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SYMPOSIUM 2022

KNOWLEDGE • OPTIMIZATION • INNOVATION

Stamicarbon 75 YEARS

Experiences with large scale revamp project

Azomures Romania

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Jaarbeurs, Utrecht

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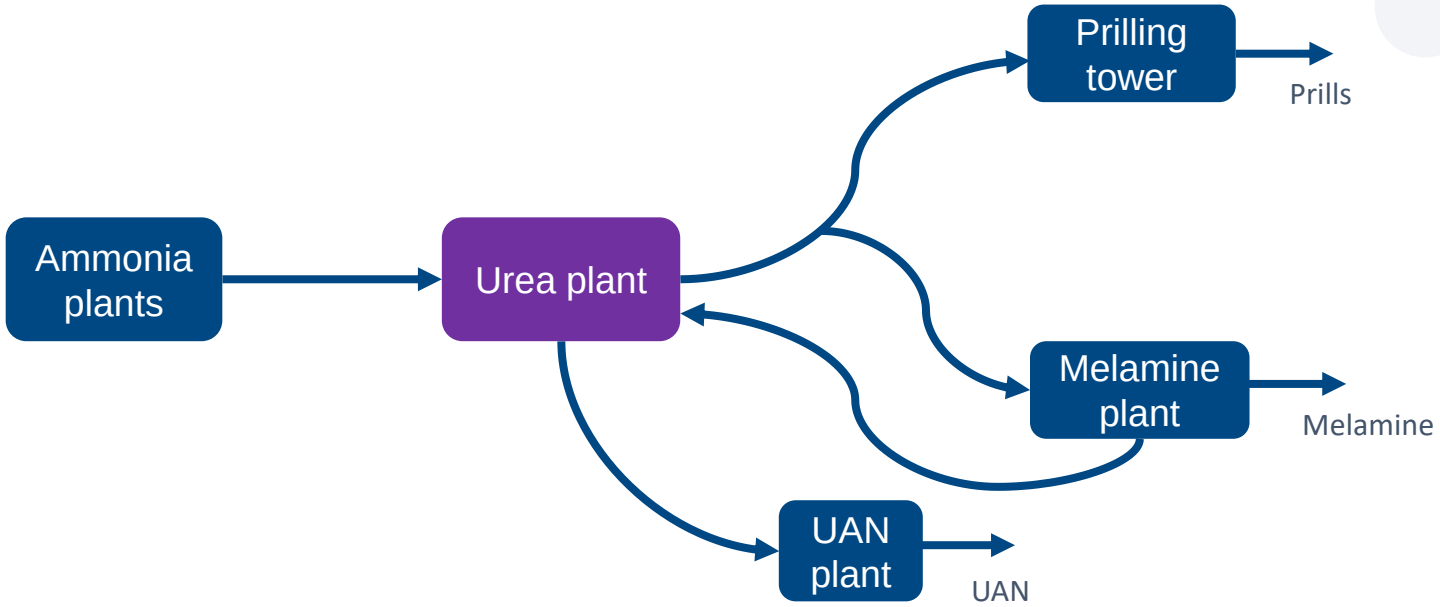
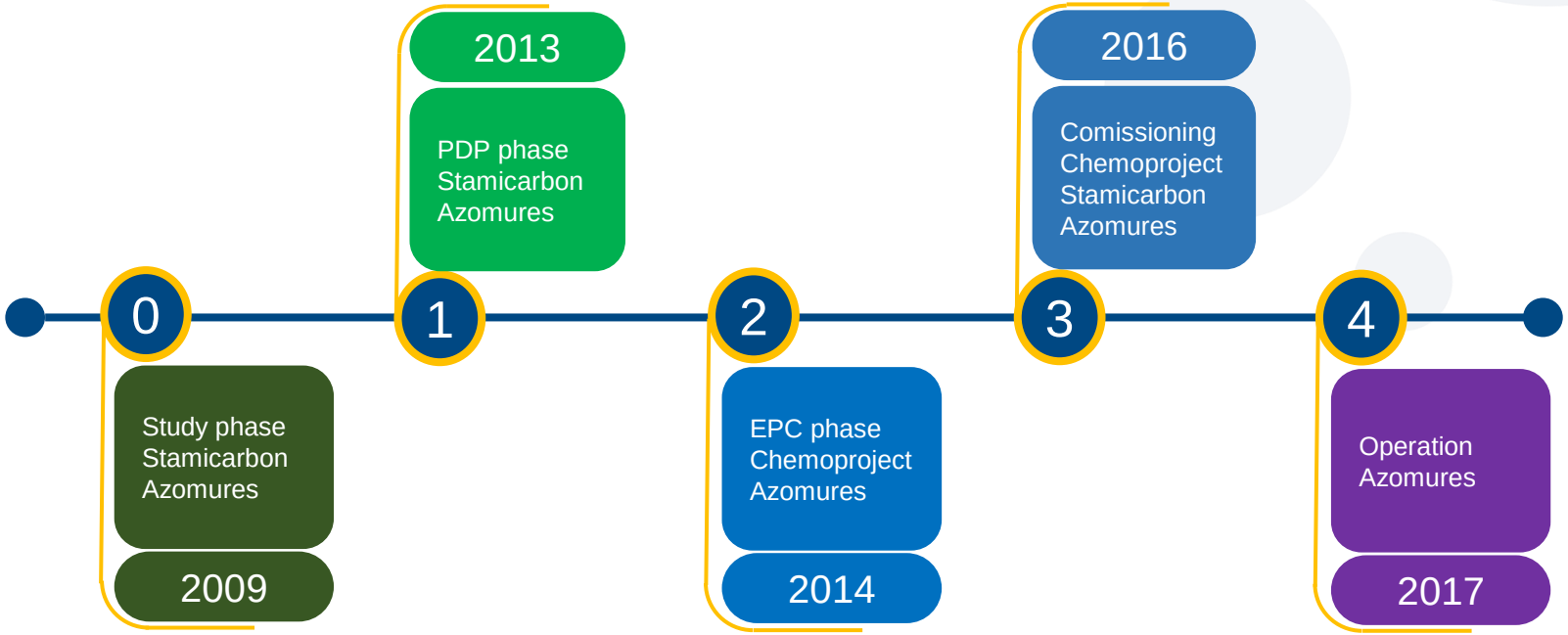
Introduction -1: Azomures plant site before revamp

Features:

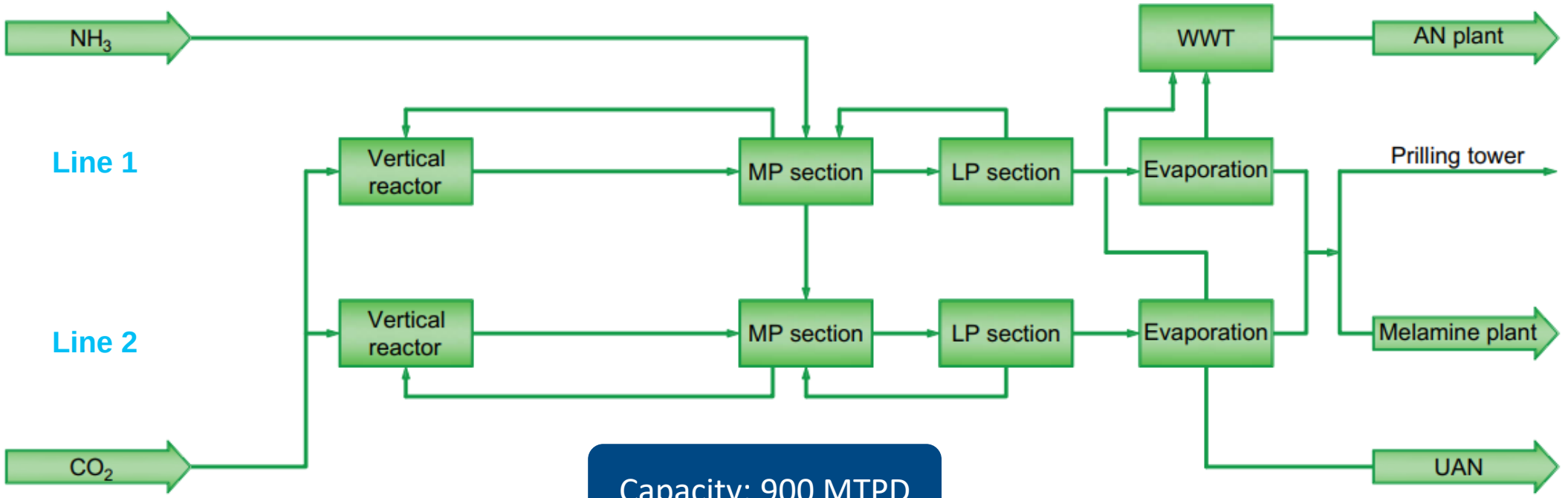
- Conventional process (200 bar) with two lines
- Complex interactions with other plants
- Variable operating cases to consider



Introduction -2: Project history



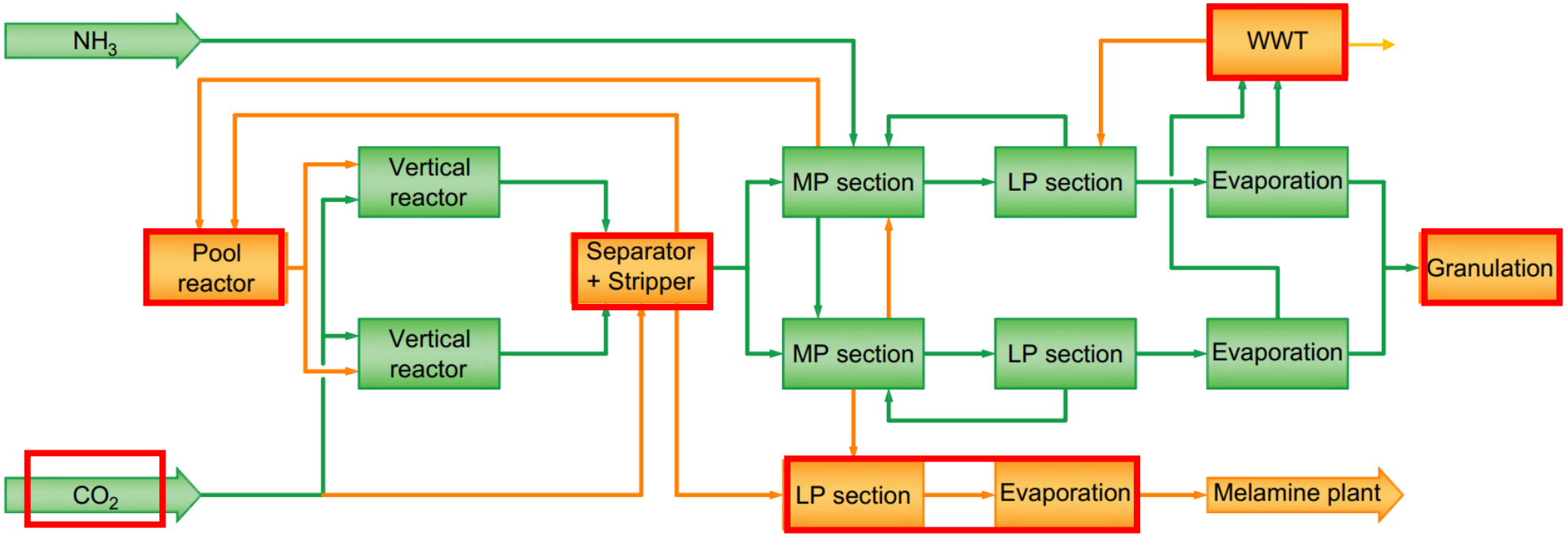
Process scheme before revamp



Drivers for revamp:

- High steam consumption
- High emission
- Intention for high plant capacity and product quality.

Process scheme after revamp



Capacity: 1425 MTPD
(ab. 60% increase)

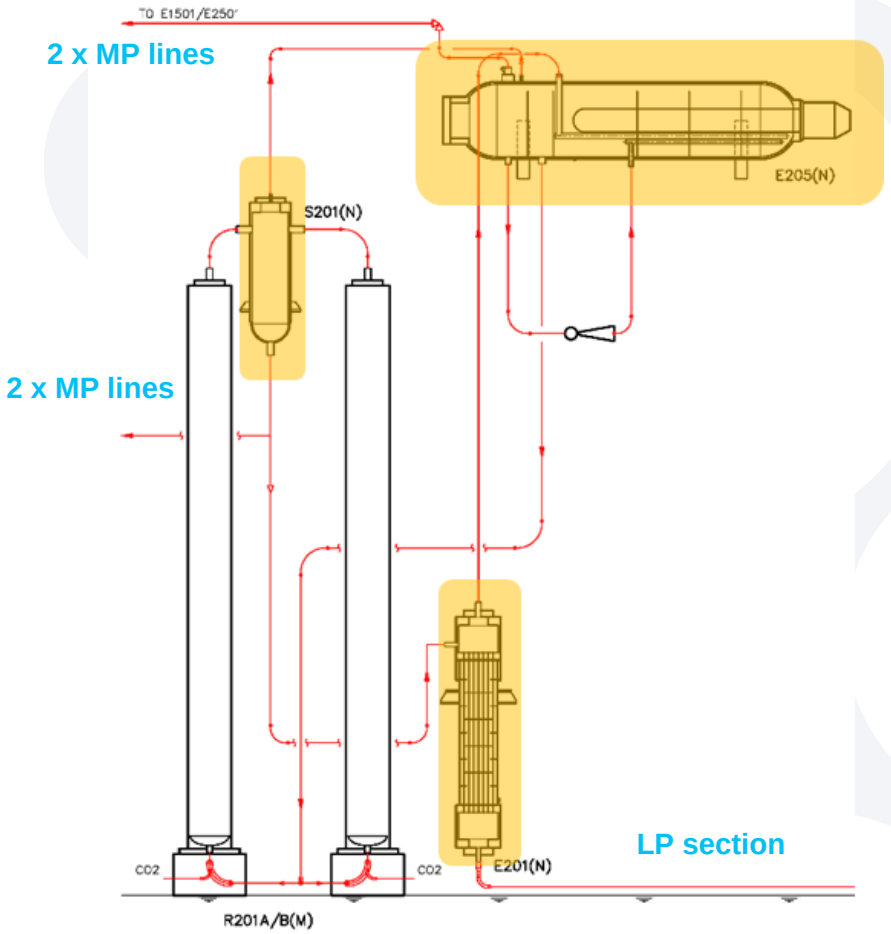
Synthesis section-1

Synthesis gravity loop layout

- Stripper (new) located at grade level
- Pool reactor (new) to provide reaction volume
- HP separator (new)

Synthesis carbamate loop layout

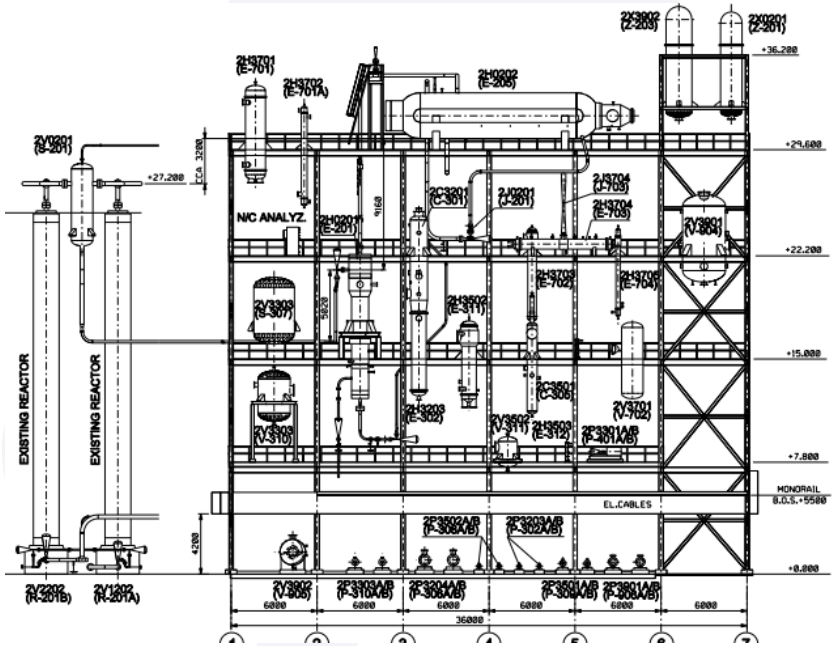
- HP pool reactor (scrubber part)
- HP ejector
- HP condensing part.

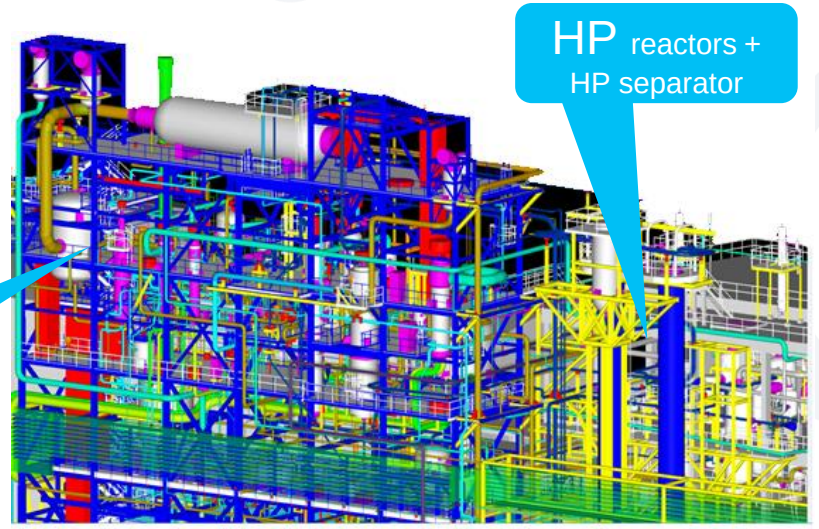


Synthesis section-2

Standalone new structure

- New structure width-length-height:
  (7.5 m x 36 m x 30 m)
- Construction can be carried out separately.
- Minimize the shutdown period for startup.

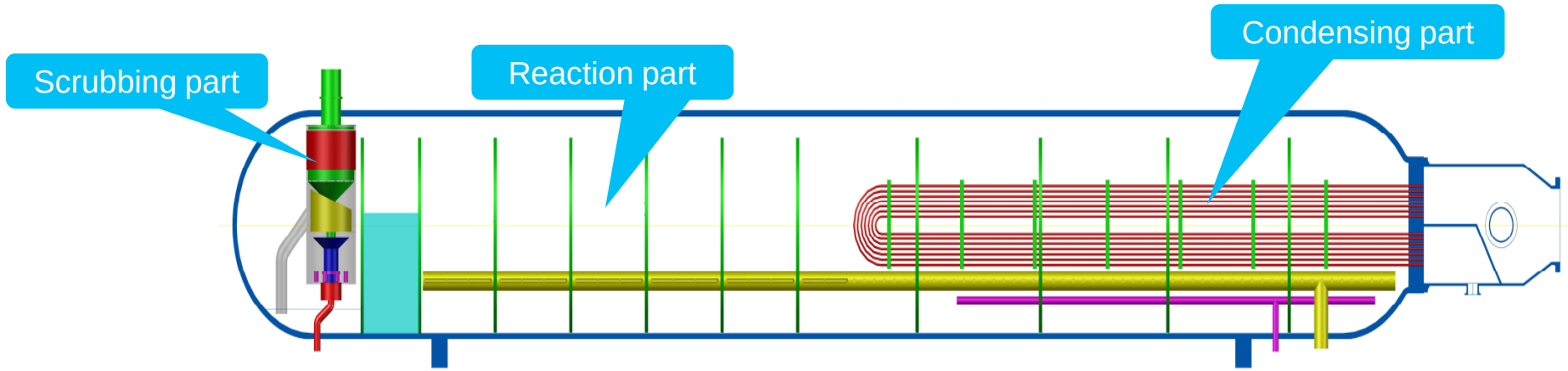




Synthesis section-3

Pool Reactor

- Extra reaction volume to achieve much higher plant capacity
- New condensing part to control synthesis pressure via LP steam production
- HP scrubber integrated in the last compartment
- Carbamate is transported from HP scrubber to condensing part of pool reactor via Ejector.



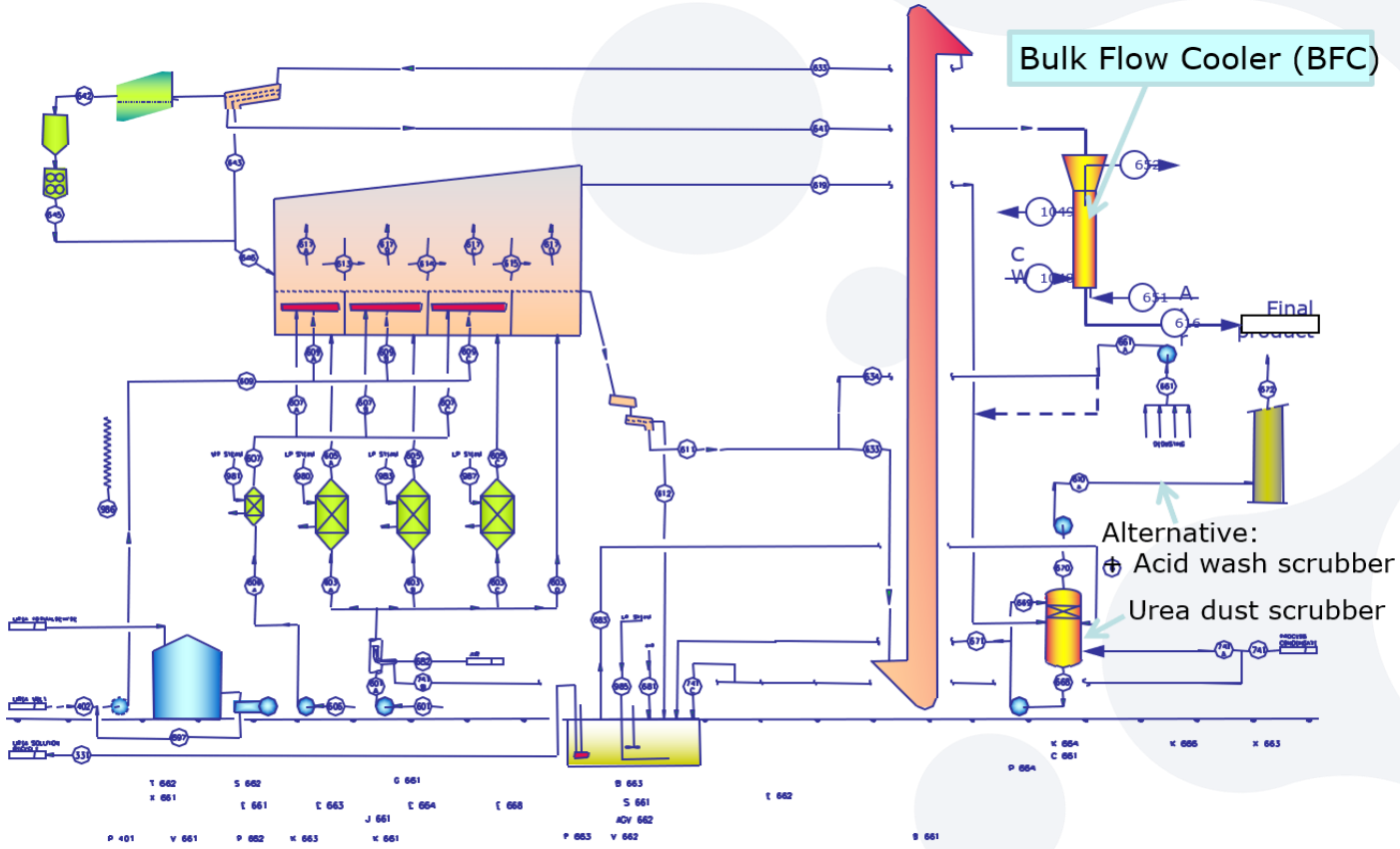
Synthesis section-4

Operational parameters:

Typical figures of urea plant	Before revamp	After revamp	Unit
Name plate capacity	2 x 450	1425 (+60%)	MTPD
N/C synthesis	~ 4	~2.85	mol/mol
Synthesis pressure	~ 195	140-145	bar (g)
Temp. outlet reactors	188-190	183	°C
Urea concentration at outlet reactors	~ 32	~ 32	wt-%
Water concentration at outlet reactors	~ 19	~ 19	wt-%

Granulation-1

Flow diagram applied:



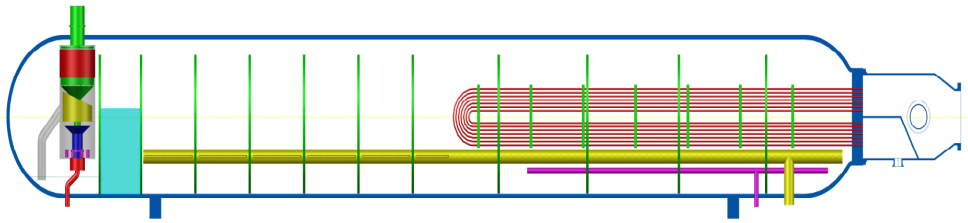
Granulation-2

Long distance between melt and granulation:

- Melt line length: ~ 200 m
- Biuret content is a challenge
- Melt split into two lines (DN40 and DN50).
- Long process and utilities lines

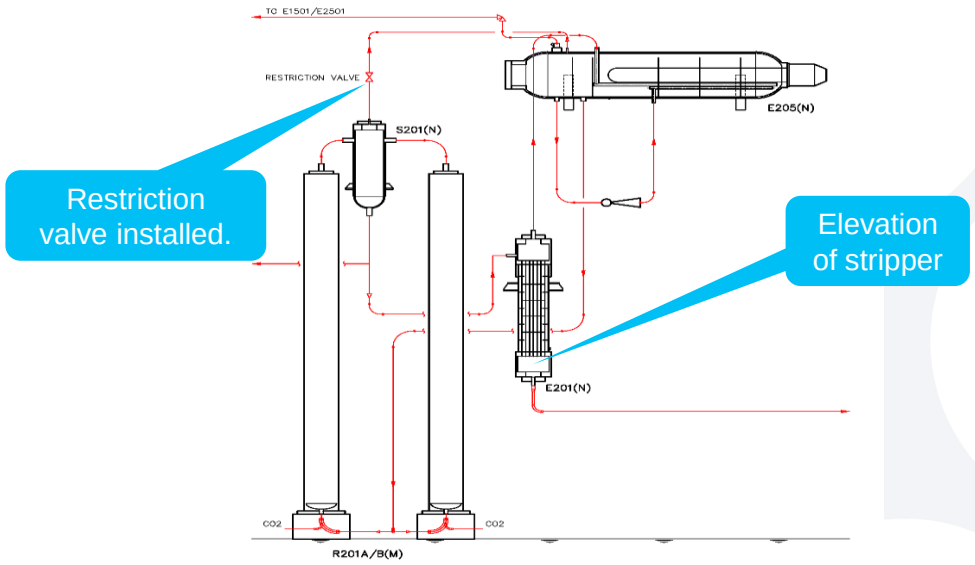
Issues during commissioning

1 Leaking overflow baffles



- Leaking overflow baffles
- Overflow was not fully achieved in the reactor
- Insufficient reaction volume leads to low urea content.
- Overloading ejector

2 Elevation issue of stripper



Plant performance and product quality

General plant performance:

ITEM	Realized value vs guarantee	UNIT
Plant capacity	Achieved	MTPD
Ammonia consumption	-3.0	kg/t
CO2 consumption	-3.0	kg/t
Steam (24 bara, 320 C)	+90.0	kg/t
Urea dust from granulation scrubber	Achieved	mg/Nm^3
Ammonia from granulation scrubber	Achieved	mg/Nm^3

Product quality:

ITEM	Specification as per ROU market	UNIT
Biuret content	Achieved	wt.%
Formaldehyde	≤ 0.3	wt.%
Water	Achieved	wt.%
Free ammonia	Achieved	wt. ppm
Product 2-4 mm	Achieved	wt.%
Product 1-2 mm	Achieved	wt.%

Conclusions and recommendations

1. Successful project

- Good plant performance, product quality
- Operability (stable operation and larger operating window)
- Established another reference for large scale revamp (+60% cap.)

2. Scope definition

- Revamp project is a balance investment and operability
- Clear scope is vital for licensor to focus on the engineering

3. Teamwork between licensor, contractor and client

- Such a revamp project is a long commitment.
- Good teamwork is a must for such a complex revamp

4. Future improvement of revamped plant

- Real plant operation differs from engineering perspective
- Keep improving operational parameters, eg., biuret, steam consumption.

Thank you!

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