ECO2CELL



GKT

ECO2CELL Key 1

Electrochemical conversion of CO_2 into syngas for industrial applications

GKT-SOLUTIONS.COM

A Member of
Dr. Aichhorn Group

1 MW CO_2-to-Syngas Plant

Converting captured CO_2 and water into syngas using renewable electricity.

ECO2CELL Key 1 is GKT's industrial-scale CO_2 electrolysis system designed to convert captured CO_2 and water into H_2/CO syngas using renewable electricity – without the need for externally supplied hydrogen.

By transforming captured CO_2 into a valuable resource, the system enables its integration into industrial value chains. The resulting syngas can be used as a feedstock for the production of e-methanol, Fischer-Tropsch fuels, and a wide range of carbon-based chemicals.

Process and gas separation

ECO2CELL Key 1 combines electrochemical CO_2 conversion with integrated gas separation and recycle. Pressure Swing Adsorption separates unconverted CO_2 from the product gas and returns it to the process, increasing overall carbon utilization.

Plant overview | key performance data

Commercial plant name	ECO2CELL Key 1 = 1 MW CO_2-to-Syngas Plant
Technology platform	Low-temperature CO_2 electrolysis (CO_2RR)
Primary applications	E-methanol, Fischer-Tropsch fuels and carbon-based chemicals
Target industries	Biogas, chemical production, steel and cement industry
Modular scale-up range	ECO2CELL Core up to 1 kW → ECO2CELL Cube pilot up to 15 kW → industrial 1 MW plant
Rated AC power	1.00 MW
Rated DC power	0.95 MW
Operating hours	8,322 h/y
Capacity factor	95%

Feedstocks and utilities

Fresh CO_2 feed	1,730 t/y
Fresh CO_2 feed rate	207.00 kg/h
Overall CO_2 utilization	95.60%
PSA CO_2 recovery	95%
CO_2 recycle stream	1,026.00 t/y
Net water consumption	217.00 m^3/y
Net water flow	0.0262 m^3/h
Electrolyzer electricity consumption	8,355.16 MWh/y
Recycle separation electricity	165.39 MWh/y
Total modeled electricity consumption	8,520.55 MWh/y

Product output

Continuous H_2/CO syngas for downstream conversion into fuels and chemicals

Syngas volume	1,264,000 Nm^3/y
Syngas flow	152.00 Nm^3/h
Daily syngas volume	3,645.00 Nm^3/day
Syngas mass	1,090.00 t/y
Daily syngas mass	3,144.00 kg/day
Annual CO production	1,052.00 t/y
Annual H_2 production	38.00 t/y
H_2: CO molar ratio	0.5
CO concentration	66.67 vol%
H_2 concentration	33.33 vol%
Syngas lower heating value	12.02 MJ/Nm^3
Annual syngas energy output	4.22 GWh/y LHV

Design basis: values are rounded from the available model data.
Project-specific engineering and verification apply. ↘



AI-generated conceptual view (A)

Syngas specification

Composition basis	Dry-gas model basis
Standard conditions	0 °C and 1.01325 bar 22.414 Nm^3/kmol
Product metering	Dry Nm^3 basis using 22.414 Nm^3/kmol
Custody metering	Project-specific

Equipment and materials

Membrane technology	Anion-exchange membrane (AEM)
Cathode catalyst	Silver nanoparticles (Ag NPs)
Anode material / catalyst	Nickel
Electrolyte	KOH
CO_2 separation technology	Pressure Swing Adsorption (PSA)
Recycle compression	Recycle compressor
Included equipment scope	CO_2RR stack; BOP; pretreatment; PSA; recycle compressor

Performance and lifecycle

Chemical energy efficiency	50.49% LHV
Specific electrolyzer electricity consumption	6.61 MWh/kNm^3
Annual stack degradation assumption	1%/y
Stack replacement interval	5 years
Plant economic life	15 years

Byproducts & carbon utilization

O_2 byproduct	911.25 t/y
O_2 byproduct flow	109.50 kg/h
O_2 volumetric flow	76.70 Nm^3/h
CO_2 converted / utilized	1,653.92 t/y

Core technology

Total stack current	366,841 A
Cell voltage	2.6 V
Current density	1,500 A/m^2
Active electrolyzer area	244.56 m^2
Faradaic efficiency to CO	66%
Faradaic efficiency to H_2	33%
Total Faradaic efficiency	99%
Single pass CO_2 conversion	60%

Explore further insights



The heart of ECO2CELL technology: The electrolysis cell converts captured CO_2 and water into valuable products using electrical energy. © GKT

WE ENGINEER GREEN KEY TECHNOLOGIES

E-01-2026

GKT is a globally operating system partner for thermal separation and environmental technologies – built on nearly 90 years of metalworking expertise and today defined by deeply rooted process engineering competence. In an industry where resources, circularity, energy, and CO_2 determine competitiveness, we make challenges technologically manageable and economically effective.

Our approach:
We Engineer Green Key Technologies.

We develop and implement key industrial technologies – from falling-film, thin-film, and short-path evaporators to distillation and drying, as well as CO_2 valorization, waste heat recovery, and IIoT-enabled process optimization.

As part of the Dr. Aichhorn Group, we validate processes in our own technical center under real operating conditions and scale them up to turnkey EPC facilities.

For our customers, this means maximum efficiency, reduced energy consumption, lower CO_2 emissions, and stronger economic viability – proven worldwide through numerous successfully executed projects.

GKT GmbH
Neusiedlerstrasse 15-19
2640 Gloggnitz, Austria

T +43 2662 42780
office@gkt-solutions.com