

Chlor-alkali Leadership: Paving the way for bankable green hydrogen projects

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INEOS | Electrochemical Solutions

12th International Chlor-Alkali Technology Conference & Exhibition

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13-15 May 2025 Barcelona - Spain

Cefic sector group *



INEOS | Electrochemical Solutions

Chlor-alkali | Green Hydrogen | Electrode Coatings

 Superior energy performance – operating at 1941 kWh/te NaOH (6kA/m²)

- High-performance
 25MW alkaline
 water electrolyser
 solutions
- Strong & bankable
 project partner

- Refurbishment and re-coating for all electrolyser types
- Short lead-times







Leveraging chlor-alkali expertise for green hydrogen advancement

- Industrial electrolysis is getting renewed attention due to green hydrogen
- However, projects are delayed due to concerns over economic viability and perceived technical immaturity
- The hydrogen industry must leverage the expertise of the chlor-alkali sector
- Adopting its well-established safety processes and culture will be crucial to progress



Chlor-alkali Industry



Began in 1897 at United Alkali Co. site in Runcorn, UK



Chlorine, caustic soda and hydrogen produced from electrolysis of NaCl or KCl brines

 $2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$

INEOS Chlor-alkali



Unrivalled expertise in technology development and electrolysis operations

Technology supply (INEOS Electrochemical Solutions)

- 45 years of industrial electrolysis R&D
- Class leading BICHLOR electrolyser technology
- Excellent electrode coatings
- End-to-end supply chain
- Global footprint and project experience (1.2 GW H₂ equivalent)





- 9 M tonnes of operating capacity (3 GW H₂ equivalent)
- Largest European electrolysis operators
- 16 sites across Europe and UK

• Mobility

- Iron and steel
- Heating
- Power

Industrial water electrolysis will contribute to the growing H₂ demand

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First Intent Hydrogen

• Refining and chemicals

Net Zero needs a significant contribution from Hydrogen





700

600

Hydrogen

Net Zero needs a significant contribution from Hydrogen

- Refining and chemicals
- Mobility
- Iron and steel
- Heating
- Power

Market demand predictions are reducing



Clean H₂ demand



Challenges in the Green Hydrogen Market



Of 200 Mte of announced green hydrogen projects only 4 Mte have reached FID

Demand

- Low offtake commitment
- High project costs
- Perceived technology immaturity
- Inconsistent policy roll out
- Uncertainty of Net Zero political support

Technology Supply

- Too many players
- Immature offerings
- Cancelled projects
- Over-investment in capacity
- Stranded assets



AWE is akin to chlor-alkali electrolysis, but easier !

Chlor-alkali:

 $2KCl + 2H_2O \rightarrow 2KOH + Cl_2 + H_2$

In chlor-alkali the hydrogen is a co-product

AWE:

 $2H_2O \rightarrow O_2 + H_2$

AWE makes 'first intent' hydrogen with oxygen as a co-product





Chlor-alkali Cells

Basic electrochemical cell chemistry



Complementary Processes



AWE cells are akin to chlor-alkali electrolysis cells, but easier !



Industrial Electrolysis Learning



12

Electrochemical technology scale-up is challenging; learn from the experts



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INEOS Have Adapted BICHLOR for Hydrogen



Essentially the same electrolysers – with extensive operating mileage



Safety is our number one priority

- INEOS SHE & Engineering standards
- Inherently safe design
- Fully developed hydrogen cell room safety cases
- Modular construction minimises time in cellroom

Operational excellence

- Robust and reliable
- Excellent current and liquor distribution
- Zero gap cells minimise resistance
- Class leading electrical efficiency
- Fully refurbishable modules minimises downtime

Robust and reliable supply chain

- Existing end-to-end supply chain
- Extensive project implementation experience

Project Delivery



Over 4 M tonnes of installed capacity \rightarrow **1.2 GW AWE equivalent**



Supply Chain Expansion



A phased and sustainable expansion to match market growth

2025

2028



Shared chlor-alkali supply chain

Increased capacity at existing facilities

Giga-scale production – strategic location

2030

No risk of over-investment and a stranded asset



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Project Delivery Experience



We have learned from decades of global project implementation

- Diverse strategies for managing multiple projects efficiently
- Adapting to varying client competencies and expectations
- Implementing value engineering to optimise cost and efficiency
- Navigating relationships with multiple EPC contractors
- Addressing global cultural differences to ensure seamless collaboration







Modularisation for Cost Reduction



Minimising cost and timescale by manufacturing off-site

- Reduced construction time and labour-hours on site
- Reduced laydown and welfare requirements
- Better on-site logistics
- Increased productivity factor
- Better QA/QC surveillance



Modularisation for Expansion



Hydraeon 25 and 50 MW units roll-out with increasing scale economies



Hydraeon



Best-in-class industrial offering, based on established INEOS product

Experienced

• Decades of experience in electrolyser design, manufacture and safe operations, at industrial scale.

Bankable

- Reliable, well-proven technology
- Business underpinned by CA revenue
- Existing reliable and robust UK supply chain.
- Backed by INEOS.



Proven

- AWE chemistry is well proven
- Hydraeon is an evolution of BICHLOR and been running for >2yrs at demo scale.

Scalable

- Cost efficient with an up to 50 MW modular design.
- Proven success in delivering large-scale industrial projects.

Safety in the Hydrogen Industry

Hydrogen needs to learn from chlor-alkali

- Hydrogen is a very hazardous fluid
- Inherent safety in design and operations
- Engineered mitigation of remaining hazards
- HAZOP, SIL, LOPA, QRA
- Expert involvement
- Industry body stewardship









Meet us at our stand in the exhibition hall !

THANK YOU

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Cefic sector group 🏶

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Chlor-alkali: achieving climate neutrality