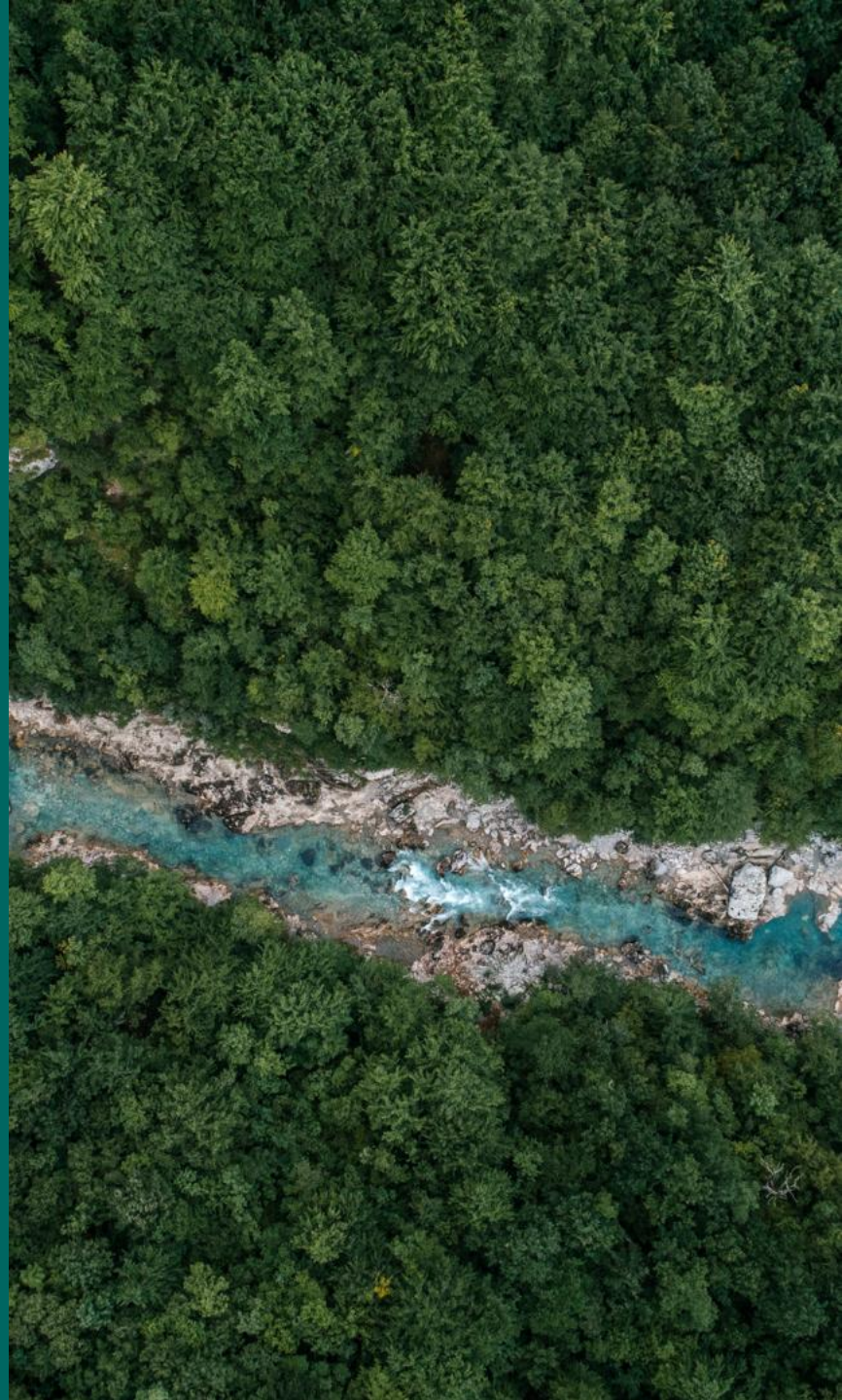
Purifying the path to a greener future: Clariant EnviCat™ offgas treatment technology



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BU Catalyst
Specialties Catalyst
29.10.2026

The 15th Five-Year Plan: A Profound Shift from Dual Control of Energy Consumption to Dual Control of Carbon Emissions

01.

Governance Transition

The Outline of the 15th Five-Year Plan clearly proposes replacing the indicator of "reduction in **energy consumption per unit of GDP**" with "**the share of non-fossil energy in total energy consumption**", shifting the governance logic from process management to structural optimization

02.

Intensity Control

According to "National 15th Five-Year Plan for Addressing Climate Change", CO_2 emissions per unit of GDP in 2030 shall be 17% lower than the 2025 level, which will be included in assessment as a binding target

03.

Mitigation of Non-CO_2 Greenhouse Gases

The "National 15th Five-Year Plan for Addressing Climate Change" identifies the mitigation of non-CO_2 greenhouse gases as a major initiative, with a target of building an emission reduction capacity of 30 million tons of CO_2 equivalent

Clariant Catalysts: Greater catalyst. Smaller footprint

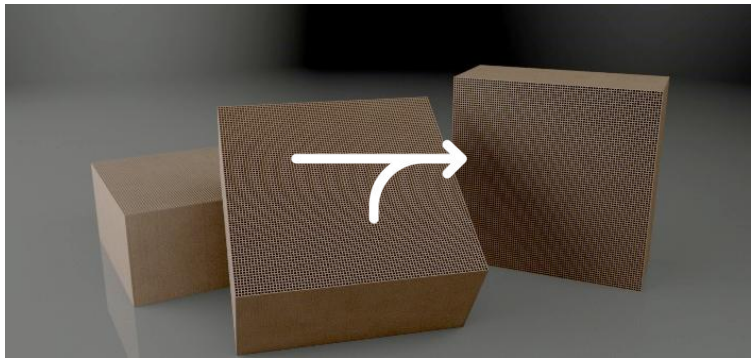
Clariant catalysts helped customers avoid more than 45 million tons of CO_2 eq emissions in 2025, equivalent to ca. 10 times Clariant Group's own total carbon footprint for the same year*

Clariant EnviCat™ catalysts is a significant contributor to the avoided emission, best embodying Clariant Catalysts' mission: Greater catalyst. Smaller footprint

With its broad product portfolio, Clariant supports customers in advancing toward the global climate neutrality targets

* Clariant recorded a carbon footprint of 4.31 million tons of CO2e in 2025 from continuing operations
* IEA, Iron and Steel Technology Roadmap, 2020
* Mission Possible Partnership, Net-Zero Steel Sector Transition Strategy, 2022
* IPCC Fifth Assessment Report, Climate Change 2014
* Multiple references worldwide using Clariant's catalysts in commercial operations.

Protecting the Environment at Every Stage
Clariant's EnviCat™ Emission Control Portfolio



Removal of Volatile Organic Compounds (VOCs) & Carbon Monoxide (CO)

Clariant's **EnviCat VOC catalyst series** enables catalytic incineration at lower T

- Cutting operating costs and equipment stress
- Converting CO, hydrocarbons (including formaldehyde, aldehydes, PAHs, NMHCs, VOCs, and TOCs) into CO_2 and water in lean burn applications
- **Have numerus industrial references**



Removal of Nitrous Oxide (N2O), Nitrogen Oxides & Ammonia (NH3)

Catalysts convert **harmful ammonia and nitric oxide emissions** into harmless N_2 and H_2O across a variety of processes

Our Catalysts solutions**:**

- EnviCat N2O-S (secondary N_2O abatement)
- EnviCat N2O (tertiary N_2O abatement)
- EnviCat Nox (remove NOx)
- EnviCat NSCR (remove both N_2O and NOx)



Purification Processes for Energy transition

- Enables **clean hydrogen & nitrogen production**
- Removes O_2 , hydrocarbons & NOx with precision
- Prepares **CO_2 streams for CCU & CCS**
- Work together with other Clariant portfolios to provide **tailor-made purification solutions**



1 N_2O Abatement

EnviCat N_2O portfolio: greenhouse gas abatement



66M tons of HNO_3 produced worldwide

N_2O emitted equals effect of 100M tons of CO_2

Same as annual CO_2 emitted by 21M cars

Case study: A big success for EnviCat

When installed at a European nitric acid plant producing 270 tons of nitric acid per day, our EnviCat N_2O-S catalyst substantially improved ammonia oxidation, reduced ammonia consumption, and removed over 95% of N_2O emissions.

The bottom line for the plant: annual emission cuts equivalent to over 14,000 tons of CO_2, as well as increased earnings of over 1M euros per year.

EnviCat N_2O-S



- **>95% N_2O removal**
- **"Drop-in" solution: easy to install with little or no engineering modifications**
- **Improve ammonia oxidation**

EnviCat N_2O



- **>99% N_2O removal**
- **converts other NO_x into harmless products**
- **> 15 years on-stream**

EnviCat™: Proven N_2 O abatement delivering measurable global impact

Global impact:

35+

global installations

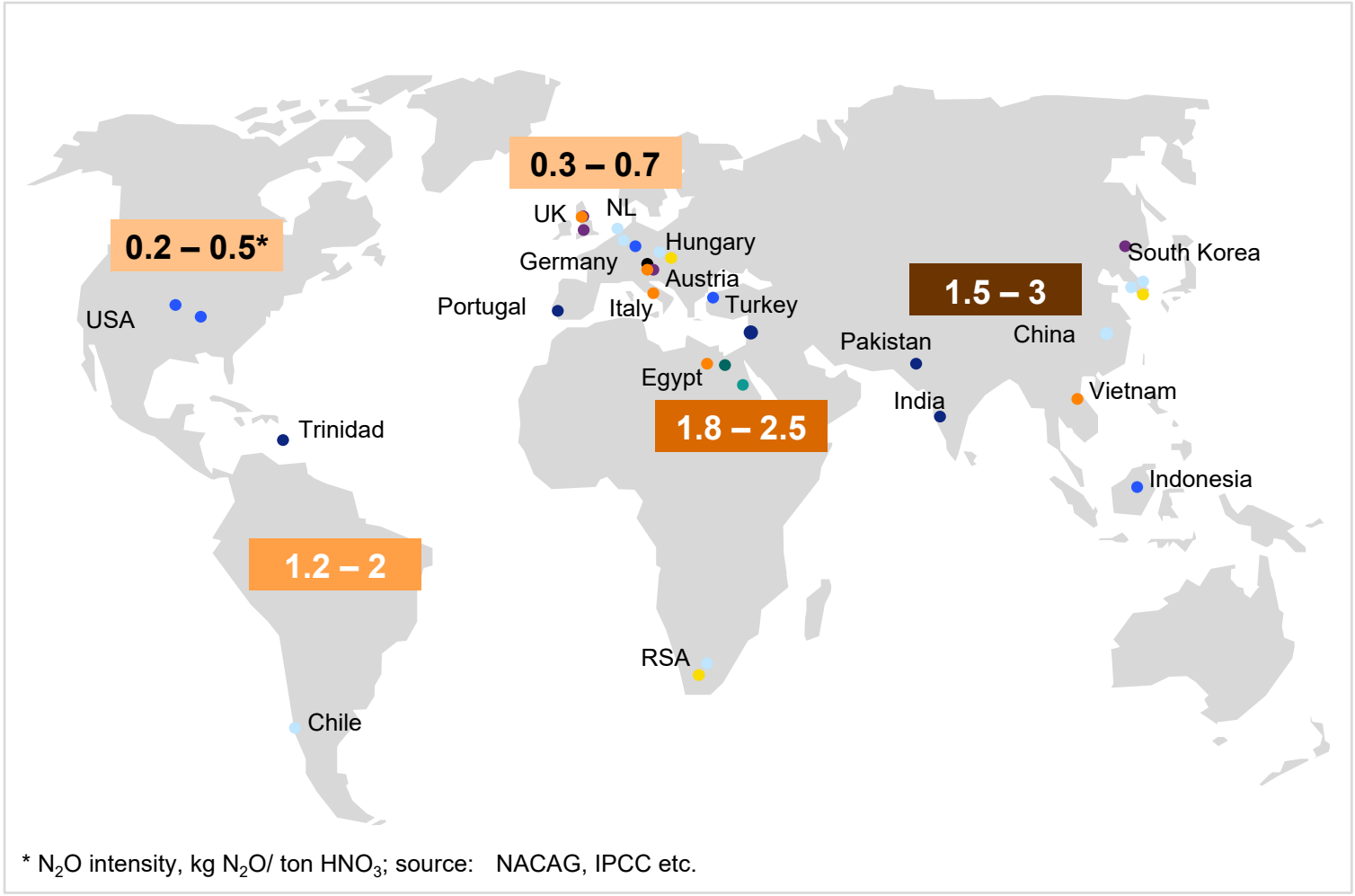
Environmental impact:

20Miot

CO_2 -eq reduction annually

- Convert N_2O into N_2 and H_2O
- **> 20 years experience** and solution provider
- **Versatile solutions** to fit for different operating conditions
- Temperature range of up to 600 °C, temperatures of even above 900 °C for secondary abatement
- **No ammonia slip** due to catalyst's ability to oxidize ammonia to nitrogen and water in tertiary abatement

+15 years on stream with emissions of < 30 ppmv



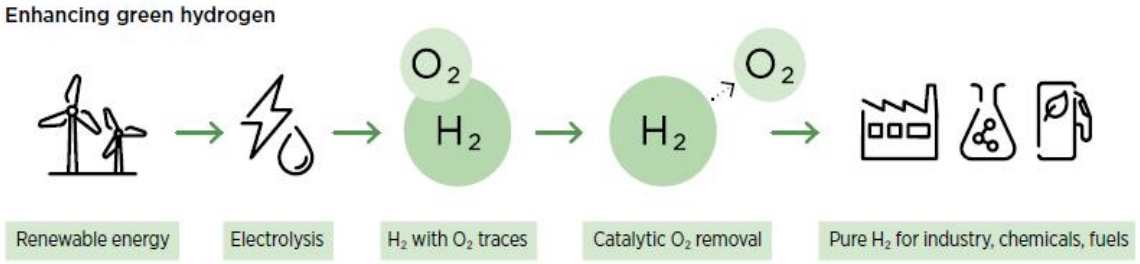
* N_2O intensity, kg N_2O/ ton HNO_3; source: NACAG, IPCC etc.



02

Green H_2 Purification

EnviCat Green : Make clean energy purer, more stable and more accessible



Clariant's EnviCat™ Green series catalyst chosen for major green ammonia project in China

- **The large-scale project aims to produce green hydrogen from renewable sources for conversion into green ammonia**
- **A deoxygenation catalyst from Clariant's EnviCat Green series will be used to purify hydrogen by removing trace oxygen from the feed**
- **The catalyst offers superior gas hourly space velocity, which requires a smaller reactor, thereby reducing both capital and operating expenses**

Reliable removal of impurities from H_2 produced by electrolysis: **oxygen, water, KOH** etc.

Efficient reduction of oxygen impurity down to 5 ppmv or even 0.1 ppmv, if required

Low inlet temperature and pressure drop, **reducing operating costs**

High mechanical stability and durability for **long-term service**, even under challenging conditions

High GHSV, **minimizing reactor size**



03

CO_2 Purification

Within the new CO_2 value chain, Clariant can offer individual purification solutions

CO_2 production → **Purification** → **Separation** → CCS → **CO_2 transport and storage**

CO_2 production

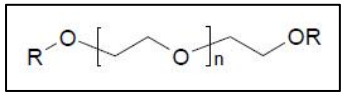
CO_2 emissions from various sources

Purification

Typical Impurities	BU CA sorbent materials
H_2	EnviCat series
H_2S	ActiSorb S2, S3, S5, S6, GP10x
O_2	EnviCat series
	ActiSorb O series
H_2S + COS	HyProGen GS 6
Organic S (COS, CS_2)	ActiSorb G1
COS, CS_2, HCN	ActiSorb 410, GP 405
H_2S + Mercaptans	ActiSorb S7 RS, S5
HCl, HF…	ActiSorb Cl 2, Cl 3

Separation

- Separation of CO_2 from mixed gas streams using solvents, solid sorbents, membranes, or cryogenics
  BU ICS – CO_2 solvents
- **Physical sorbents**



PEGs

- **Chemical sorbents**
  advanced amines and others

CO_2 transport and storage

- CO_2 is injected in saline aquifers or depleted reservoirs for storage or EOR
- Challenges: **low water, low oxygen (< 10ppm), low sulfur to prevent corrosion**

CCU (PtX) →

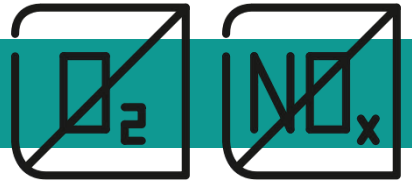
CO_2 Usage

- Challenges: **remaining impurities poison synthesis catalysts**
- CCU today much smaller than CCS market, but expected to grow significantly

Source: CO2captureproject.org, epa.gov Carbon Dioxide Capture and Geologic Storage, GLG expert interviews

CO_2 purification: O_2 and NOx removal (EnviCat Green + EnviCat NSCR)

Case study: APAC region





Application:

CO_2 Purification – O_2
and NOx removal with H_2

CO_2 source:
Chemical plant (details confidential)

Process Conditions:

- Pressure: 2.9 MPaG
- Inlet temperature: 90 °C

Gas composition	
NO	max. 10 ppm, ave. 5 ppm
NO_2	0.2 ppm
O_2	50 ppm
CO	10 ppm
NH_3	max. 5 ppm, Ave. 2 ppm
CO_2	balance
H_2 addition	100 ppm

EnviCat™: Turn environmental investment into asset value, and compliance pressure into growth opportunities

Reliable Partner

Over 20 years of expertise and > 1,000 global references deliver **proven, replicable and implementable engineering capabilities**

Scenario-based Customized Solution

We offer tailored solutions across oil, chemical, semiconductor and green energy transition sectors. Our broad portfolio addresses **diverse application scenarios on the same technology platform**

Deliver Sustainable Benefits

High-performance catalysts enable stable long-cycle operation and superior return on investment. They also generate **verifiable, quantifiable and tradable carbon abatement gains**



Purifying the path to a greener future：EnviCat™