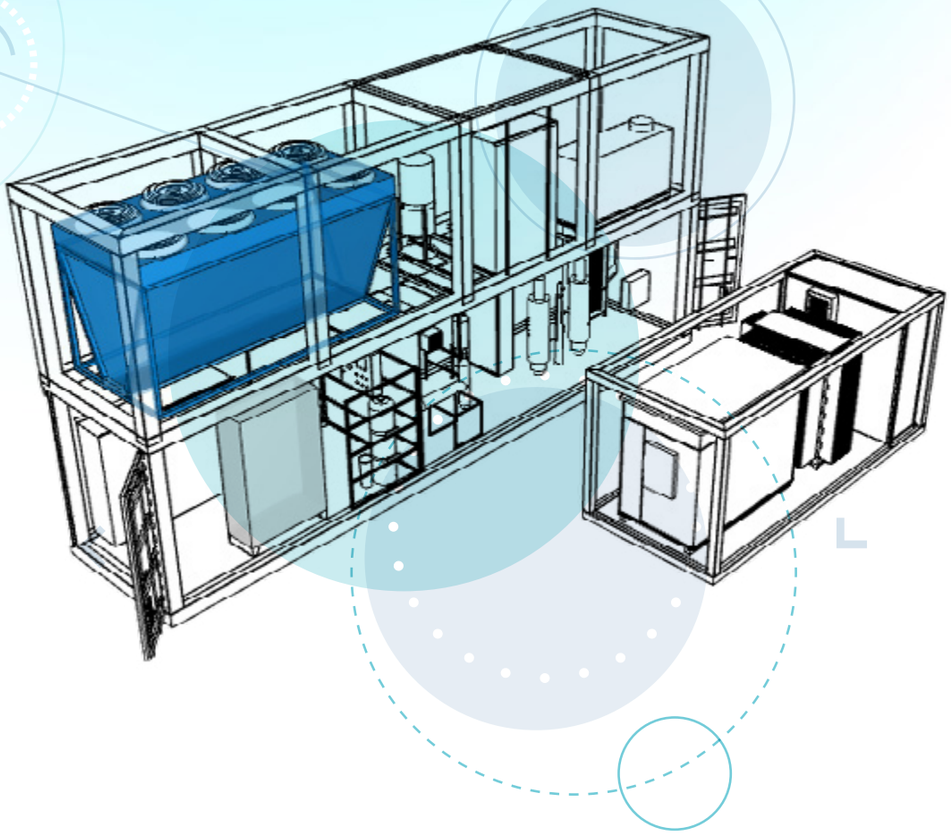
3. OPTIMIZE MANUFACTURING OPERATIONS

> “The virtual twin enables companies to design and optimize their manufacturing processes. All before a single unit is produced.“

Clara Wiltberger
Hydrogen Business Strategy,
Industrial Equipment,
Dassault Systèmes

Are you looking to standardize and scale up your manufacturing processes with the least costs? In part three of **Hydrogen Production Insights**, experts highlight how the virtual twin can support new production lines quickly and more efficiently.

Key Takeaways



Watch part three

+ **Learn more:**
Ready to Make

1.

Boost productivity and lower costs

Did you know that by moving from a manual to a semi-automated assembly line, you can reduce costs for cell stack assembly by up to 90%? Create a virtual twin of the electrolyzer production line to visualize and identify the best layouts while mitigating potential bottlenecks ahead of time.

2.

Opt for digital manufacturing

Digital manufacturing, supported by the virtual twin on the **3D**EXPERIENCE platform, facilitates rapid prototyping of components and products and allows for a higher level of customization. Your teams gain end-to-end visibility into all operations and can optimize production planning and scheduling, inventory management and quality control.

3.

Reduce bottlenecks and downtime

How well can your teams simulate what-if scenarios for sales and operations planning? By creating a virtual twin for engineering and manufacturing and another for field operations, your teams can understand the impact of changes along the entire supply chain. This can help avoid potential bottlenecks and downtime.

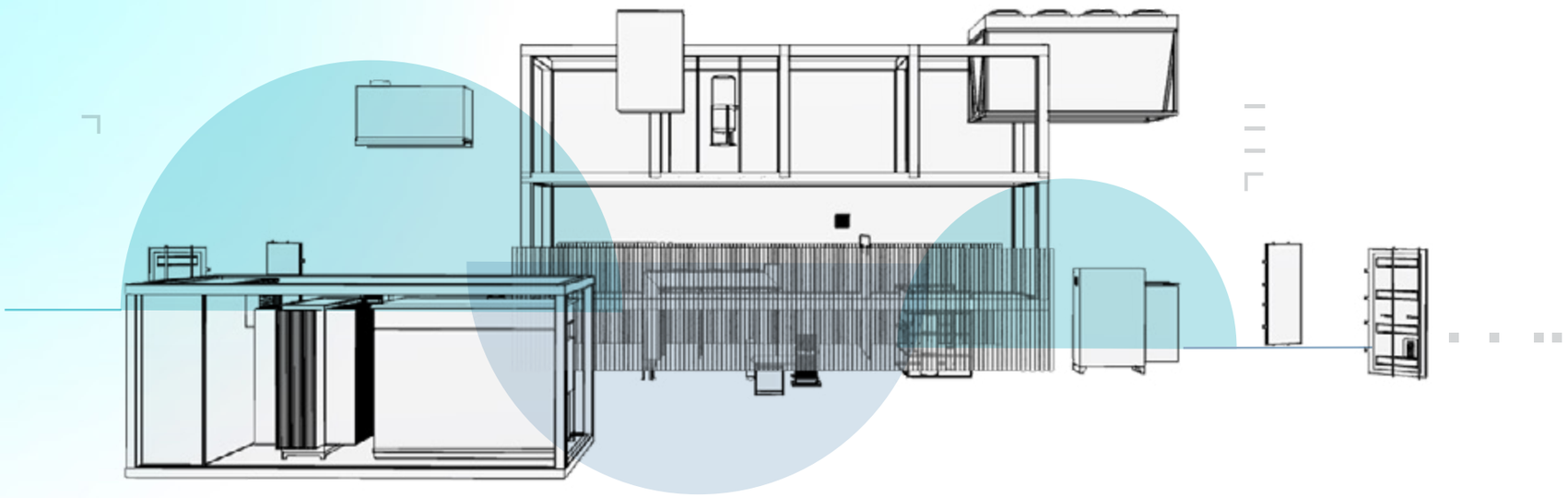
4. REDUCE SERVICE OPERATING COSTS

“With the **3DEXPERIENCE** platform’s capabilities, you can sift through volumes of data and learn how your asset is performing in the field.“

Jean-Yves Tresson
Renewables Business Consultant, Industrial Equipment, Dassault Systèmes

Electrolyzer maintenance and after-sales services can generate a steady revenue stream. Dive into part four of **Hydrogen Production Insights** and discover how to reduce service operating costs and maximize revenue.

Key Takeaways



1.
Collect and collate monitoring data

Do your teams know what goes on in the field? During the operational phase, the **3D**EXPERIENCE platform facilitates a continuous feedback loop with the electrolyzer in the field. Through the platform, your teams gain easy access to operational data that can be combined with historical data to improve current and future electrolyzers.

2.
Turn data into intelligence

Faced with vast volumes of data, your teams need the right insights to help them make more informed decisions. How will your teams know if they need to pay more attention to the cell stacks, storage tanks or a different component altogether? Lean on the **3D**EXPERIENCE platform's capabilities that combine artificial intelligence and machine learning to quickly understand how the equipment is performing.

3.
Leverage predictive maintenance

Based on the operational data collected, your teams can conduct predictive maintenance to anticipate potential issues and implement mitigation measures. Rely on predictive analytics — powered by the virtual twin and **3D**EXPERIENCE platform — to predict quality, energy efficiency, uptime, throughput and asset reliability while keeping service costs low.

Watch part four

Learn more:
Industrial Equipment Solutions

WIN THE GREEN HYDROGEN RACE

Backed by deep scientific expertise and experience with today's industry leaders, Dassault Systèmes is uniquely positioned to help you meet the demands of the clean energy transition.

Equip your teams with the virtual twin and **3D**EXPERIENCE platform to deliver innovative electrolyzers that are safe, cost-effective and energy-efficient while increasing overall equipment effectiveness (OEE).

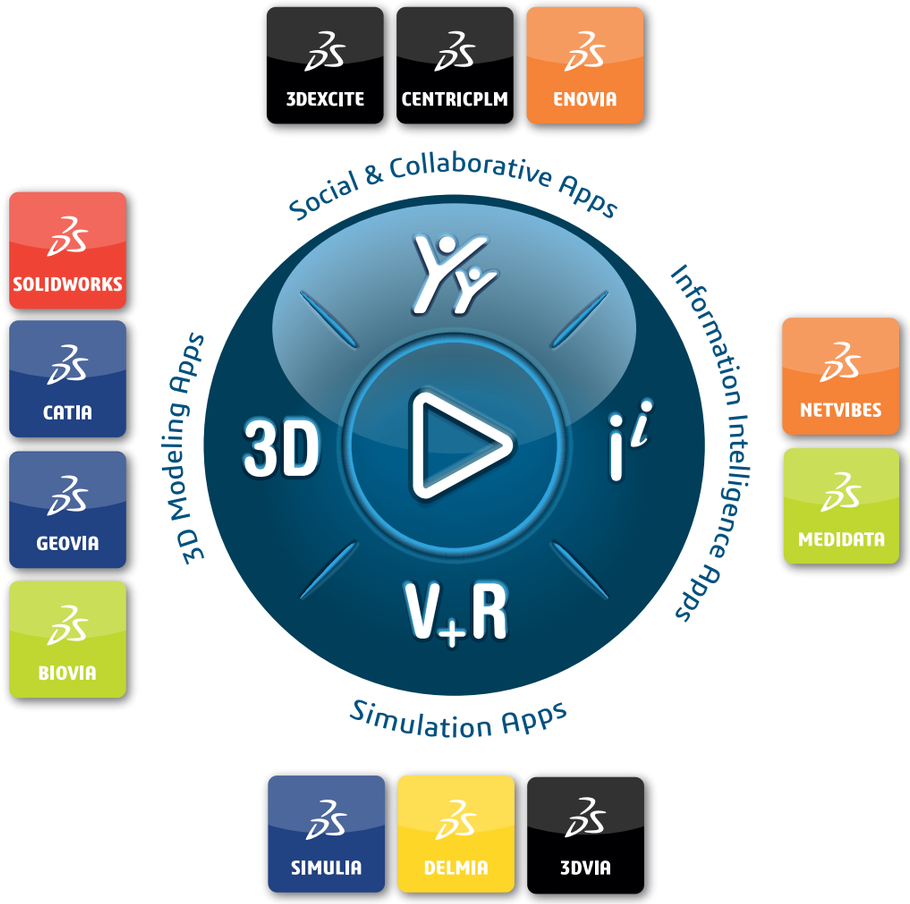
Ready to act? Take your next steps below:

- Discover our solutions
- Read about decarbonizing green hydrogen production

Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating virtual twin experiences of the real world with our **3D**EXPERIENCE platform and applications, our customers can redefine the creation, production and life-cycle-management processes of their offer and thus have a meaningful impact to make the world more sustainable. The beauty of the Experience Economy is that it is a human-centered economy for the benefit of all –consumers, patients and citizens.

Dassault Systèmes brings value to more than 300,000 customers of all sizes, in all industries, in more than 150 countries. For more information, visit **www.3ds.com**.



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