

Brennstoffzellenproduktion

Entwicklung kosteneffizienter, skalierbarer
Produktionsverfahren gemeinsam mit der Industrie

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KEY FACTS

- Applied research and development: fuel cells, hydrogen and electrolyzers
- Focus on industry demand - Independent service provider and R&D partner
- GmbH/ltd. as daughter of University of Duisburg-Essen
- ~ 150 employees + student researchers
- Limited institutional funding by state of North-Rhine-Westphalia



Offen im Denken



EUROPEAN UNION
Investing in our Future
European Regional
Development Fund

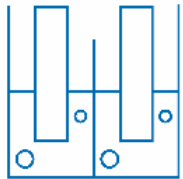
Ministerium für Wirtschaft,
Industrie, Klimaschutz und Energie
des Landes Nordrhein-Westfalen



Ministerium für
Kultur und Wissenschaft
des Landes Nordrhein-Westfalen



Our portfolio



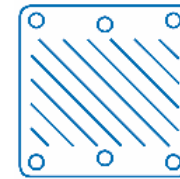
Electrolysis

- ✓ Proton Exchange Membrane (PEM)
- ✓ Anion Exchange Membrane (AEM)
- ✓ AEL
- ✓ Cell and component development
- ✓ Material & component characterization
- ✓ Single cell and stack testing



Hydrogen

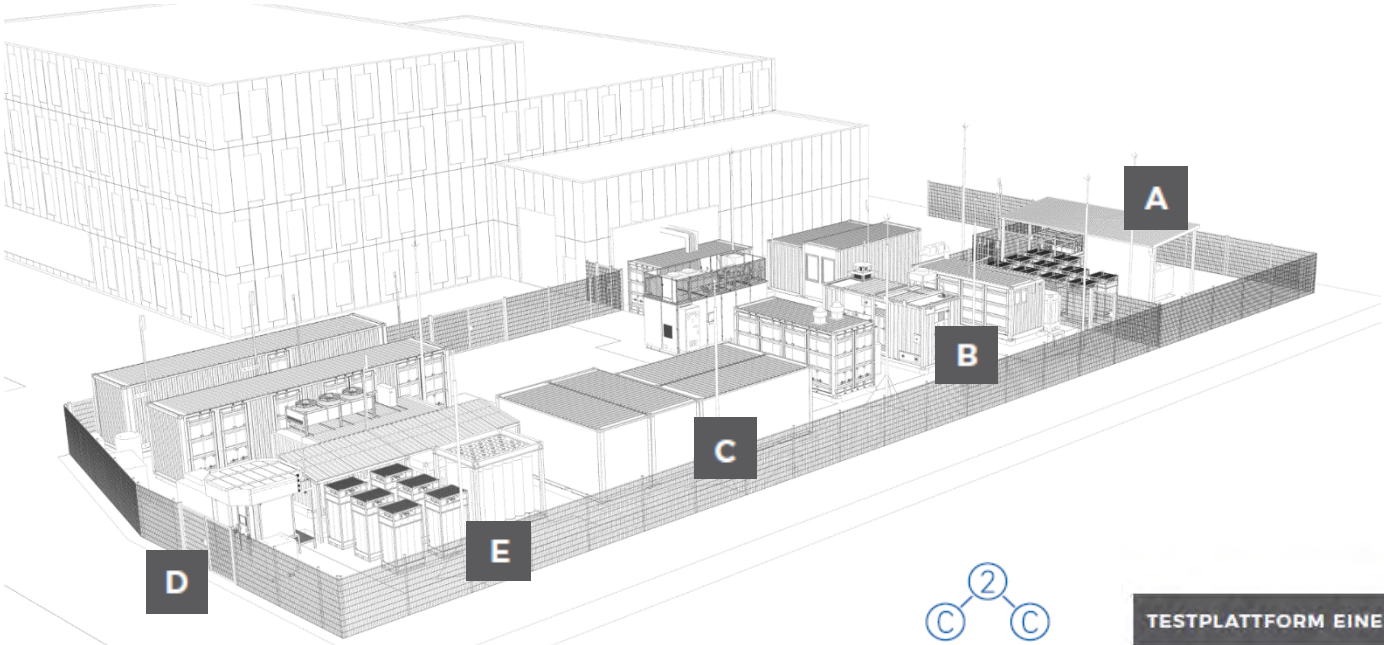
- ✓ Hydrogen purification and quality
- ✓ Hydrogen refuelling
- ✓ Hydrogen distribution
- ✓ Ammonia synthesis, cracking, and systems
- ✓ Studies, safety and standardisation
- ✓ Consulting



Fuel cells

- ✓ Proton Exchange Membrane (PEM)
- ✓ Material development, characterization and qualification
- ✓ Cell, stack and component development
- ✓ BoP and system technologies
- ✓ Production, recycling, and sustainability

HYDROGEN TESTFIELD



WASSERSTOFF-QUALITÄTSLABOR

Qualitätsanalytik gemäß ISO 14687-2
Validierung durch Ringversuche mit Partnerlaboren
Optimiertes Verfahren zur Probenahme an Tankstellen
Analyse der H₂-Qualität an Tankstellen
Unterstützung der Normungsaktivitäten in Deutschland und der EU

F&E THEMEN UND DIENSTLEISTUNGEN

- ANALYSE DER H₂-QUALITÄTEN UNTERSCHIEDLICHER QUELLEN (U.A. TANKSTELLEN)
- ERARBEITUNG EINES QUALITÄTSMANAGEMENTS FÜR TANKSTELLEN
- SCHADGASUNTERSUCHUNGEN AN BRENNSTOFFZELLEN



ELEKTROLYSE-SYSTEME

A NIEDERDRUCKSPEICHERUNG @ 200 BAR
2-stufiger Kolbenverdichter
70 kg H₂ in Stahlflaschen

B ELEKTROLYSEN
inkl. Wasseraufbereitung, H₂-Reinigung u. Sicherheitstechnik
SOEC: 5 Nm³/h H₂ bei 10 bar
PEM: 5 Nm³/h H₂ bei 35 bar
AEL: 10 Nm³/h H₂ bei 12 bar

F&E THEMEN UND DIENSTLEISTUNGEN

- ELEKTROLYSE-KOMPONENTEN-UND SYSTEMENTWICKLUNG
- ERPROBUNG VON ELEKTROLYSEVERFAHREN
- INTEGRATION VON VOR-ORT-H₂-ERZEUGUNG IN TANKSTELLENKONZEPTE

H₂TestOpt

TESTPLATTFORM EINER H₂-TANKSTELLE

TESTRAUM	
C	Bereitstellung von H ₂ bei 200-875 bar (variabel) Regelbare Vorkühlung
DISPENSER	
D	350 / 500 / 700 bar Vorkühlung bis -40°C
WASSERSTOFFSPEICHER	VERDICHTER
D	380 kg bei 500 bar 80 kg bei 875 bar
	1-stufiger Kolbenverdichter Für Booster-Betankung geeignet

F&E THEMEN UND DIENSTLEISTUNGEN

- ENTWICKLUNG UND QUALIFIZIERUNG VON TANKSTELLEN-KOMPONENTEN
- ENTWICKLUNG UND ERPROBUNG INNOVATIVER TANKSTELLENKONZEPTE
- ERARBEITUNG UND ERPROBUNG ZUKÜNFTIGER BETANKUNGSPROTOKOLLE (U.A. HEAVY DUTY)



Production technologies for graphitic bipolar plates

Development of graphite compound materials for

- Fuel cells
- Redox flow batteries
- Electrolyzers
- Heat exchangers



Manufacturing of graphitic bipolar plates

- Compression molding

Esspresso
(03EN5020B)

Ultrapress2
(03EN5010D)

- Injection molding

BiPPMoldCoat
(KK5190504ZG1)

- Foil extrusion

InduREX
(03ETB017B)

IGF TheBiPo
(22905N)

IGF Faserverstärkte
Folien (22342N)

- Plate extrusion

BMWK-GRETE
(03EN5041F)

Recycling & bio-based graphites and polymers

Re³dOx
(03ET6156F)

IGF FC Bio
44LN/45LN/46LN



Supported by:



on the basis of a decision
by the German Bundestag

INDUSTRIELLE
GEMEINSCHAFTSFORSCHUNG

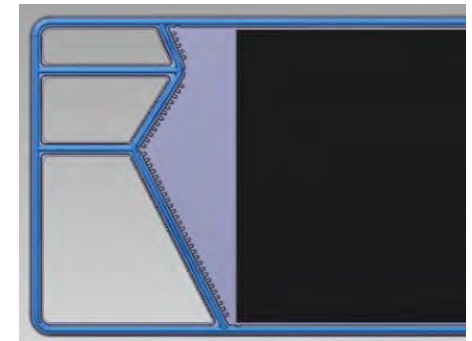
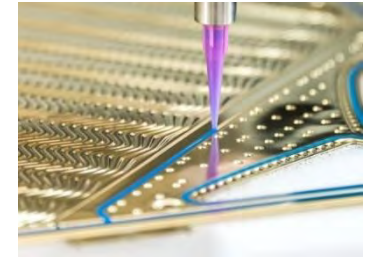
IGF

ZBT dispenser based sealing solutions: Cost efficient, scalable sealing application

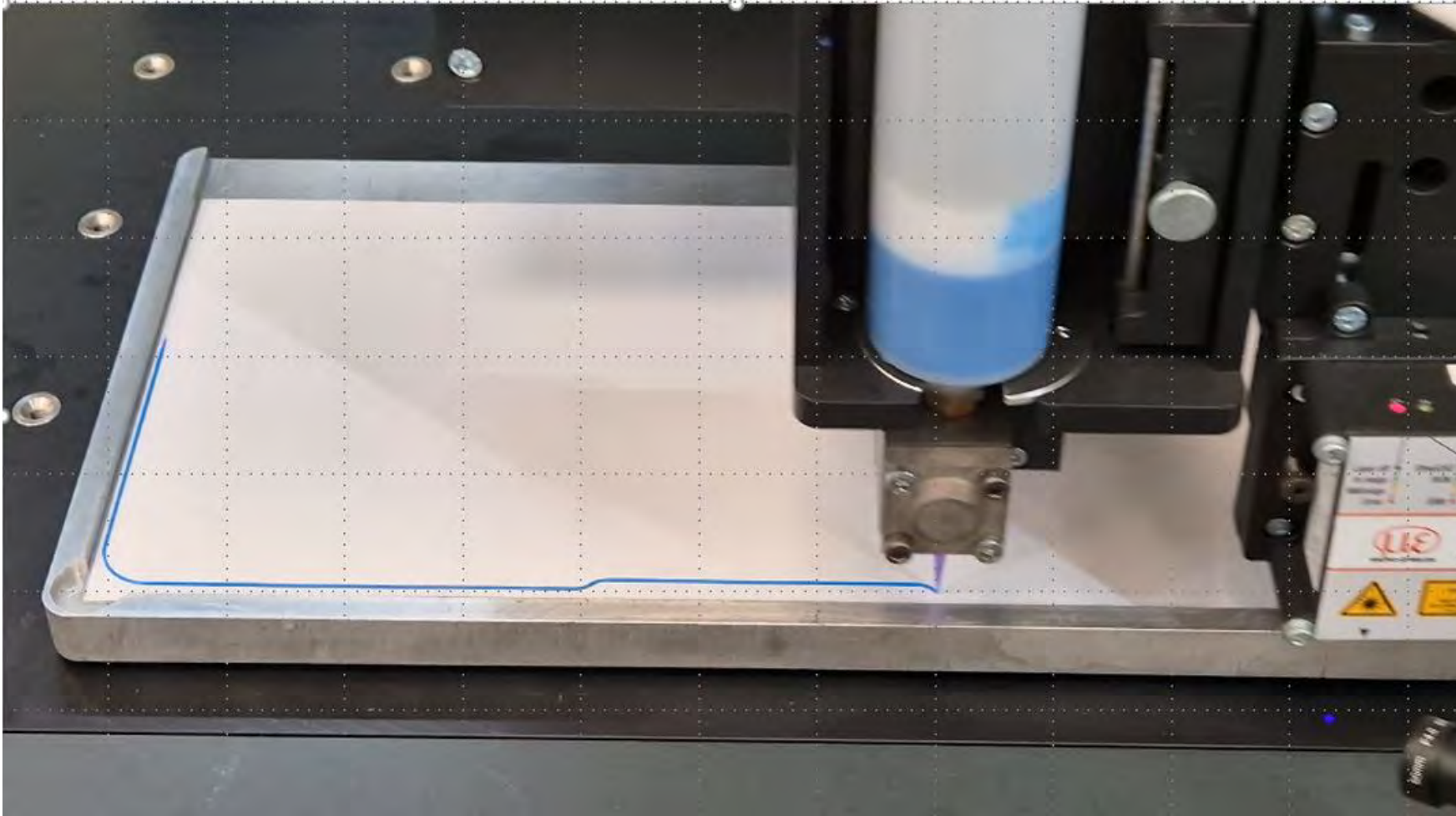
Advantages:

- Very compact sealing design:
 - Significant reduction of bipolar plate size and cost
 - Significant increase in stack power density
- Mechanically robust also for development trends of **thinner ($\leq 75\mu\text{m}$) and lightweight bipolar plate substrate materials**
- Stable, low cost application process
- Sealing developments for more than 15 industry partners
- Process licensed to several industry partners

Scalable from prototype to series production?



ZBT dispenser based sealing solutions: Cost efficient, scalable sealing application



Source: ZBT



Source: Datron, EVO 600 Dispenser

High-speed sealing
application process
developed within project
InduREX (03ETB017B)

Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages

ZBT stack assembly lab

Max. compression force:	up to 200 kN
Max height:	800 mm
Max. compression distance:	600 mm
Width between pillars:	650 mm
Resolution compression force measurement:	0.05 kN
Max. error compression force measurement:	0.5 kN (10-50 kN) 1 kN (50-100 kN)
Max error distance measurement:	30 µm / 600 mm compression distance
Max. speed:	100 mm/s

- Accessible from 4 sides
- Accessible during stack compression e.g. for installing tie-rods
- Programming of compression strategies possible (ramps, holding times, cycles)
- Operated in temperature and humidity controlled stack assembly lab



Stack compression and tolerances
are being investigated within
project FCPP (03EN5013B)

Gefördert durch:



aufgrund eines Beschlusses
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Standardized contact resistance measurement: From research project to industry measurement standard

BePPEI (03B11002B): Development of standardized measurements
for physical parameters of bipolar plates

Partners: DLR, Fraunhofer ISE + ICT, FZJ, ZSW, ZBT

Duration: 2017-2020



Since 2021:

- Measurement system and measurement services available
- Delivered to several German and European customers
- DIN standard DIN 4880 in preparation (in cooperation with DLR)

Interested in In-Line systems?



Interested? Meet us at our booth!

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