Retrofitting Grey to Blue and Green – Making Net-zero Ammonia Possible

R. Ostuni - AEA Phoenix 16 November 2022 CASALE

PLANTS FOR A NEW PLANET. SINCE 1921. Casale delivers technologies to the ammonia chain covering >95% of current markets.



Dedicated to support customers representing 38% of the global ammonia footprint.



Near-Zero retrofits to trigger the Ammonia Sector Transition.



**CO $_2$ emissions intensity includes scope 1 and 2 only.

(1) MPP Explore pathways to net zero ammonia, 2022

First milestones for the production (2)



(2025) "Transitional" capacity implemented 10-27Mt/y.

(2025-27) Appearance of "near-zero" capacity with scope 1&2 emissions reduction -92%-99%.

(2030) "Near-zero" capacity implemented 48-118Mt/y by newbuilds plus retrofits.

(2) MPP – Ammonia sector Explore pathways to net zero ammonia, exhibits 2.2, 2.6

The Scenarios to Net-Zero Ammonia Sector by 2050 (1)

Retrofit - opportunities

- Solutions for near-zero blue and green ready & aligned with milestones of the scenarios.
- 500+ plants without cannibalizing newbuilds.
- Decarbonize at lower capex and faster. Also, possibility for capacity increase (+30% +50%), market expansion, gas savings.
- Lower scope 1&2 emissions of fertilizer chain.

Challenges

- Shorter ROI vs residual asset lifetime.
- Specificity & limitation of existing plant requires a tailored design.
- Slimmer retrofit opportunities than newbuilds.



Australian green retrofit for 100% emission-free ammonia.



Project Status: Front End Engineering Design



-100% scope 1&2 CO₂ emissions -0.7Mt/y +30% capacity increase : 900 MTD to 1'150 MTD



Front end replacement with electrolysis – 50kt/y green H₂ Revamping of the loop & converter



NEWS Ammonia Revamping from Grey to Green

https://www.casale.ch/news/ammonia-revamping-from-grey-to-green



Blue Ammonia and Urea retrofit with CO₂ utilization for Melamine.





Existing 500+ plants are an opportunity to expedite the decarbonization of the ammonia industry.



Experience of Casale with Green and Blue ammonia retrofits provides confidence to reach reported by MPP 92-99% emission reduction – matching newbuilds – and aligned with the early implementation milestones of the MPP scenarios.



Near zero retrofits (green and blue) can cumulate emission reduction at less capex per ton decarbonized, with additional benefits of increased capacity (+30% +50%), market expansion, reduced natural gas consumption, and decarbonization of the fertilizer chain.



Retrofits impose challenges of shorter ROI and specific plant needs, which require a tailor made approach to the lowest cost of reducing emissions. Number of retrofit opportunities for near zero retrofits is today slimmer than newbuilds – both are needed.



Casale retrofit solutions linked to the needs of Ammonia Sector Strategy to decarbonization in the MPP report.

Plant updating Process Optimization Equipment Upgrade Site integration

Reduce scope 1&2 emissions ammonia plant

Increase low-carbon ammonia capacity

Reduce gas consumed per ton of ammonia

5...15% avoided CO₂ emissions (*)

0...30% increase (*)

5...10% reduction (*)

CO₂ capture

Blue Retrofit

Flexiblue®

>95% captured CO₂ emissions (*)

0....50% increase (*)

Green retrofit Flexigreen® Injection of green H₂ Max use of green kWh

10...100 % avoided CO_2 emissions (*)

0...30% increase (*)

0...20% reduction (*)

10...100% reduction (*)

(*) Reported values for a typical case. Contact Casale to assess benefits to your plants. Contact: Federico MAFFIETTI - Green Technologies Business Development Manager – f.maffietti@casale.ch

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