



# RECONNECT

## SYMPOSIUM 2022

KNOWLEDGE • OPTIMIZATION • INNOVATION



# Experiences with MP Flash design

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# Agenda

- LAUNCH MELT flash design
- Steam balance optimization
- CAPEX and OPEX comparison
- MP flash design in revamps
- Operational experiences

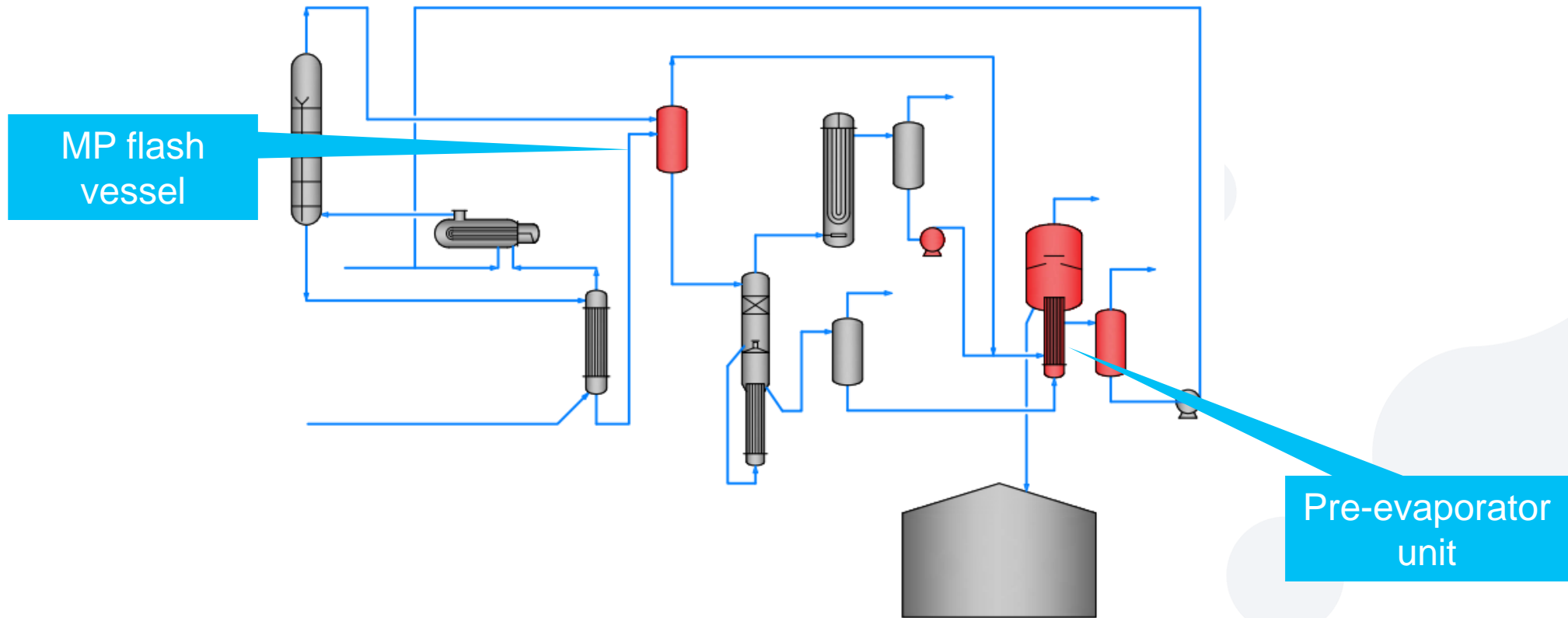
# Introduction

- In the past, in urea plant design, reactor yield and thus stripping efficiency have been optimized
- In the MP Flash concept optimization is made towards HP steam consumption and investment cost
- The optimum for HP steam consumption is not equal to the optimum in reactor yield
- HP steam saving goes at the expense of reactor performance

# Introduction

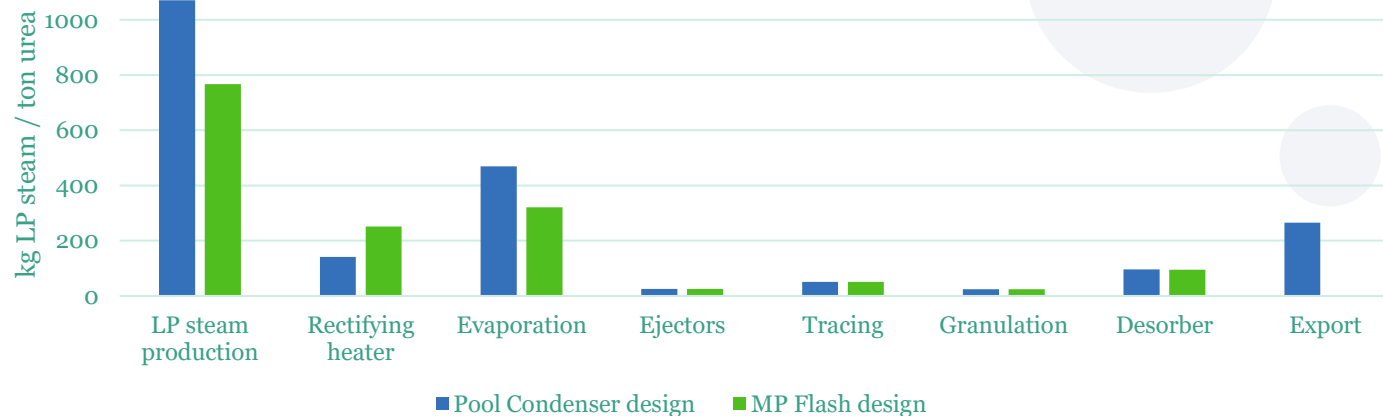
- In a urea synthesis, HP steam is consumed and LP steam is produced
- LP steam is used in the downstream sections
- The LAUNCH MP Flash concept:
  - Minimizes LP steam export
  - Lowers LP steam consumption

# Content Overview: the Flash Design



# Steam balance optimization

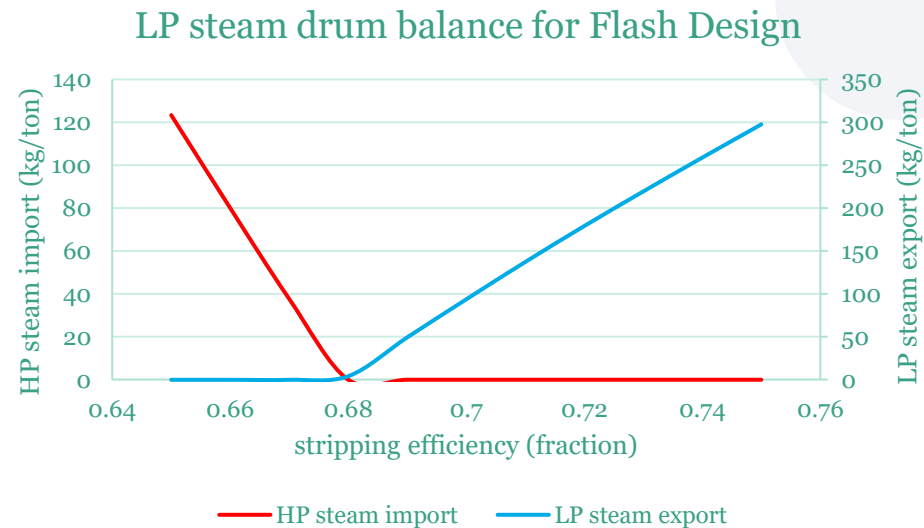
The Flash design compared with LAUNCH MELT Pool Condenser design:



- Energy saving only due to heat integration between MP carbamate condensation and pre-evaporation
- Additional saving in HP extraction steam due to minimizing LP steam export

# Steam balance optimization

- The value of the excess LP steam is lower than the value of HP extraction steam

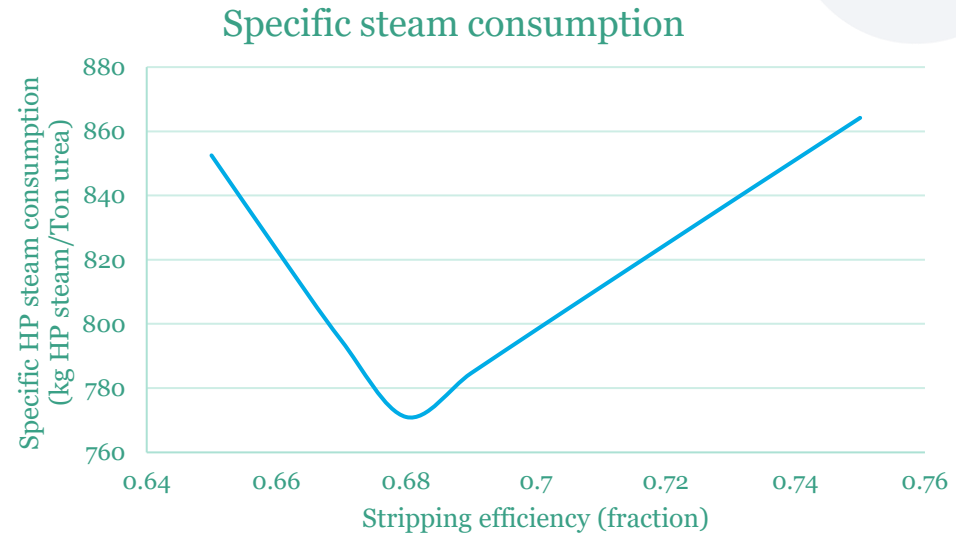


- Minimize excess of LP steam from urea plant by decreasing stripping efficiency
- LP steam export cannot become negative; HP steam is imported on LP steam drum



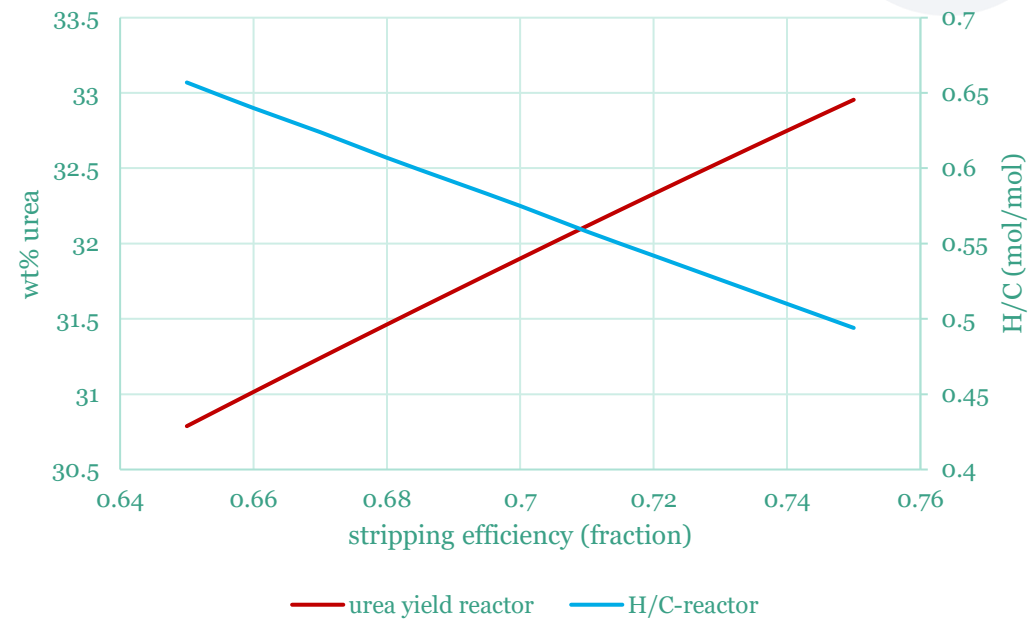
# Steam balance optimization

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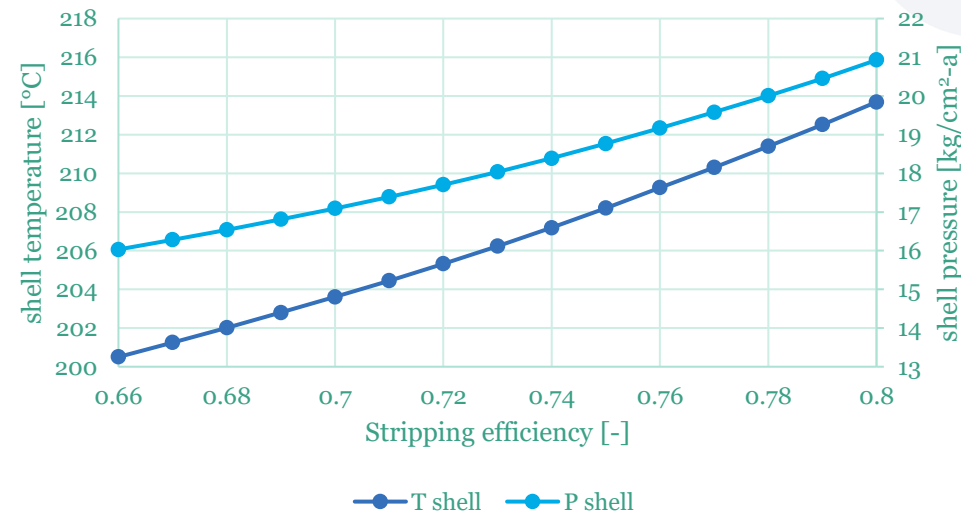
# Steam balance optimization

- Reducing stripping efficiency increases the carbamate recycle and thus the water content (H/C ratio) in the reactor, effectively reducing the reactor yield



# Stripper shell temperature

- As compared to the Pool Condenser design, the temperature in the shell of the HP stripper decreases by some 10°C



- Consequently, the lifetime of the HP stripper increases due to lower passive corrosion rate

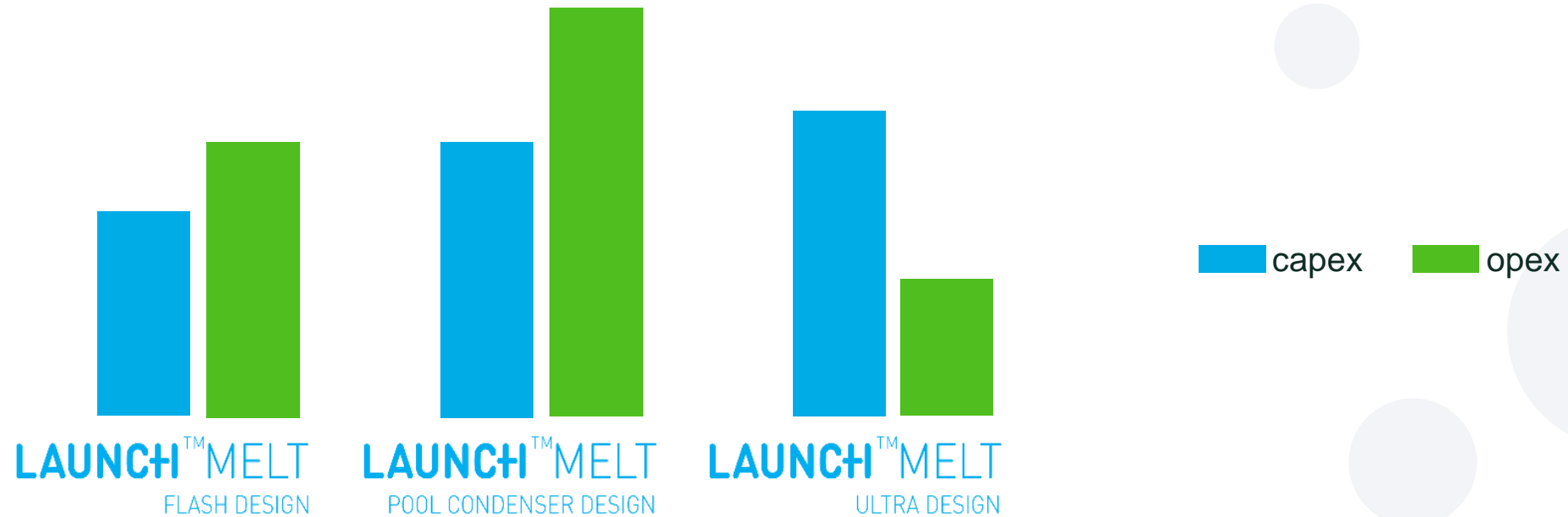
# Concept comparison

CONCEPT	STEAM CONSUMPTION* [kg/ton]	NUMBER OF HP EQUIPMENT	NUMBER OF MP EQUIPMENT
<b>Flash Design</b>	<b>710</b>	<b>3</b>	<b>4</b>
Poolcondenser Design	870	4	-
Ultra Low Energy Design	560	3	8

*All concepts are considered with a pool condenser*

# Concept comparison

- The Flash design as compared to the Pool condenser design and the Ultra Low Energy design:



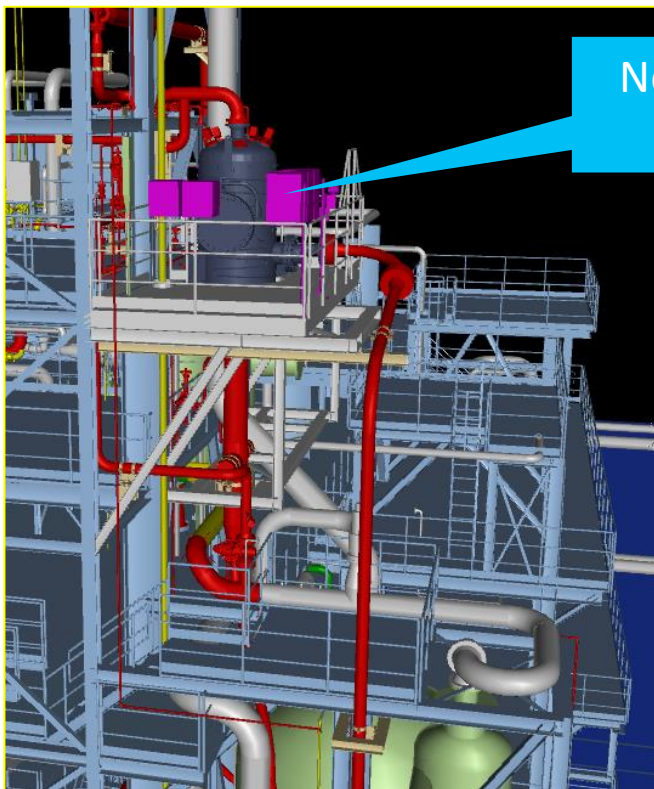
# MP Flash design in revamps

The MP flash can be applied in revamps (EVOLVE) if one of the following is relevant:

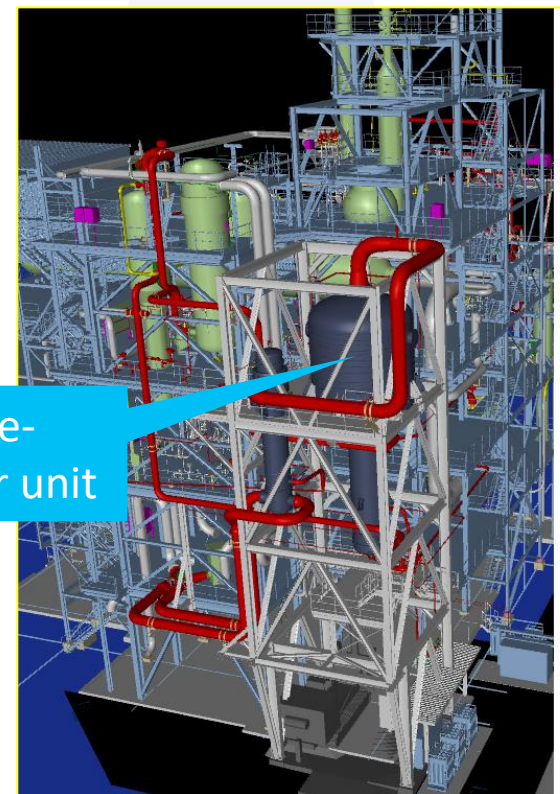
- Minimizing HP steam consumption – heat integration with pre-evaporator
- Optimizing production with limited HP steam or cooling water supply
- HP scrubber is end of life (consider safety aspects)

# EVOLVE MELT MP Flash Design

Minimizing downtime → the MP flash can be built outside the existing construction...



New MP flash vessel



New pre-evaporator unit

# Operational experiences

So far, 6 plants with the MP Flash concept are in operation:

CLIENT	YEAR IN OPERATION	DESIGN CAPACITY [MTPD]	GRASS ROOT / REVAMP	SCRUBBER YES/NO	STEAM CONSUMPTION*
PR China	2015	2700	Grass root	Yes	710 kg/ton
USA	2017	1800	Grass root	No	760 kg/ton
USA	2017	2200	Grass root	No	
PR China	2017	+3%	Revamp	Yes	-76 kg/ton (saving)
PR China	2017	+3%	Revamp	Yes	-76 kg/ton (saving)
The Netherlands	2019	+7%	Revamp	Yes	-125 kg/ton (saving)



# Operational experiences

- Reduction of amount of equipment in synthesis eases operation of synthesis
- Presence of MP flash 'dampens' upsets from synthesis to downstream sections
- N/C fluctuations have limited impact in downstream sections

# Conclusion

- Proven standard concept
- Optimization of CAPEX and OPEX
- Extension of lifetime HP stripper due to lower skin temperature
- Ease of operation
- Significant steam saving in revamp projects
- Minimize downtime for revamp projects

**Thank you!**