INERATEC GmbH

Innovative Chemical Reactor Technologies

Greenhouse gases transformation to renewable fuels and chemicals
Problem

We are depending on hydrocarbons made from oil and gas

Worldwide energy consumption 2035: >55% oil and gas

Annual CO₂ emissions: >35,000,000,000 tons
Solutions

Compact chemical plants that produce renewable hydrocarbons

\[ \text{Greenhouse Gas Recycling by INERATEC}^{\circledR} \]

\[ \text{CO}_2 + \text{H}_2 \text{ Power-to-X} \]

\[ \text{CH}_4 \text{ Gas-to-X} \]

\[ \text{Renewable Fuels and Materials} \]
Conventional

The existing technology is not the perfect match for renewables
Innovation

Most compact chemical reactor technology in the world
Products

Innovative compact chemical plants in containers
Processes

Power-to-Gas, Power-to-Liquid and Gas-to-Liquid

Chemical Energy Conversion

GAS-TO-LIQUID

POWER-TO-GAS

POWER-TO-LIQUID
Activities

Engineering, manufacturing and sale of turn-key chemical plants

Engineering

Plant construction

Commissioning & Services

+ Research
Various biogenic input feeds to refined biofuels
ICO2CHEM

Industrial CO2 conversion into renewable customer products
PtL/PtG project  Pilot plant installed in Finland in 2016
PtG project  Methanation pilot plant near Barcelona (2018)
PtKerosene

Integrated PtX plant for kerosene production (2018)
PtKerosene

Compact chemical pilot plant converts solar power and CO$_2$
Next Steps

First industrial-scale Power-to-Liquid plant worldwide in 2018

Audi e-diesel plant Laufenburg

1. Renewable electricity
   Renewable energy obtained from hydropower.

2. Electrolysis
   Electrolysis splits water into hydrogen and oxygen. Oxygen dissipates into the surrounding air.

3. Conversion
   A two-step process turns CO₂ and hydrogen into hydrocarbon chains.

Chemical synthesis
   In the first step, hydrogen and CO₂ are converted to synthesis gas in the reverse water-gas shift reactor. The Fischer-Tropsch reactor then uses this to build hydrocarbon chains.

Infrastructure compatibility
   e-diesel is compatible with existing infrastructure and engine technologies. It replaces fossil fuel.

Heat for use in residential areas or in industry.

Renewable waxes for cosmetics, foodstuffs and chemical industries

Almost CO₂-neutral e-diesel for mobility
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Products

Characteristics of the synthetic hydrocarbons

- CO$_2$-neutral production
- Sulfur-free
- 0 Aromates
- Increased burning efficiency

Wachs und Kraftstoffproben aus der INERATEC Pilotanlage

Erfolgreiche Spray-Verbrennungsversuche am DLR