NEXTCHEM

UNFOLD
STAMICARBON
15TH SYMPOSIUM 2026

NEXT GENERATION NITRIC ACID PRODUCTION

Paz Muñoz

AGENDA

01

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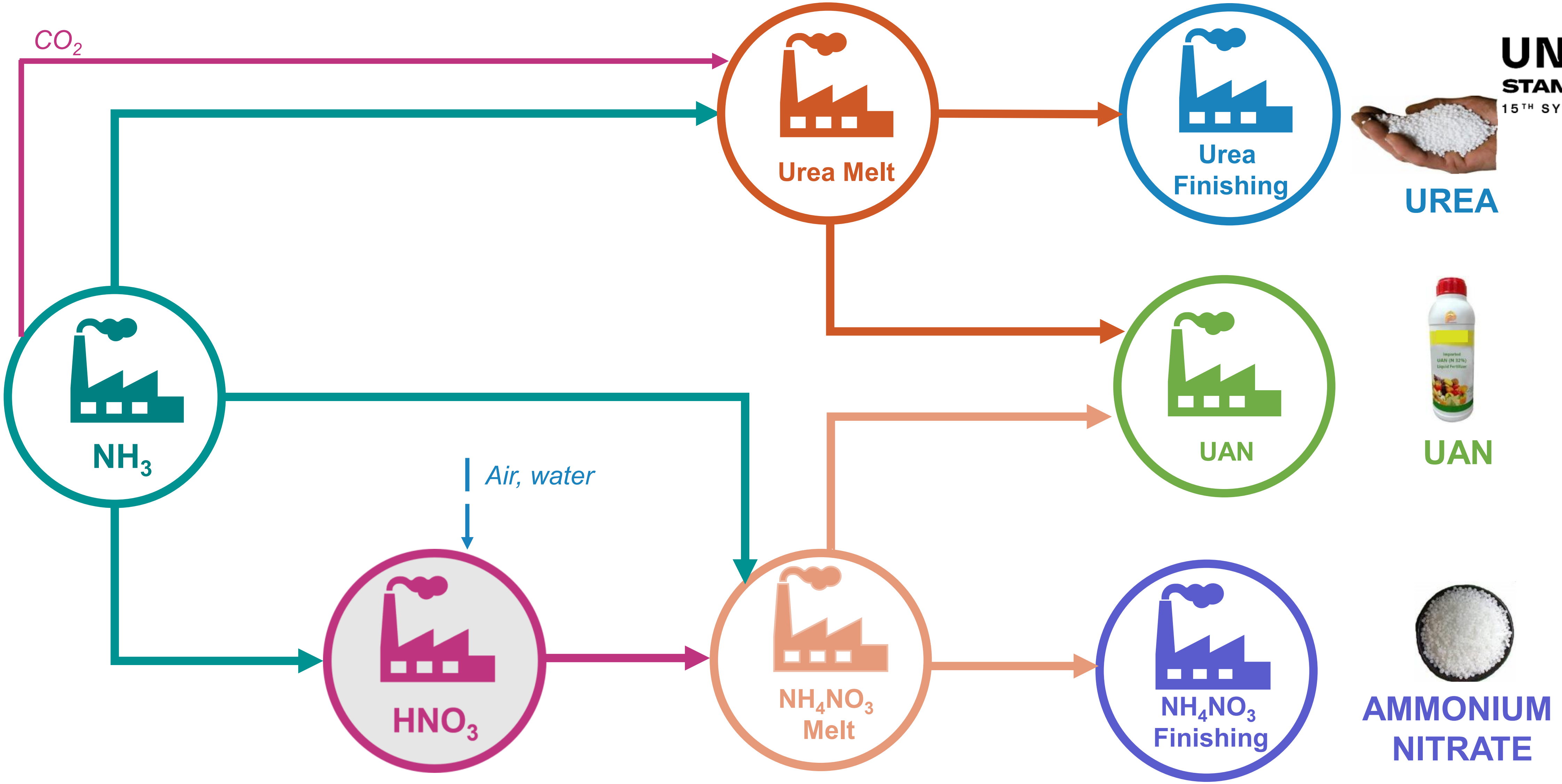
15TH SYMPOSIUM 2026

INTRODUCTION

AMMONIA TO FERTILIZERS



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HOW IS NITRIC ACID PRODUCED?

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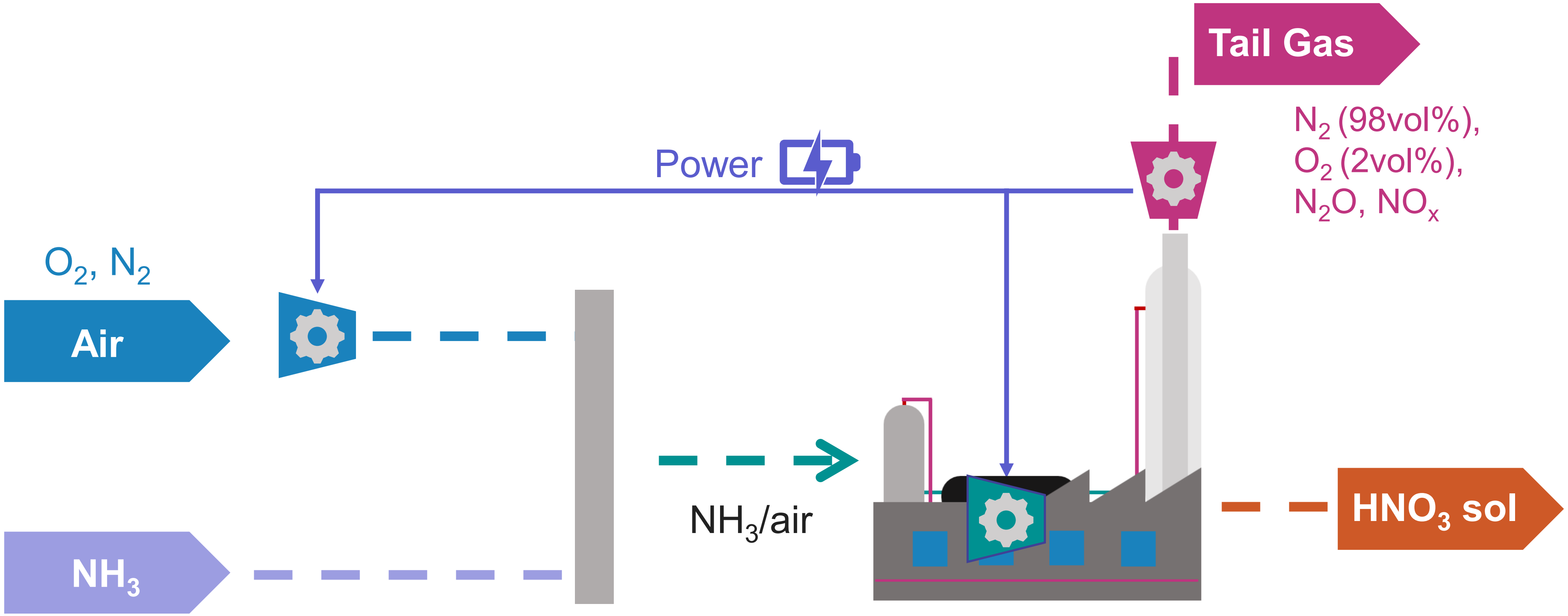

STAMI NITRIC ACID PRODUCTION TECHNOLOGIES

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	MONO PRESSURE	DUAL PRESSURE
Capacity		
N. Equipment		
CAPEX		
OPEX		

STAMI NITRIC ACID PRODUCTION TECHNOLOGIES

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High Energy Efficiency

> 800kg steam/ton HNO_3

Low NO_x/N_2O Emissions

<20ppm(vol)

Long lifetime

Low Corrosion Rates

More power extracted in the tail gas expander

Pinch-optimized HX layout.

Tertiary abatement technology

Smaller catalyst bed

No addition **of natural gas** due to high tail gas temperature (480°C):

$$2N_2O \rightarrow 2N_2 + O_2$$

Minimizing condensation/(re)evaporation effect

No use of **exotic materials**

STANDARD NITRIC ACID PRODUCTION

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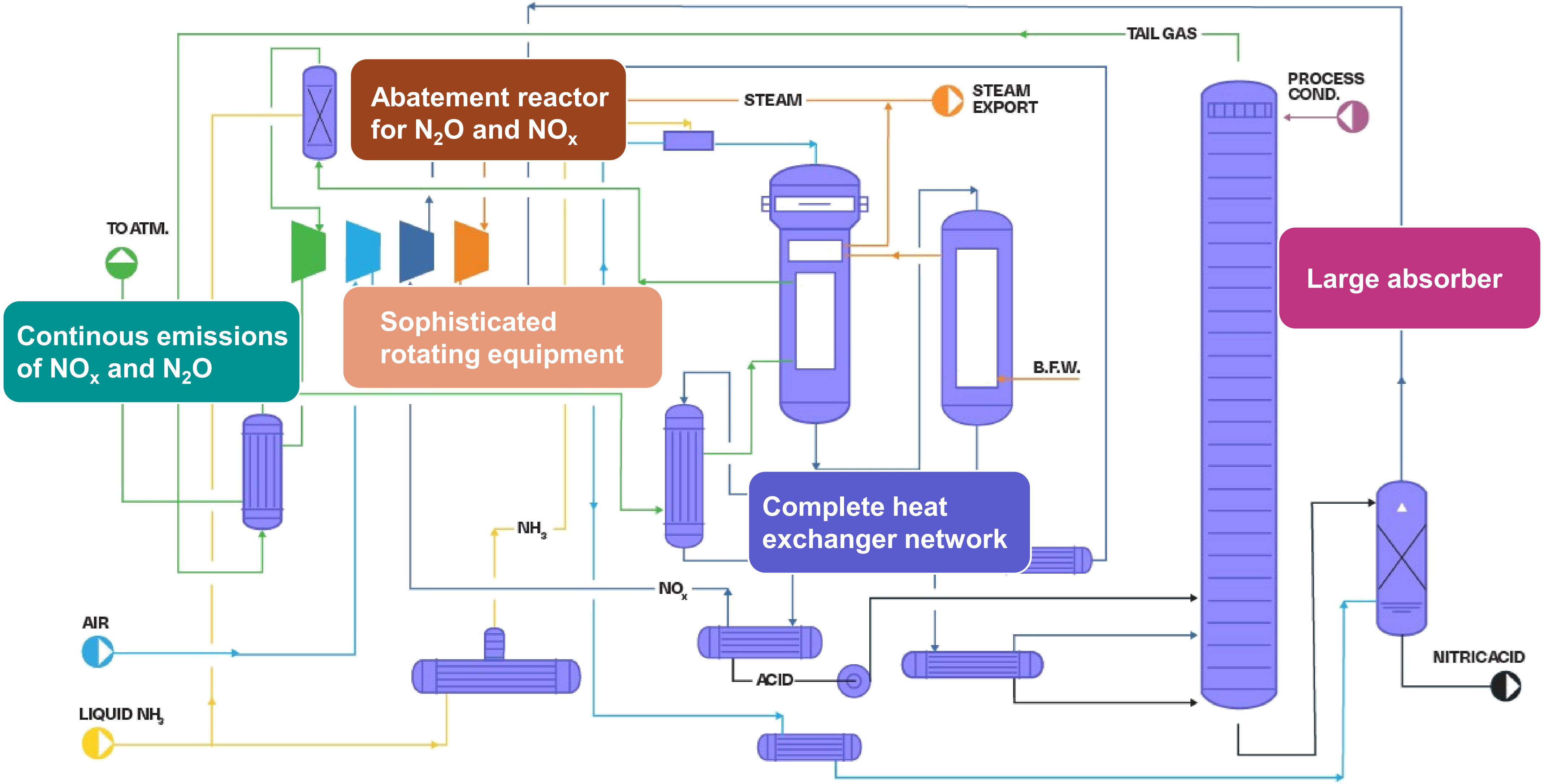

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TOTAL RECYCLE CONCEPT

HOW IS NITRIC ACID PRODUCED?

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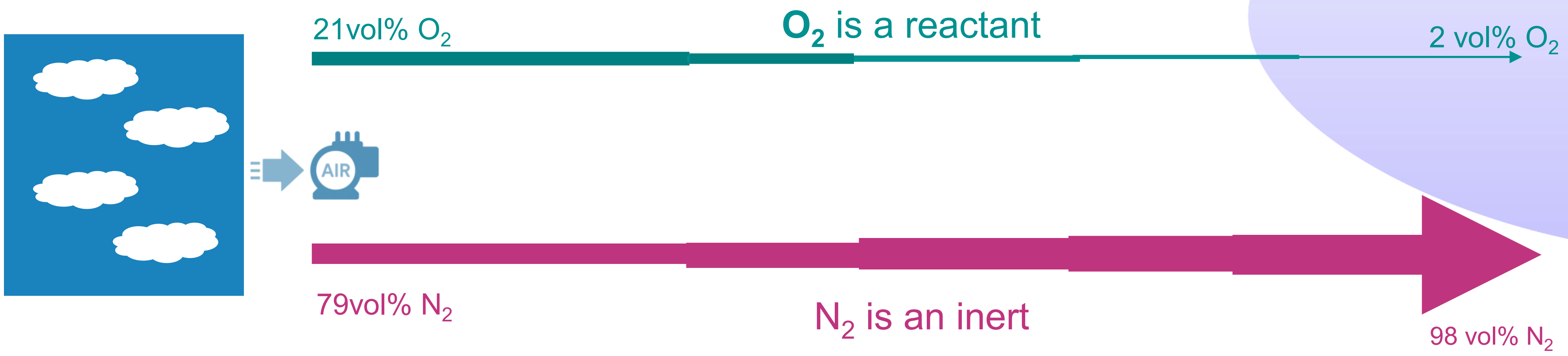
NH_3 —(*Pt/Rh catalyst*, O_2)→ NO —(O_2)→ NO_2 —($+H_2O$, O_2)→ HNO_3



TOTAL RECYCLE CONCEPT

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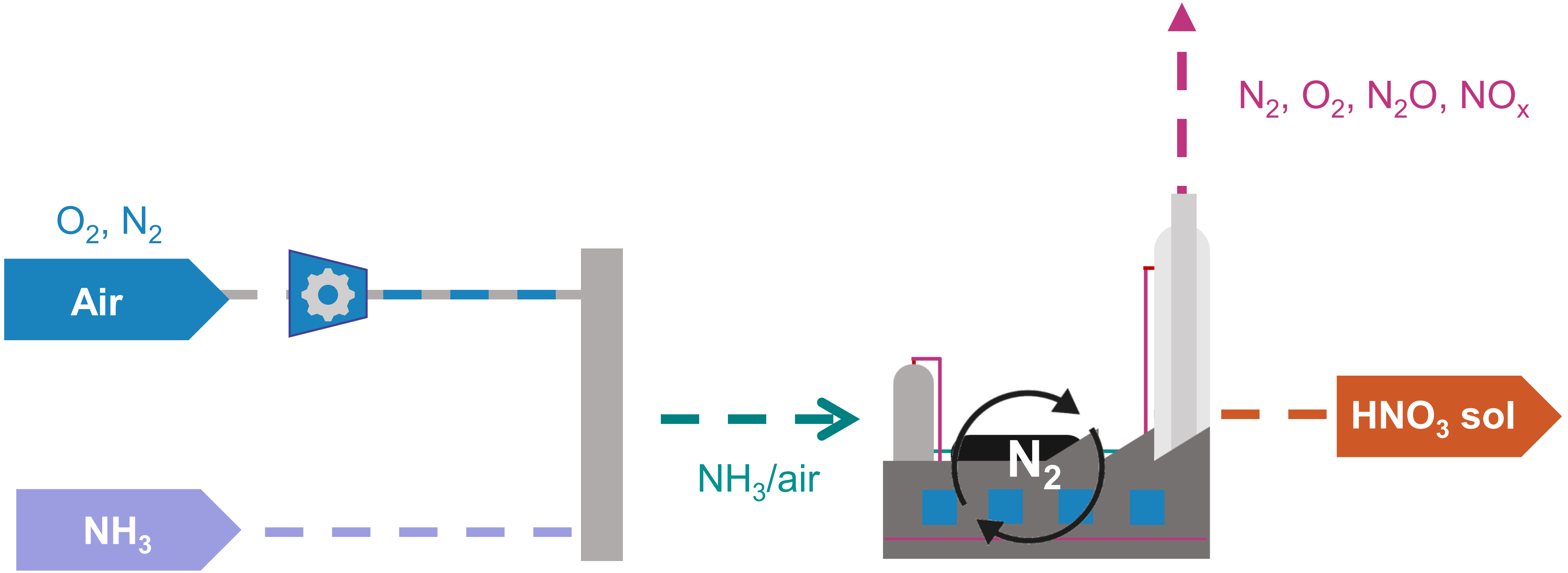

TOTAL RECYCLE CONCEPT

N_2

O_2/N_2 mixture

Pt/Rh gauzes

900°C

$4NH_3+5O_2 \rightarrow 4NO+6H_2O$

Secondary N_2O abatement:
$2N_2O \rightarrow 2N_2 + O_2$

$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$

$4NH_3 + 4O_2 \rightarrow 2N_2O + 6H_2O$

$2NO+O_2 \rightarrow 2NO_2$

$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

60°C, approx. 45wt%

Process gas with
high O_2 content

TOTAL RECYCLE CONCEPT

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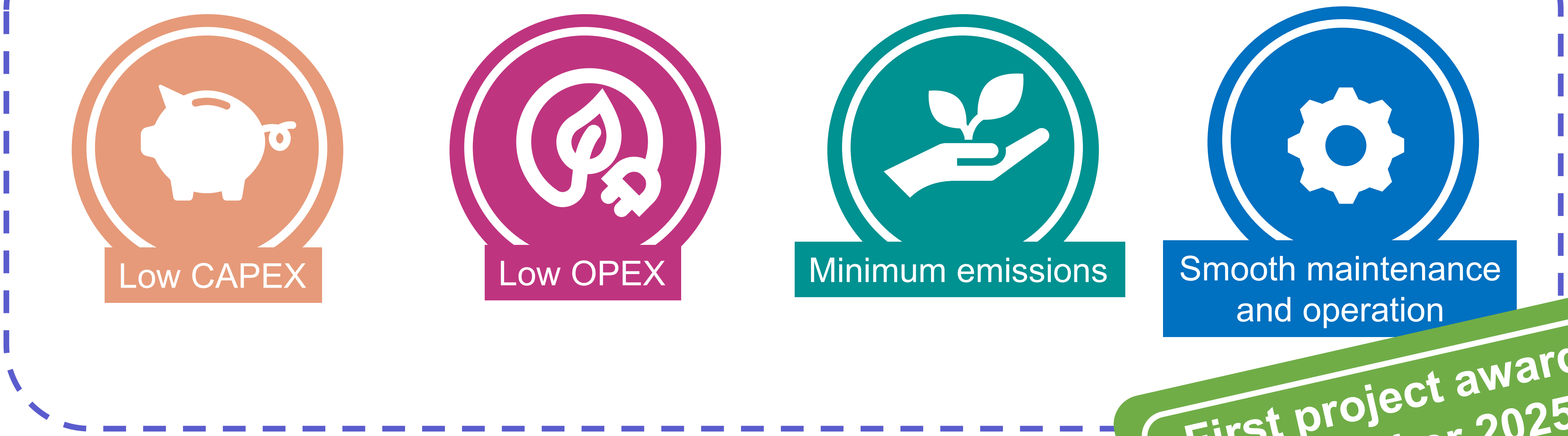
N_2

Mono-pressure technology (**8bara**)



First project awarded in December 2025

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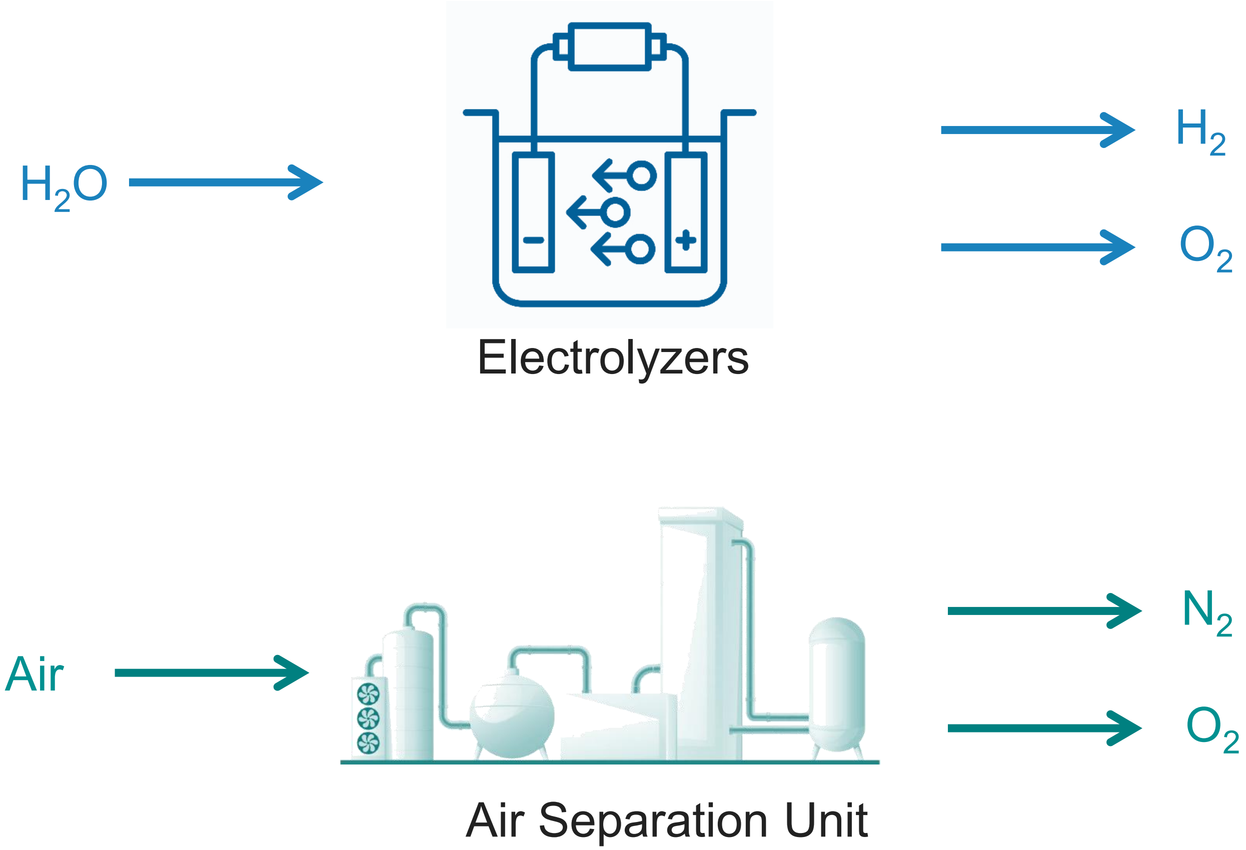
OXYGEN SUPPLY

OXYGEN SUPPLY



THE COLORS OF AMMONIA PRODUCTION

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Grey Brown	Natural gas/Coal as feedstock (SMR/coal gasification/POX)
Blue	Natural gas as feedstock with CO_2 capture (usually CPO or ATR technologies that include ASU)
Pink	Electrolysis powered by nuclear energy
Green	Electrolysis powered by renewable energy

THE COLORS OF AMMONIA PRODUCTION

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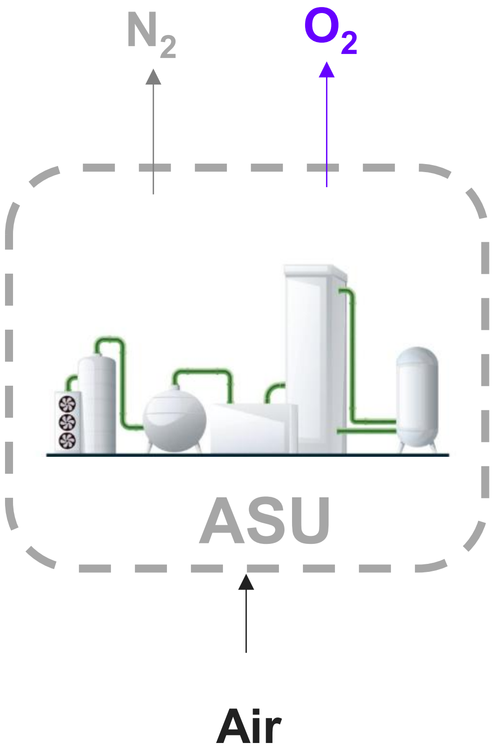
- Grey
- Brown
- Blue
- Pink
- Green



Air Separation Unit is already required for coal gasification and ATR/CPO technologies.
Unit can be **scaled up** to supply O_2 to Nitric acid plant.

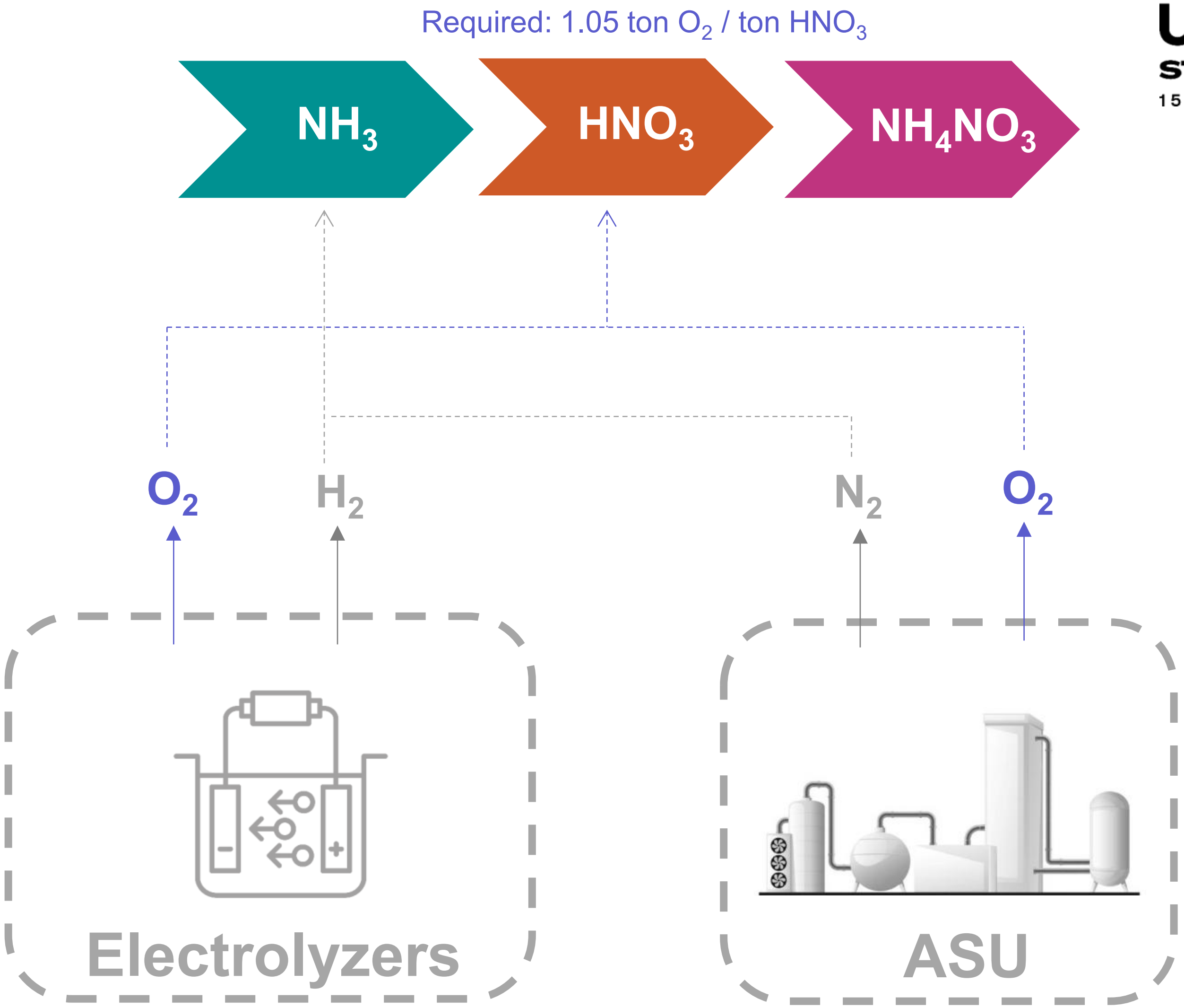
THE COLORS OF AMMONIA PRODUCTION

Grey Brown

Blue

Pink

Green



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ECONOMICS

CAPEX ANALYSIS

Case Study 1: 325 MTPD

mono-pressure

VS

total recycle

Total Recycle reduces CAPEX up to 30%

Total Recycle reduces CAPEX up to 40%

dual-pressure

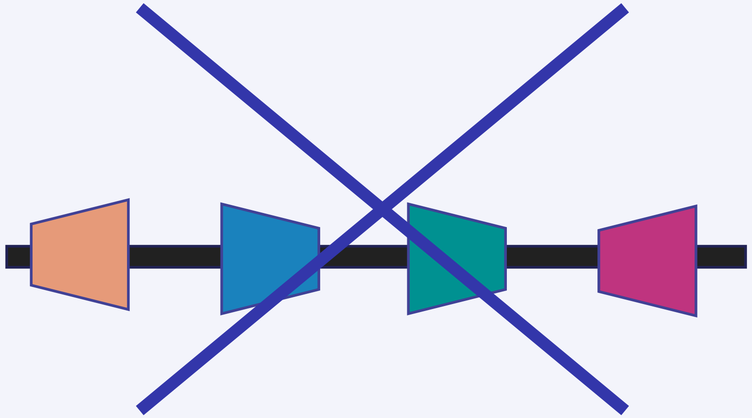
VS

total recycle

Case Study 2: 1000 MTPD

*Based in EU

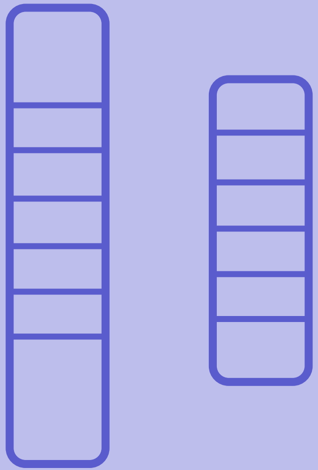
MAIN ADVANTAGES INFLUENCING CAPEX



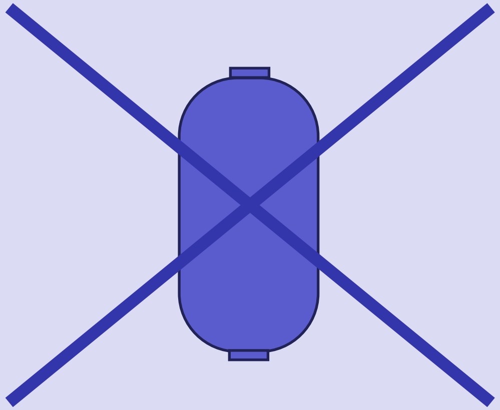
No compressor train

Wide range of capacities

Simplified heat exchanger network



Oxidation/absorption column
40% reduced in length



No need for NO_x
abatement reactor

OPEX ANALYSIS

mono-pressure

VS

total recycle

Total Recycle reduces OPEX up to 25%

Total Recycle reduces OPEX up to 20%

dual-pressure

VS

total recycle

*Based in EU

Assumption: O_2 is considered to be received pressurized and at no cost

MAIN ADVANTAGES INFLUENCING OPEX

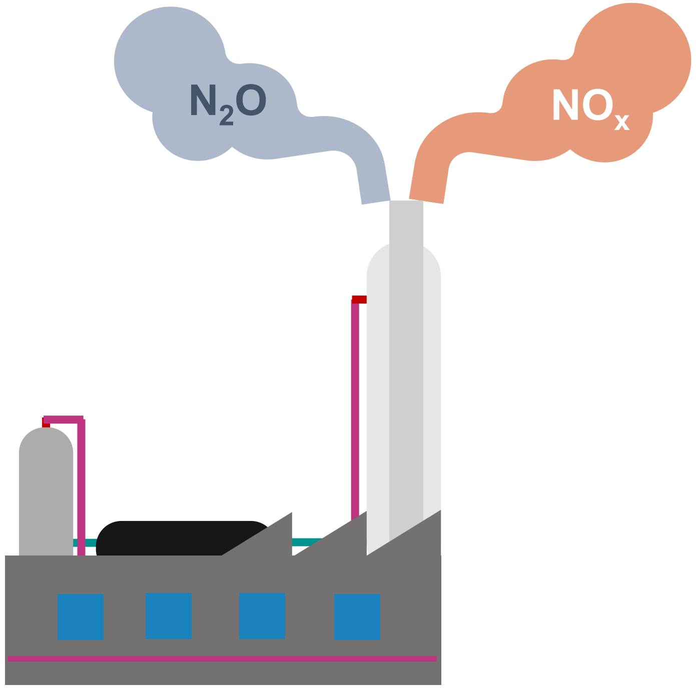
High Steam Export (45bar, 450°C)

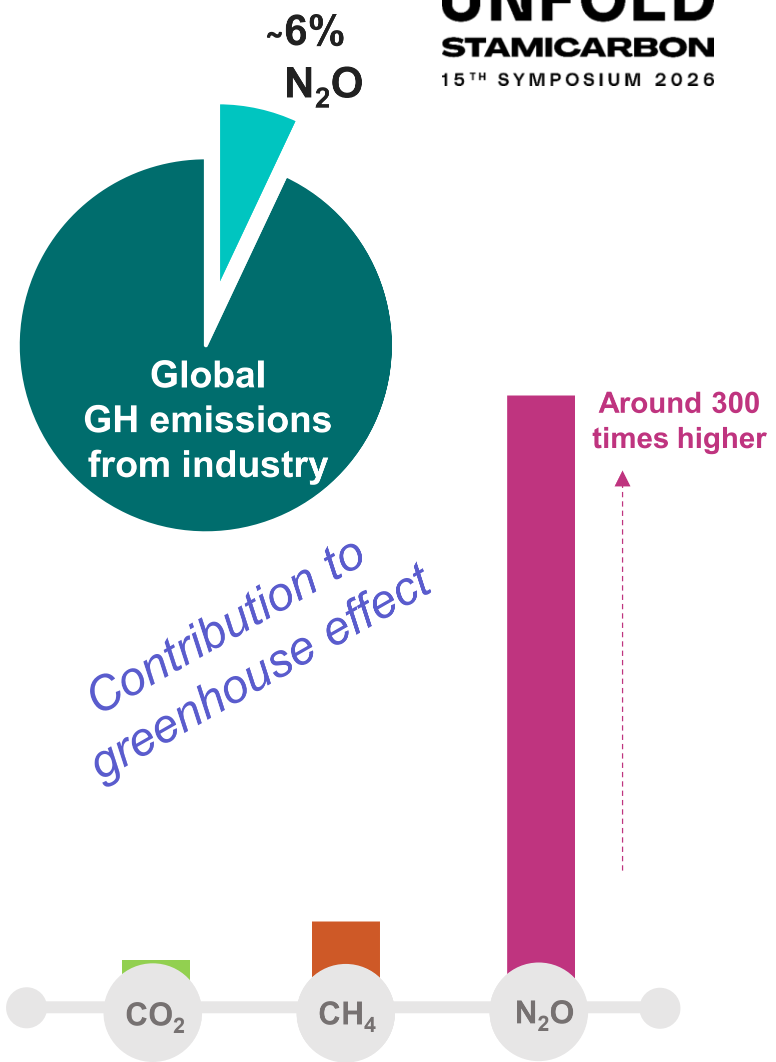
1200kg steam/ton HNO_3 (100%)

~50% above best conventional plants

Minimum Emissions

< 4 g N_2O/ton HNO_3 (100%)
< 4 g NO_x/ton HNO_3 (100%)





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MAIN ADVANTAGES INFLUENCING OPEX

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High Steam Export (45bar, 450°C)

1200kg steam/ton HNO

~50% above bes

Minimum Emissions

< 4 g N_2O/ton HNO_3 (100%)
< 4 g NO_x/ton HNO_3 (100%)

STANDARD TECHNOLOGY

Considering tertiary abatement system

- 10 ppmv NOx → 50 g/ton HNO_3
- 20 ppmv N_2O → 120 g/ton HNO_3

N_2O → CO_2 credits

MAIN ADVANTAGES INFLUENCING OPEX

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High Steam Export (45bar, 450°C)

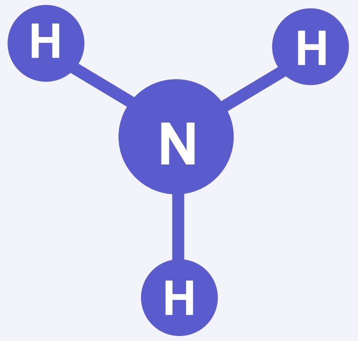
1200kg steam/ton HNO_3 (100%)

~50% above best conventional plants

Minimum Emissions

< 4 g N_2O/ton HNO_3 (100%)
< 4 g NO_x/ton HNO_3 (100%)

Smooth **operation** and **maintenance** (low corrosion rates)



Lower **ammonia** consumption

CONCLUSION

CONCLUSION

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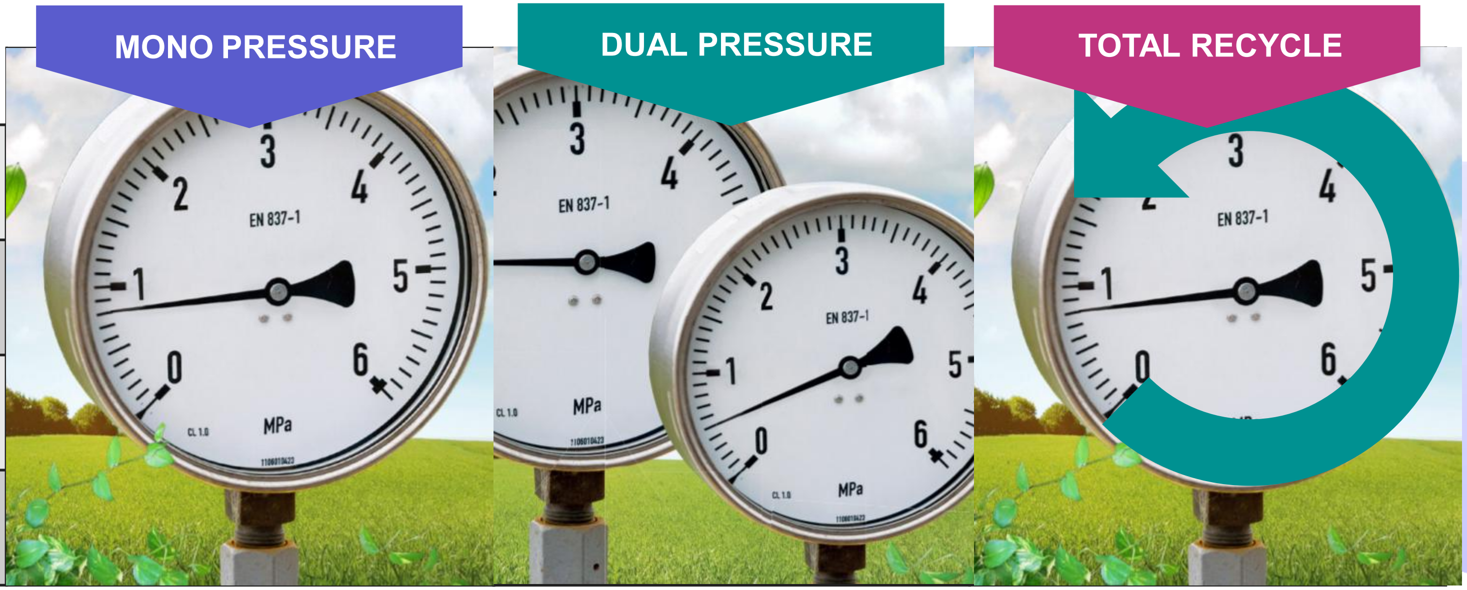
Capacity
N. Equipment
CAPEX
OPEX



CONCLUSION

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Stamicarbon is contributing to the **decarbonization** of the fertilizer industry

Process synergies enable development of **new eco-friendly** processes

First award **for Total Recycle concept** in December 2025

Total Recycle Concept delivers up to **40% reduction in CAPEX and 25% savings in OPEX**

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MAIRE Sustainable Technology Solutions

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THANK YOU