

Higher efficiency for steam reformers WITH EARTH[®] TECHNOLOGY

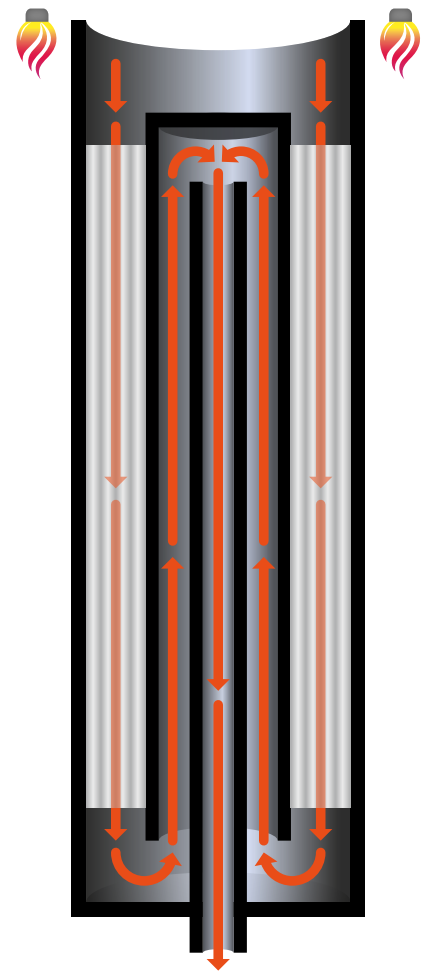


The **Enhanced Annular Reforming Tube for Hydrogen (EARTH[®]) and syngas production** is a drop-in insert consisting of a structured reforming catalyst and concentric flow tubes, installed in existing or new reformer tubes, to simultaneously achieve **higher throughput** and **heat recovery** in steam reformers.

EARTH[®] is a novel, recuperative steam reforming technology which facilitates efficient recovery of high-grade process heat, thanks to the unique geometric arrangement of a structured catalyst and concentric heat exchange tubes positioned inside the main reformer tube.

Technip Energies and Clariant have joined their collective expertise in process, heat transfer and catalysis technology to develop and deliver EARTH[®] technology to the market, comprising this proprietary geometric layout in combination with a **highly active, stable and mechanically robust catalyst** that promotes efficient and optimized heat transfer as well as low pressure drop.

The EARTH[®] reactor technology is advantageous for achieving a **capacity increase of up to +20 percent**, at otherwise constant reforming conditions with no or minor modifications on the steam reformer furnace and heat recovery system. Moreover, EARTH[®] enables energy efficiency and carbon footprint benefits compared to conventional steam reforming technologies, allowing for **up to 10 percent CO₂ emissions reduction** per unit of hydrogen produced.



PERFORMANCE BENEFITS



Reduced CO₂ emissions



High activity and low pressure drop



High heat transfer and heat recovery leads to improved furnace efficiency



Stable and robust catalyst with long service life



Tailor-made tube internals and catalyst

COMMERCIAL BENEFITS



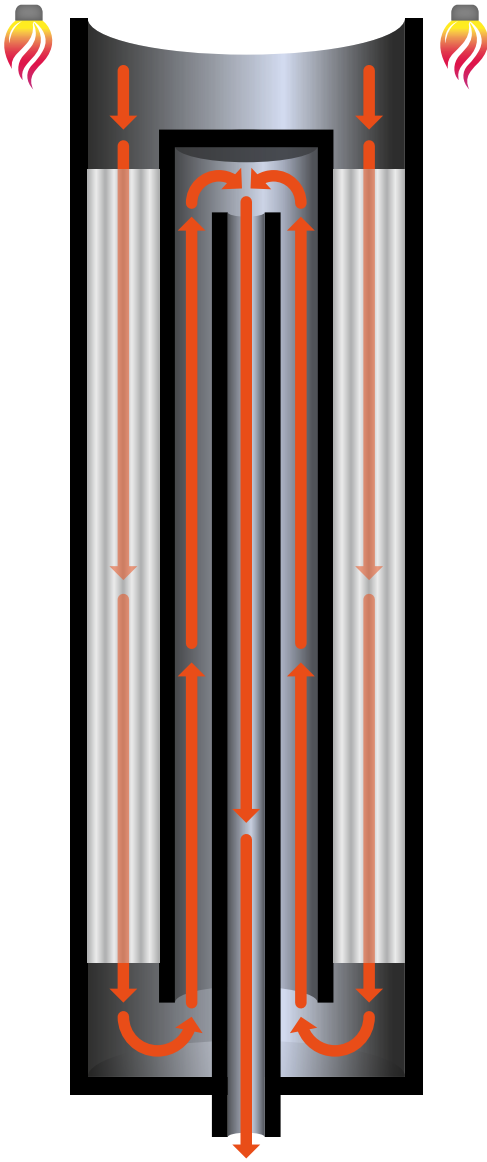
Capacity increase of up to 20 percent



Reduced feedstock and fuel



Reduced CO₂ emission penalty



ADVANTAGES

as demonstrated in reference unit

TECHNOLOGY	CAPACITY	EFFICIENCY (feed and fuel to H ₂)	CO ₂ FOOTPRINT PER Nm ³ OF H ₂	STEAM EXPORT
Conventional technology	Base	Base	Base	Base
EARTH® (achieved)	Same	-10% ↑	-10% ↓	-50% ↓
EARTH® (estimated)	+20%	↑	↓	↓

FUNCTIONALITY

While traditional steam reforming technologies degrade high-grade process heat to generate high-pressure steam, EARTH® offers the possibility to **utilize high-value heat to produce additional hydrogen, and/or to save energy** (and operating cost) by reducing the firing duty of the reformer.

The tradeoff between steam generation and energy savings may be easily optimized to meet the desired outcome.

EARTH® REFERENCE

EARTH® has already been implemented in industrial units for H₂ and syngas production, with significant benefits in terms of fuel savings and furnace efficiency compared to a conventional packed bed reactor.

KEY RESULTS ACHIEVED:



- **>30%** fuel savings
- **>10%** decreased CO₂ footprint
- **~20%** decreased pressure drop
- **>20%** increased furnace firebox efficiency, i.e. the energy absorbed by the conversion process versus the total energy liberated in the furnace
- **~50%** decreased steam export

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