HYDROGEN

FLEXIGREEN®

HYDROGEN

MACH$_2$

Mega Ammonia Cracking H_2 technology

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**

HYDROGEN

$MACH_2$

$MACH_2$ is Casale's proprietary ammonia cracking process to convert ammonia into hydrogen for sustainable applications. The technology leverages Casale leading position in ammonia technology making it the most reliable and efficient solution available on the market. It is devised to fit a broad spectrum of hydrogen plant capacities, offering the highest single train plant capacity - exceeding 1300 MTD - while delivering exceptionally pure hydrogen.
$MACH_2$ process scheme can be customized and optimized according to the client's needs (optimizing CAPEX or OPEX), acting on different operating parameters and plant optimization: steam export, power generation or co-generation, which can be easily integrated in the Casale $MACH_2$ ammonia cracking technology.
$MACH_2$ technology has been developed in strict cooperation with leading Catalyst Manufactures.

Capacity

- From **5 MTD** to **1300+ MTD** of H_2 with single train configurations

Enviromental Impact

Carbon Intensity, kg of CO_2 per kg of H_2:
• from 0 to 0.6[3].

Performances

- H_2 purity up to grade **5 (99.999%)**
- H_2 efficiency[1] from NH_3: **up to 96%**[2]
- H_2 product pressure: **over 40 bar** without H_2 compressor

Benefits

- Market leader in H_2 single train capacity
- Highly reliable
- Very high plant efficiency
- Tailored and customized solution
- Compact design
- Catalyst agnostic design to ensure performance, flexibility & lowest cost

(1): Defined as the % of NH_3 effectively converted into H_2 at the battery limits, the balance converted ammonia (Tail gas) is used as fuel.

(2): Depending on the selected process scheme.

(3): Low carbon case scheme.

Casale technical assets

- Ammonia Cracker Unit
- Expertise in metallurgical selection in NH_3 environment process optimization
- Strong ammonia cracking plant modularization expertise

PROCESS OUTLINE

The liquid ammonia from storage is first vaporized and preheated up to the temperature required for the reaction.
The preheated ammonia is then sent to the core unit, the ammonia cracking unit, where the ammonia decomposition takes place. The resulting gas is finally sent to the hydrogen purification section consisting in well-know and proven technologies commonly used in different industrial processes:

- ammonia Recovery Unit: based on H_2O/NH_3 absorption & distillation technologies where the unconverted ammonia is recovered and recycled
- hydrogen Pressure Swing Absorption (PSA) unit where the H_2 is recovered and purified up to the required level.

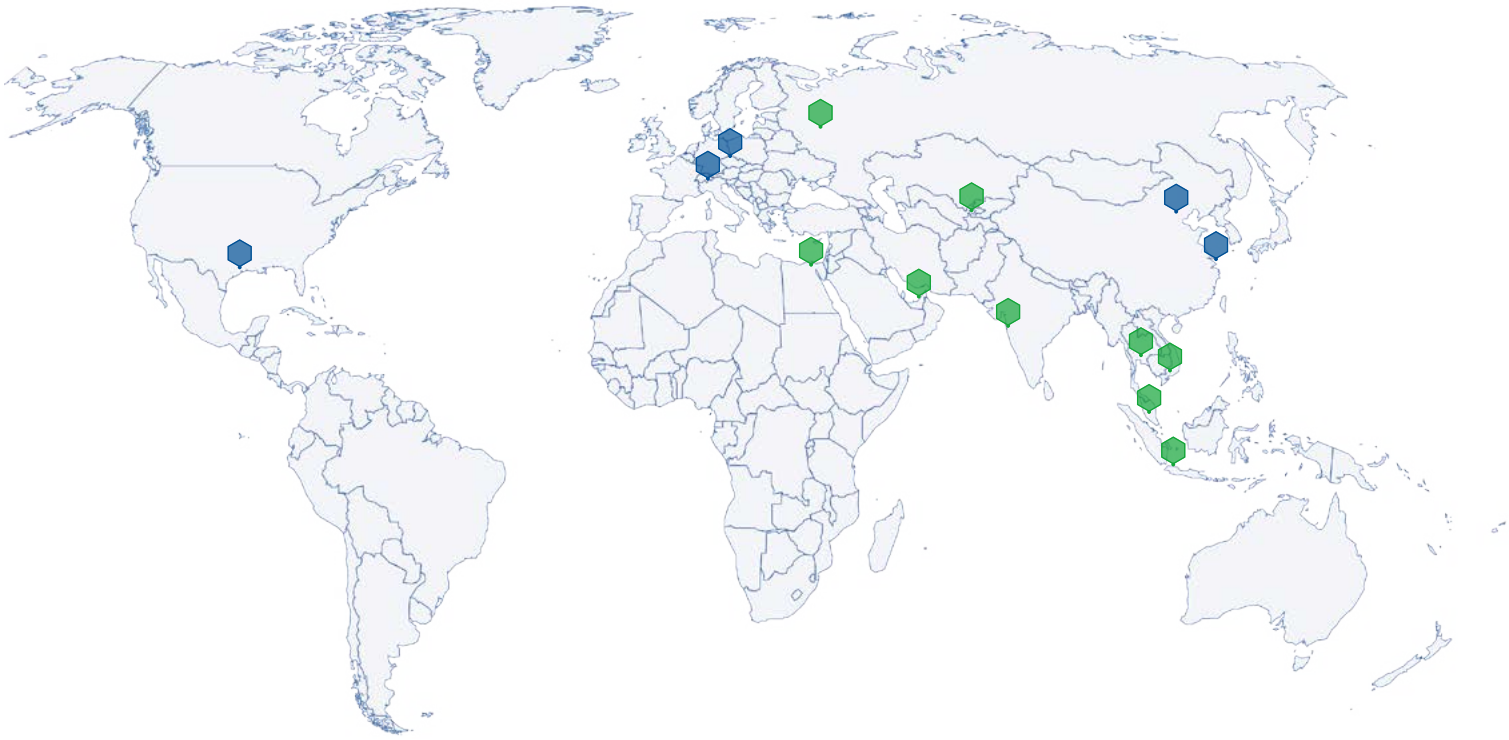
The Ammonia Cracking Unit configuration is selected according to the plant capacity and performances.

MACH$_2$ technology simplified scheme

PLANTS FOR
A NEW PLANET.
SINCE 1921.

v.01.04.24

Casale in the world



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