ROX solution for Recuperative & Oxydative Reforming

The success of energy transition calls for new thoughts, technologies and relationships. To this end, Casale and Technip Energies have created ROX, a breakthrough solution for low-carbon hydrogen production at large scale, part of our BlueH$_2$ by T.EN suite of solutions.

Technip Energies and Casale have a long-standing relationship, going back to the 1980s, with numerous achievements in the syngas and hydrogen space. Our partnership will jointly license oxidative, reforming-based technologies, allowing clients to produce low-carbon hydrogen. Plant size will range from mid-to-large scale and achieve up to 99% captured carbon.

Oxidative reforming (ATR and POx) are processes to produce syngas that contains hydrogen, CO and CO_2. They become cost-effective for low-carbon hydrogen when combined with carbon capture technology and are very suitable for larger-scale facilities.

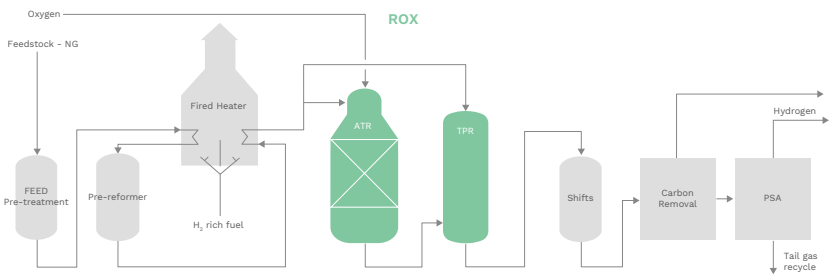
As part of this collaboration, Technip Energies and Casale will be co-licensors of and will offer Process Design Packages (PDP's), the associated proprietary equipment, or entire plants.

Optimized Flowsheets

ROX flowsheet is optimized with state-of-the-art proprietary equipment to achieve decarbonization of up to 99% CO_2 capture. Core contributions are from careful choice of process parameters around the operation of the Casale ATR and Technip Parallel Reformer (TPR®). Choice of Steam-to-Carbon ratio's, effluent temperature & oxygen ratio influence the methane slip. Lower slip results in less use of natural gas, thus reducing the carbon used in the process. Use of a Pre-reformer & TPR® in the process scheme reduces the duty of the ATR, in turn reducing the oxygen demand, thus producing lower Scope 2 emissions from the Air Separation Unit (ASU). As feed preheats are essential to the process, utilizing a small quantity of the produced hydrogen as fuel in the Large Scale Vortex (LSV®) burners can lower the carbon footprint by up to 99%.

ROX's key performances

- Flexible carbon capture
- High production capacity
- Reduced consumption and optimized efficiency
- Minimized excess steam



Oxidative Reforming Processes

Autothermal Reforming (ATR) with the Technip Parallel Reforming (TPR®) is used for synthesisg as generation and offers a simple process layout for large-scale production:

- Plot area and construction costs are reduced because of the compact design,
- Utra-high capacity can easily be achieved in a single train design.

The ATR reactor is based on the use of pure oxygen burners installed in a combustion chamber followed by a catalytic bed all housed inside a pressure vessel lined with refractory material. Thanks to Casale and Technip Energies' deep knowledge in partial oxidation kinetics, proven technologies and tailored process solutions, the performance of the ATR achieves the best possible conversion of natural gas to syngas.

A good ATR design begins with a good burner design based on sound scientific principles. Our technology allows improved mixing between oxygen and process gas resulting in a short flame, thus increasing the distance between the flame tip and the catalytic bed while reducing the overall length of the reactor. For added safety and longer operating life, the whole burner body including the tip is water cooled, for highest safety level.

Value for clients

Technip Energies and Casale together bring unique strengths for improved project performance with Casale's four decades of experience in developing and applying advanced ATR and POx technologies combined with T.EN's 60 years of experience in hydrogen market and technology, having designed and executed more than 30% of the installed global capacity.

ROX key benefits

- Cost-effective and flexible solution for low-carbon hydrogen production.
- T.EN's leading reforming technologies, including eSMR, TPR, EARTH and H_2 burners
- EPC experience and cost and schedule certainty
- Technology design to delivery.
- Reduced feedstock and energy consumption
- Optimized CAPEX & OPEX
- Lowest Levelized cost of hydrogen (LCOH)

100+
YEARS COMBINED EXPERIENCE

275+
T.EN HYDROGEN PLANTS DELIVERED

15
CASALE ATR REFERENCES

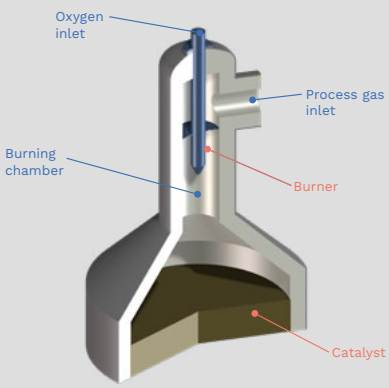


Fig. 1 ATR arrangement

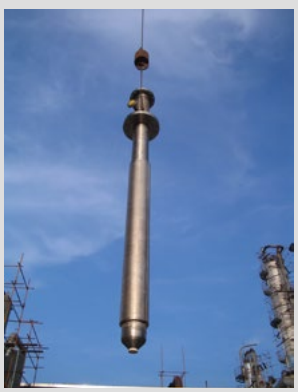


Fig. 2 ATR burner


Fig. 3 installed ATR

Technip Energies:
Vinay Khurana
vinay.khurana@ten.com
www.ten.com

Casale:
Ermanno Filippi
e.filippi@casale.ch
www.casale.ch