METHANOL

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SynPOWER-M

Casale's combined reforming process for large scale Methanol plants

CASALE

We are a global partner in the chemical industry, offering **integrated technologies, engineering, contracting and construction solutions** for over a century.

Our mission

Contribute to shape a new sustainable planet with our plants for the production of fertilizer, methanol, hydrogen, melamine and derivatives, and help our customers creating value respecting the environment.

We are a global company front leader in the energy transition: a key player in the sustainable transformation of the chemical and energy industry, from a social, economic and environmental point of view.

Our values

INNOVATION PEOPLE CARE **PROFESSIONAL EXCELLENCE**
QUALITY **SAFETY** ETHIC **SUSTAINABILITY**

METHANOL

SynPOWER-M

SynPOWER-M is Casale process for traditional methanol plants, based on steam-methane reforming (SMR) of natural gas. The process can be customized to meet specific Client's needs as well as easily integrated in any downstream unit. If any CO_2 stream is available at battery limits it can be used as additional feedstock to boost the production. The process is extremely flexible, and it may be adapted to meet specific market needs and/or customer requirements.

Capacity

- Best suited from **3000 MTD** to **10000 MTD** of grade AA methanol, or grade A or IMPCA

Performances

- Energy consumption: **7 Gcal/MT** on LHV basis, including ASU consumption
- Demi-water net consumption: as low as **0.1 t per MT** of methanol

Benefits

- Low energy consumption
- Reduced CAPEX
- The steam balance can be optimized from zero export to maximum export, utilizing the excess of steam for power production
- Compact and simple lay-out, with all sections arranged in a way to minimize the overall footprint as well as optimize the connections across the different sections of the plant

Casale technical assets

- Casale design of primary reformer
- Auto-Thermal Reformer reactor and burner
- Pre-Reformer
- IMC® converter (steam rising)

Enviromental Impact

Total CO_2 emissions to atmosphere, per ton of methanol produced:

- less than 0.3 CO_2 / methanol
- less than 140 mg/Nm³ of NOx or even lower than 50 mg/Nm³ installing the SCR in primary reformer convection section.

PROCESS OUTLINE

SYNGAS GENERATION THROUGH COMBINED REFORMING

The incoming natural gas is desulfurized and sent first to a Casale Axial-Radial® pre-reformer whose purpose is to reduce the duty of the next reforming step.

The natural gas feed is desulfurized and then sent first to a Casale Axial-Radial® pre-reformer and then split in two parallel streams: one goes to a conventional steam reformer, the other is added to the primary reformer effluent and the mixture undergoes a final reaction step in an oxygen-blown Auto-Thermal Reformer (ATR).

The composition of the syngas so generated is balanced for methanol synthesis.
This combination of different reforming steps optimizes the energy consumption, the syngas composition and the plant cost, including the Air Separation Unit (ASU).

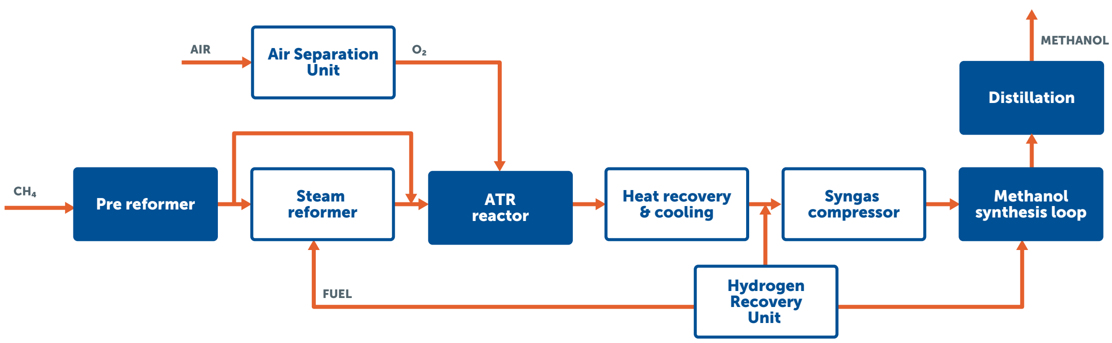
HEAT RECOVERY AND COMPRESSION

The hot syngas passes through a series of heat exchangers to efficiently recover heat by generating steam and then compressed to the optimal pressure for methanol synthesis.

METHANOL SYNTHESIS

The compressed stream is mixed with the loop's recycle gases at the discharge of the circulating compressor and routed to the converter feed/effluent heat exchanger where it is heated up to converter inlet temperature.

The preheated feed gas enters the highly efficient, Casale patented IMC® converter (Isothermal Methanol Converter). A notable feature of this design is its proprietary, hollow heat-exchanging plates. These plates are embedded in the catalyst and serve the essential function of removing the reaction heat by generating medium-pressure steam through a circulation of hot boiler feedwater within the plates. The paramount advantage of this configuration lies in its ability to maintain the catalyst temperature at a nearly constant level, closely aligned with the optimum value for methanol synthesis.



REACTION HEAT RECOVERY AND METHANOL SEPARATION

The hot effluent from the converter is firstly routed to the feed/effluent heat exchanger, then to the distillation's topping column reboiler and finally to the trim condensers where final condensing temperature is reached.

The crude methanol is separated in the high-pressure separator, then is let-down to the low-pressure separator where the dissolved vapors are washed by a stream of water and methanol from purge gas washing column. The flash gases from the low-pressure separator are used as fuel in reforming section, while the crude methanol is sent to the distillation section.

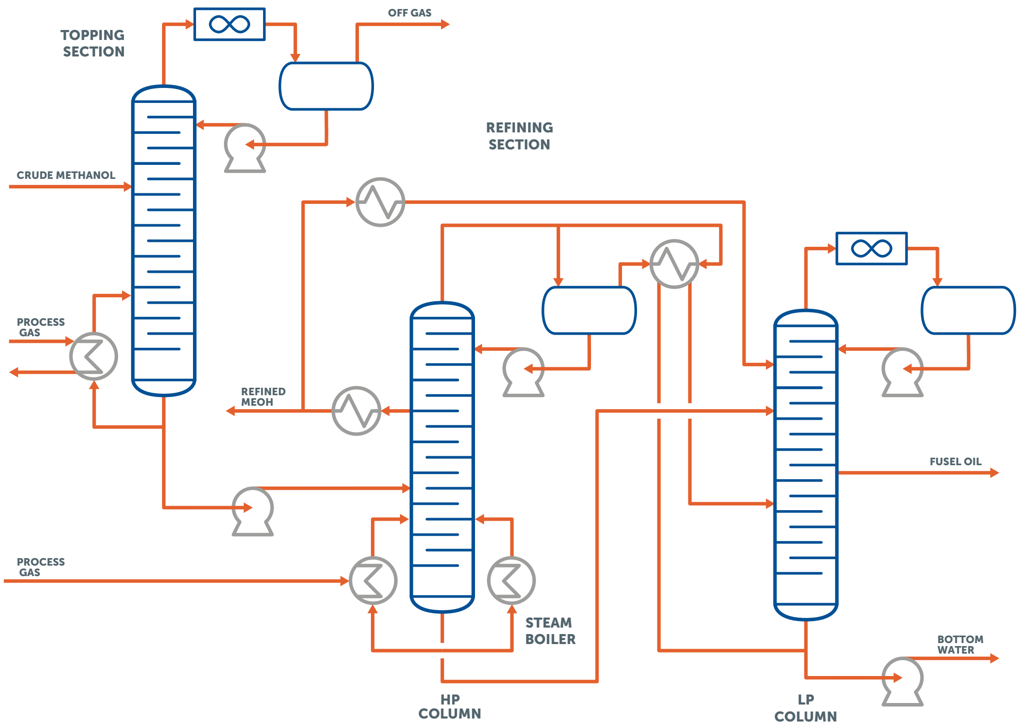
From the high-pressure separator, the vapors containing non-converted reactants are recycled back to the synthesis loop through the syngas compressor circulator. A stream of purge gas is removed from the recycle gas to control the inerts' concentration in the synloop and it is washed in column by a stream of bottom water from the distillation section to recover the traces of methanol. The washed purge gas from the top of the column is sent to the Hydrogen Recovery Unit (HRU) to recover as much as possible of the hydrogen, thus reducing the size of the primary reformer.

The tail gas from HRU unit is sent, as fuel, to the primary reformer.

DISTILLATION SECTION

To achieve AA grade methanol, the purification of crude methanol is accomplished through a two-step distillation process: the topping column isolates lighter compounds, while the refining section separates water and higher-end impurities.

The refining section consists of two distinct columns: one pressurized and the other operating at atmospheric conditions. This configuration minimizes the energy required for distillation, making it the most energy-efficient option.



FEATURES IN DETAIL

At its core is the Casale IMC® (Isothermal Methanol Converter):

- the heat of reaction is continuously removed by heat exchanging plates embedded in the catalyst, generating steam
- its internal cooling system is more efficient and requires less maintenance compared to older designs, like tube-cooled converters, even in large units.

High conversion rates in the Casale IMC®:

- lead to lower gas recycle rates
- allow for reduced equipment sizes in the loop
- enable the use of a single converter for capacities up to 8000 MTD, thanks to IMC technology.

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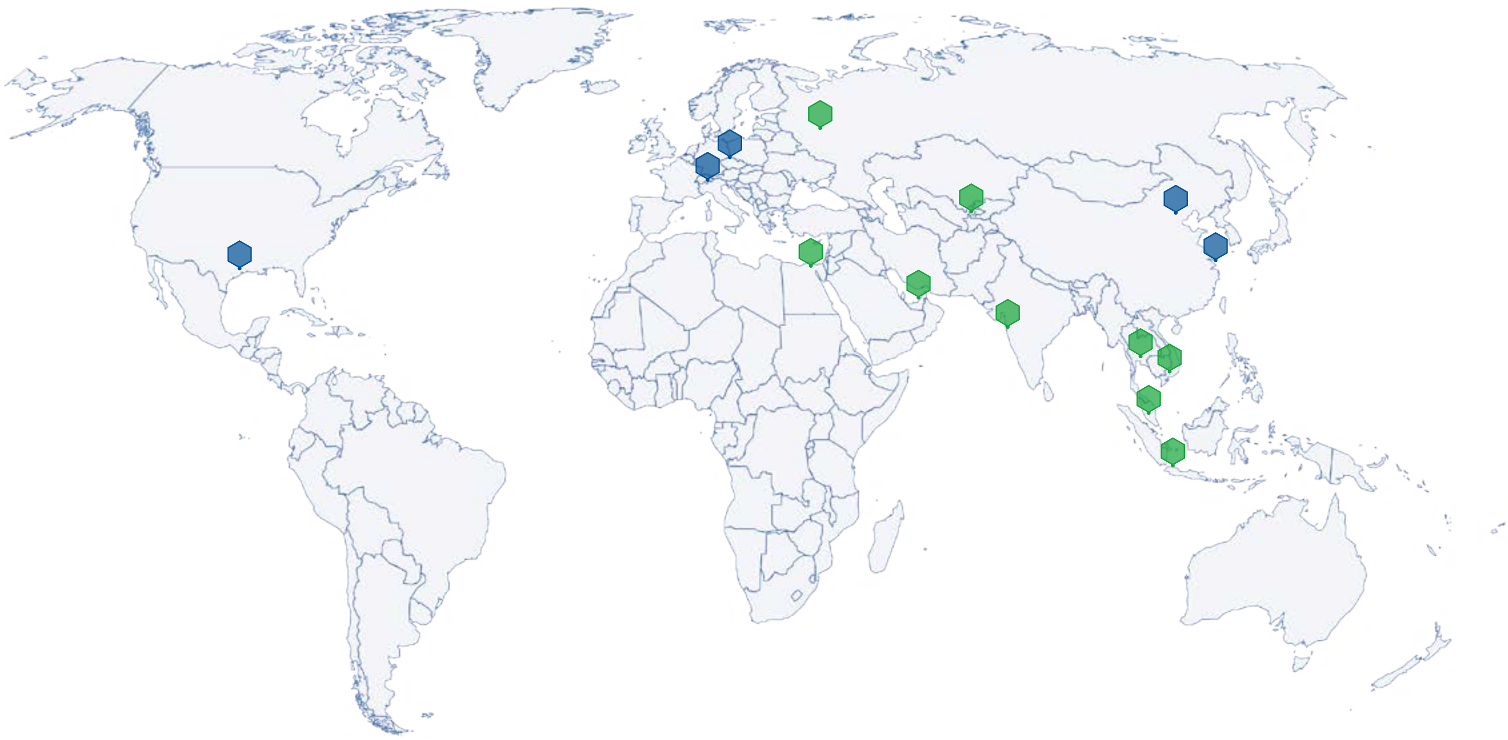
PLANTS FOR
A NEW PLANET.
SINCE 1921.

Casale in the world



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