

Capacity Increase of Urea Plants



Thomas Krawczyk, Uhde Dortmund

***24th AFA Int'l. Technical Fertilizers Conference & Exhibition
22 – 24 November 2011, Amman, Jordan***

Uhde



ThyssenKrupp

Outline

- Targets and requirements of a revamp
- Revamp concept for a capacity increase of 17% (1925-2250 MTPD)
- Contractor's input
- CO₂ generation



Targets and requirements of a revamp

- Capacity increase
 - By using existing margins to get maximum possible additional product with the lowest effort necessary
 - Elimination of bottlenecks
- Reduction of energy consumption (e.g. heat integration)
- Environmental improvements
 - Reduction of emissions (to comply with new laws and international standards)
- Increase of reliability and availability
- Utilization of a well proven and reliable technical concept
- Short as possible implementation downtime for modifications and new equipment

Revamp targets

Melt Plant

actual design revamp

Granulation

actual design revamp



STAC 1925 mtpd	+ ~17% 2250 MTPD
-------------------	------------------------

UFT 2000 mtpd	+ 12.5% 2250 MTPD
------------------	-------------------------

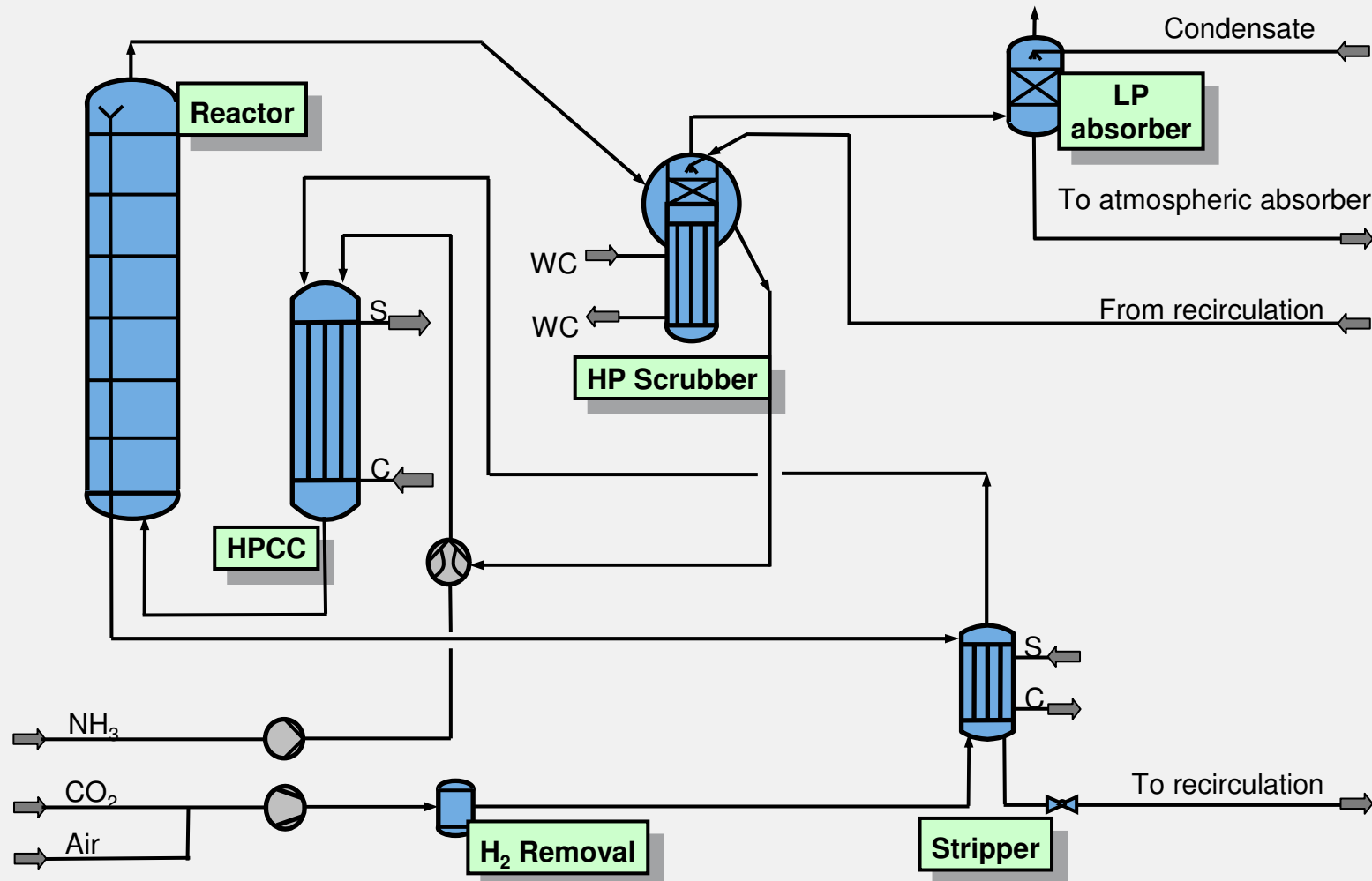


STAC 1925 mtpd	+ ~17% 2250 MTPD
-------------------	------------------------

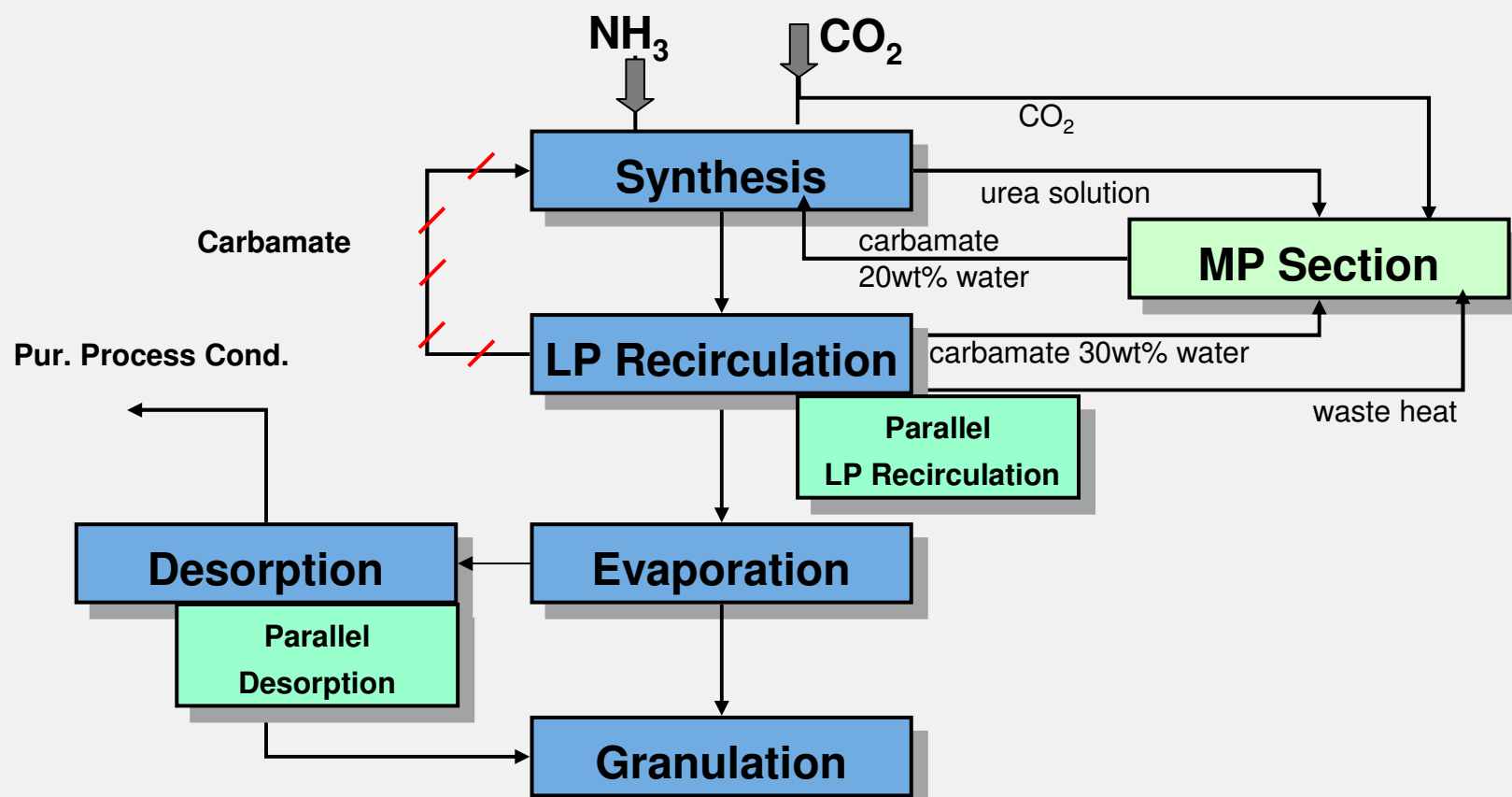
STAC 2000 mtpd	+ 12.5% 2250 MTPD
-------------------	-------------------------

The basis before the revamp for both plants

Conventional *Stamicarbon* CO₂ Stripping Process

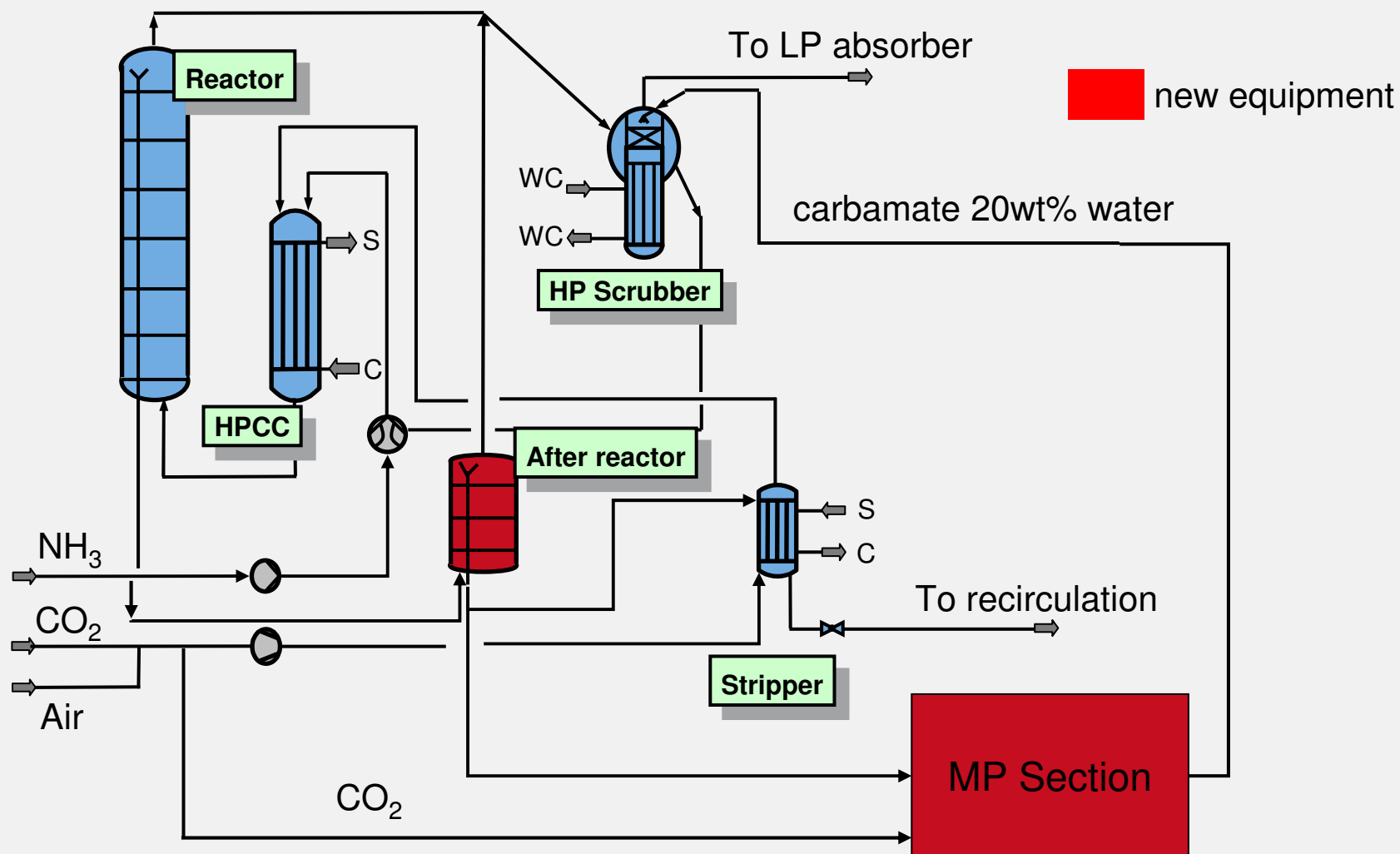


Block Diagram Plant I & II (MP Section)

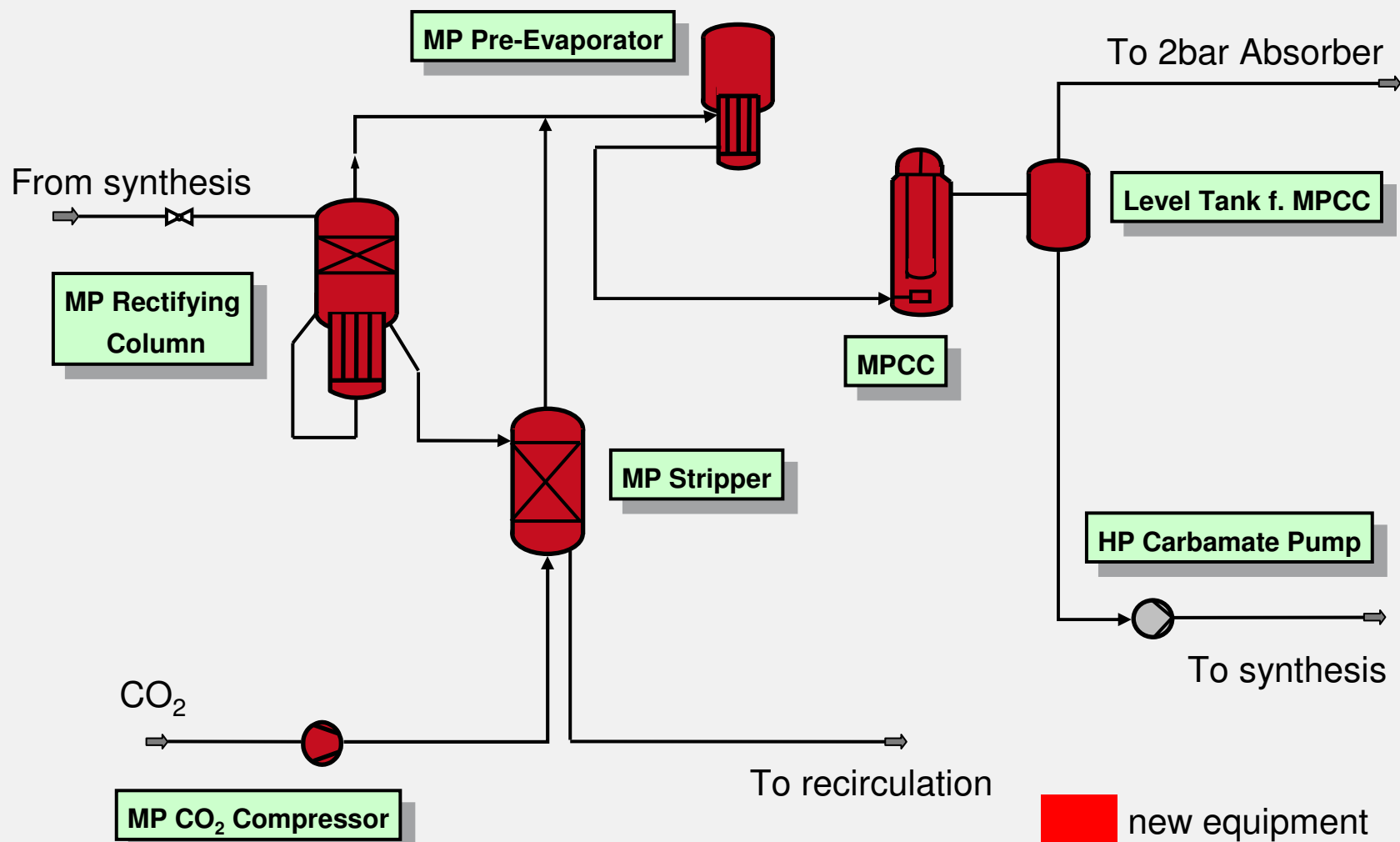


1925 MTPD +17% → 2250 MTPD

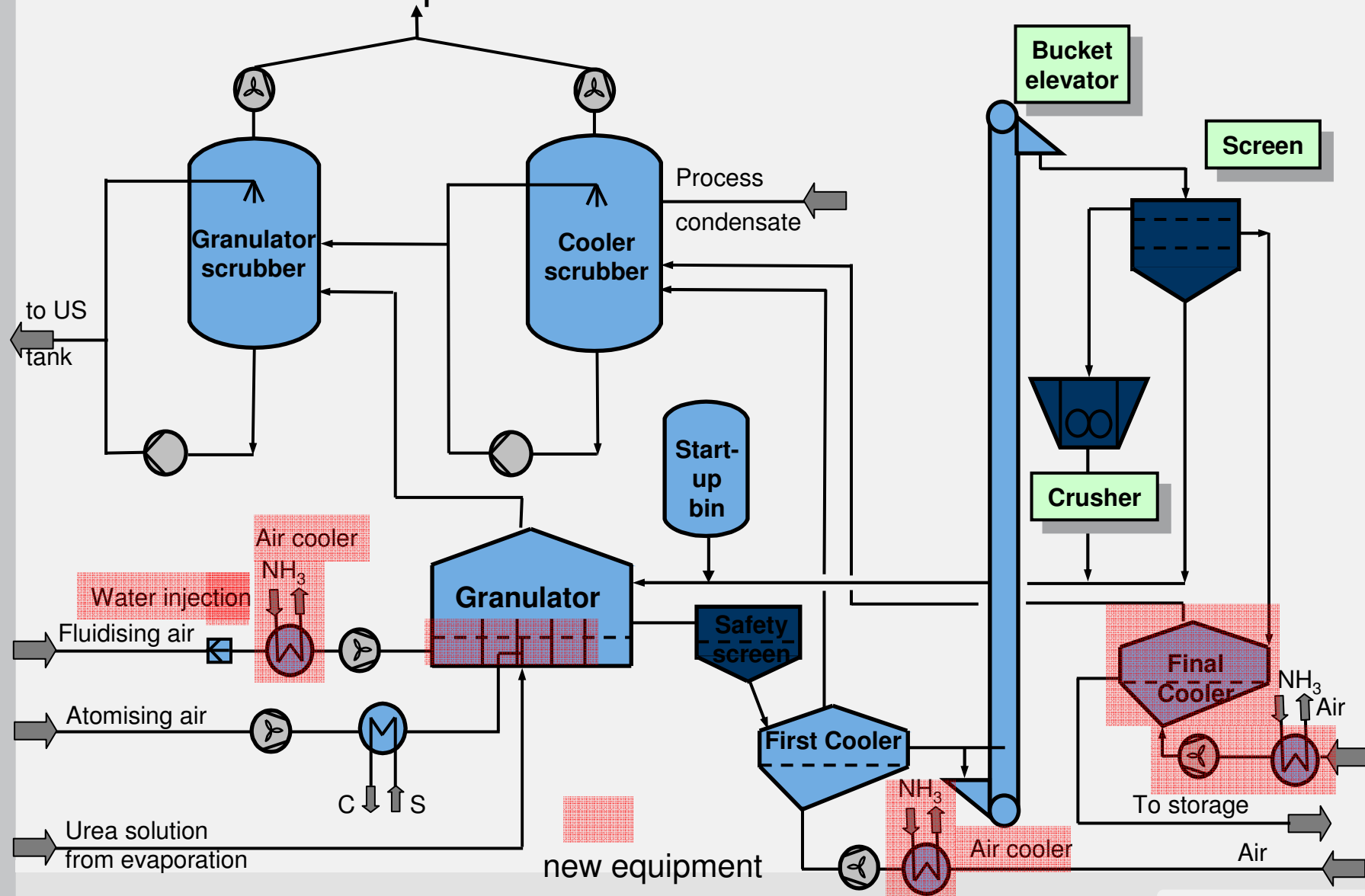
Revamp concept 1925 → 2250 MTPD



MP Section (operating at ~20bar)

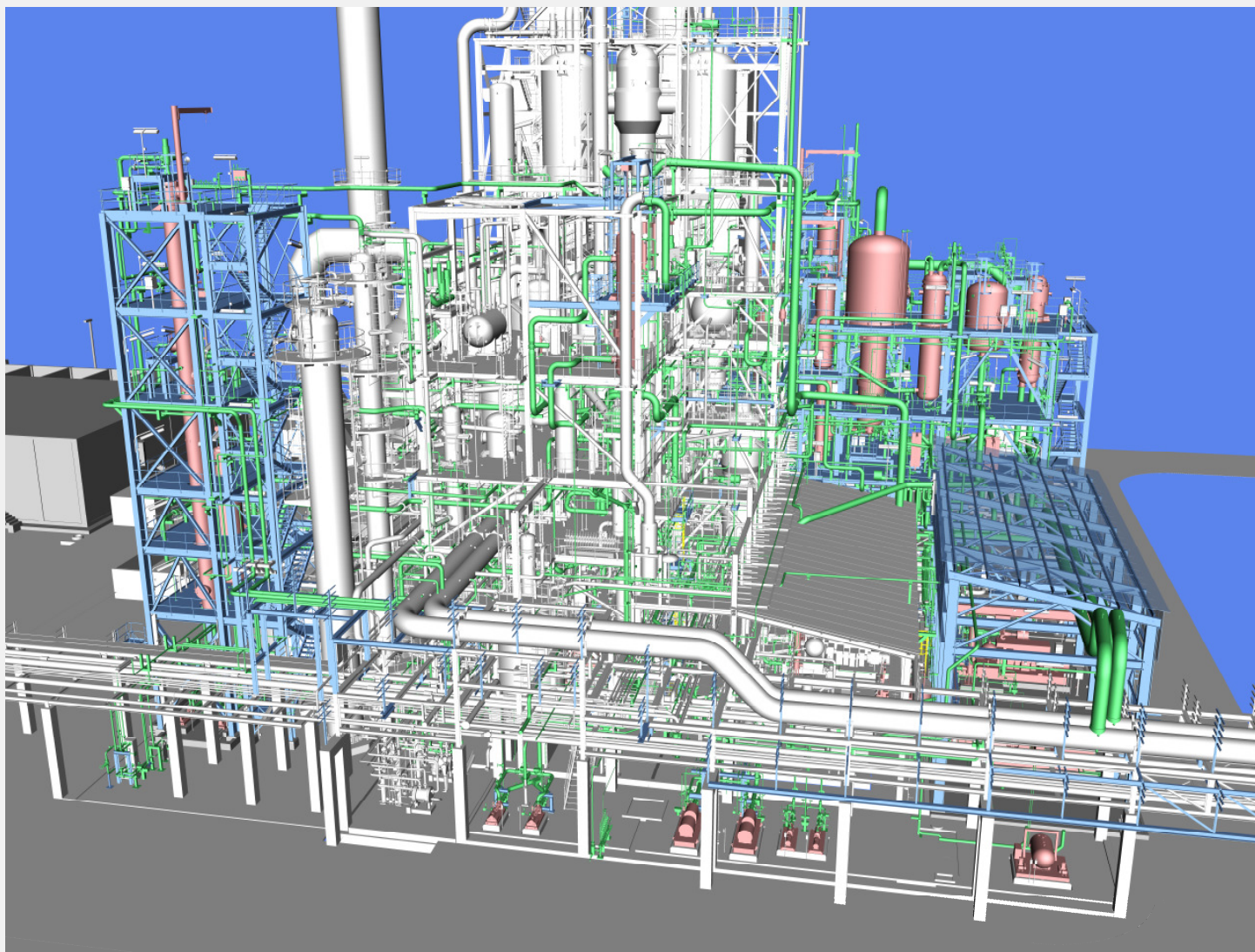


Granulation Revamp 2000 → 2250 MTPD



Capacity Increase of Urea Plants
 24th AFA Int'l. Technical Fertilizers Conference & Exhibition
 22 – 24 November 2011, Amman, Jordan
 T. Krawczyk

Overview of the revamp measures for plant I & II



Capacity Increase of Urea Plants
24th AFA Int'l. Technical Fertilizers Conference & Exhibition
22 – 24 November 2011, Amman, Jordan
T. Krawczyk

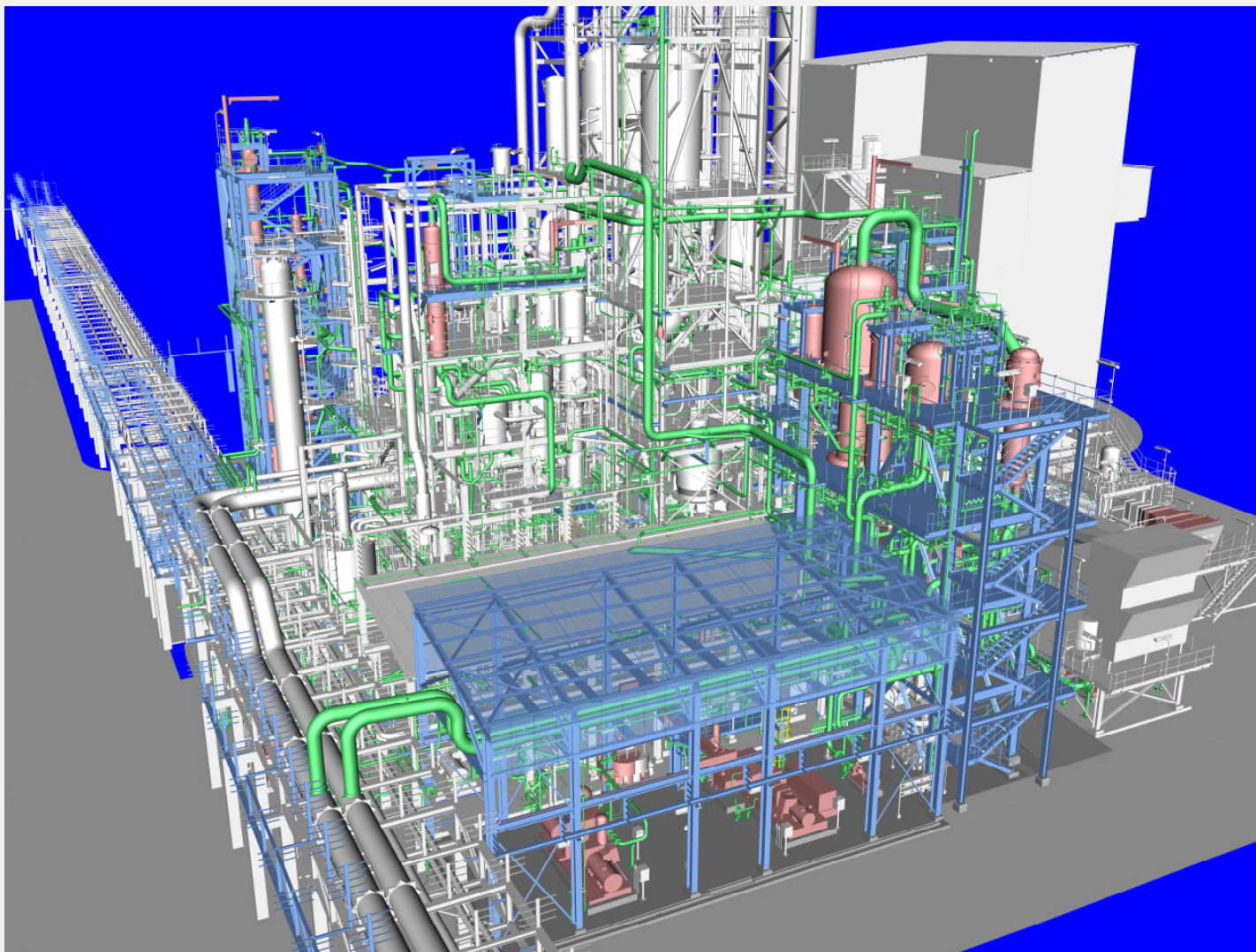
10

Uhde



ThyssenKrupp

Overview of the revamp measures for plant I & II



Capacity Increase of Urea Plants
24th AFA Int'l. Technical Fertilizers Conference & Exhibition
22 – 24 November 2011, Amman, Jordan
T. Krawczyk

11

Uhde

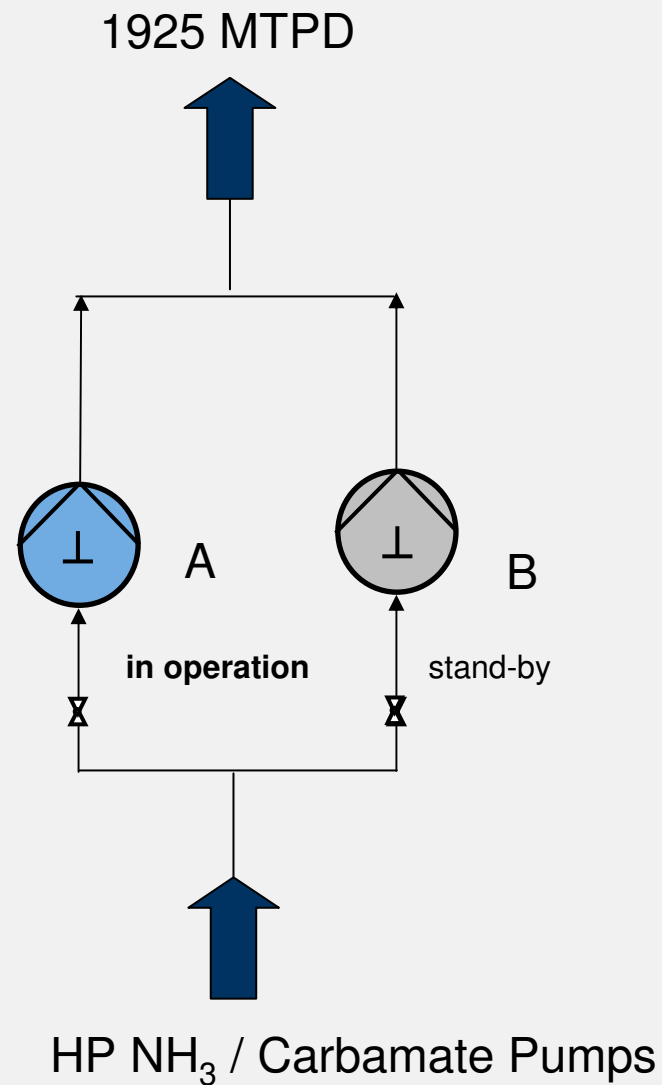


ThyssenKrupp

Uhde's input to optimise the concept

Case 1: before revamp

- One pump in operation
- One pump stand-by



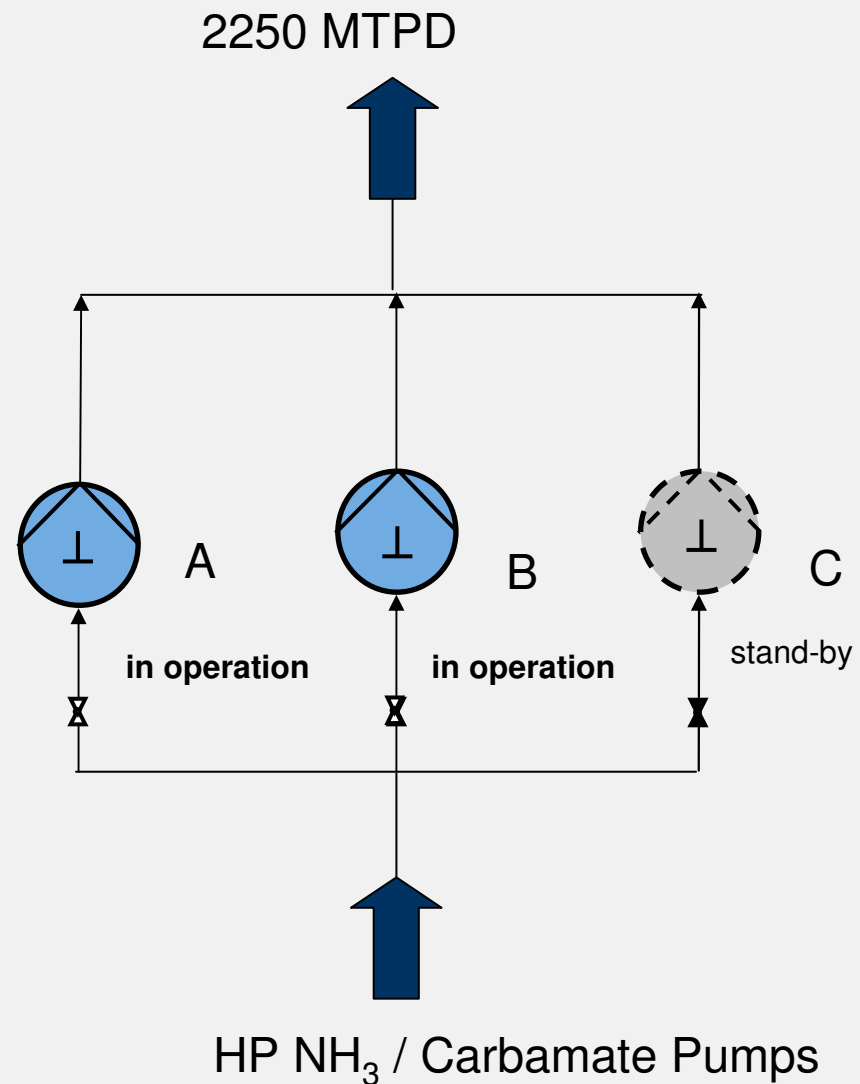
Uhde's input to optimise the concept

Case 2a : after revamp

- Two pumps in operation
- Fall back to capacity before revamp in case of malfunction or maintenance

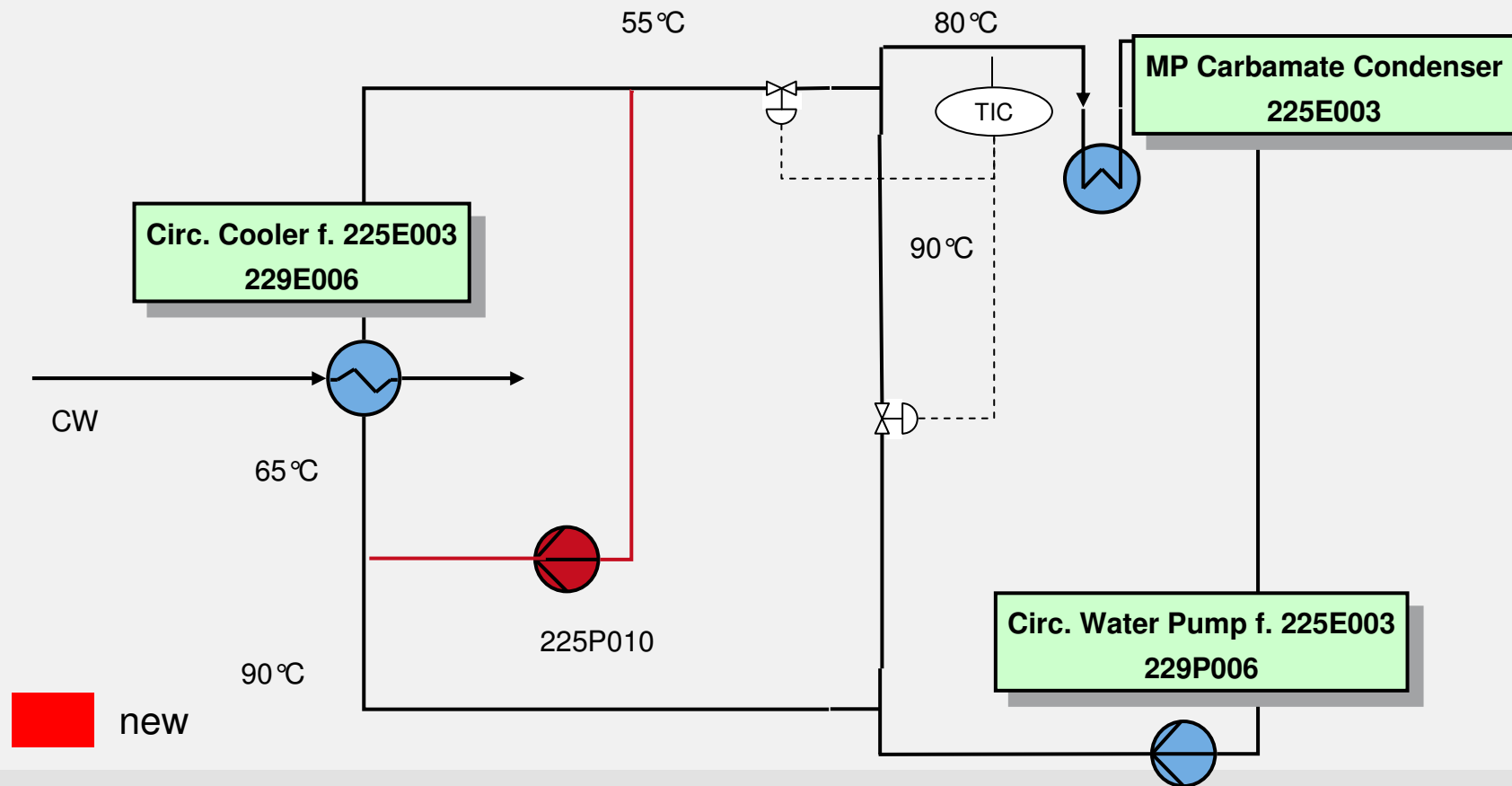
Case 2b : after revamp

- Two pumps in operation
- One pump stand-by
- Production remains at revamp capacity



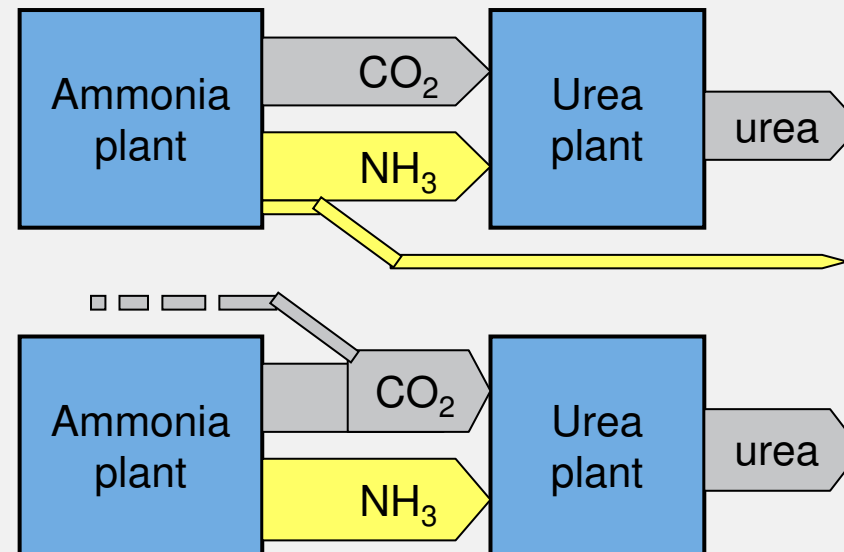
Uhde's modifications of closed cooling water loops

Lower water temperature in order to reduce fouling on CW side.



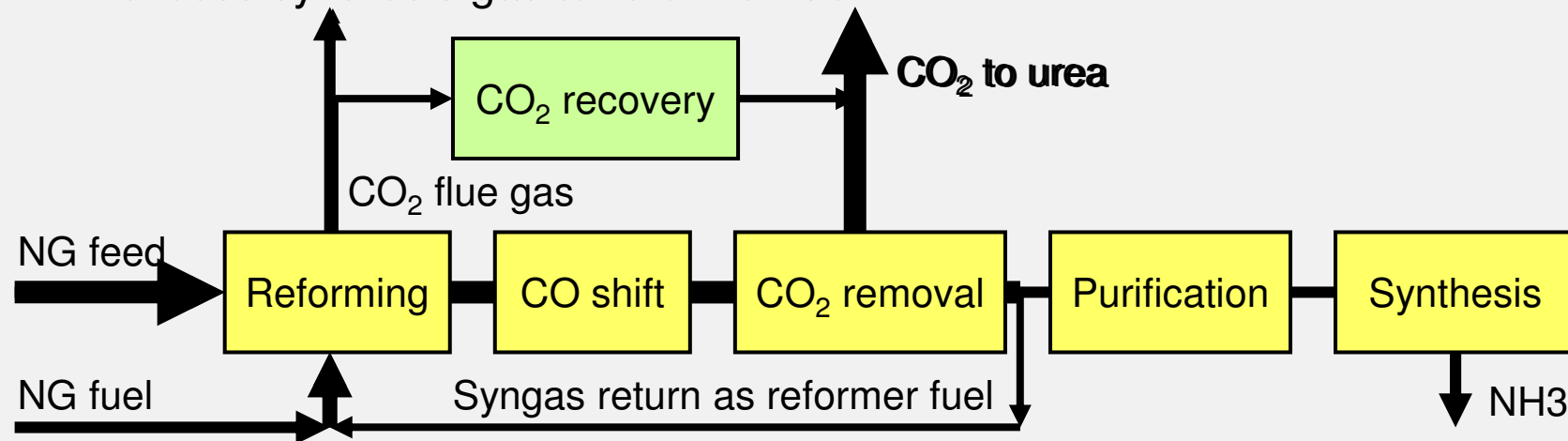
CO₂ and NH₃ for Urea Production

- Production of ammonia plant is typically with lower ratio CO₂ / NH₃ (1.14 t/t for ideal process with no loss and pure CH₄ as feedstock)
- Demand of urea plant per ton of urea: 0.566 t NH₃ + 0.733 t CO₂
⇒ Ratio CO₂ / NH₃ needed: 1.29 t/t



Ways of CO₂ Production

- Standard CO₂ production process by increase of CO₂ input for CO₂ removal and return of excess synthesis gas to reformer fuel



Conclusion

- Changes in one place always lead to changes in another place
 - Overall knowledge
- Many constraints in an existing plant and set by the existing periphery
 - Collaboration between all involved parties
- Input to optimize the revamp concept for a tailor-made solution
 - Experienced contractor

Thank you for your attention!

thomas.krawczyk@thyssenkrupp.com

www.uhde.eu

