NEXTCHEM

UNFOLD
STAMICARBON
15TH SYMPOSIUM 2026

UPGRADING A NON-STAMICARBON GRANULATION PLANT

Barbara Cucchiella
Juan Coloma

AGENDA

01 WHY REVAMP?

02 NOZZLE DEV. & PILOT TESTS

03 GENERIC REVAMP SCHEME

04 CASE STUDY

05 CONCLUSIONS

01

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WHY REVAMP?

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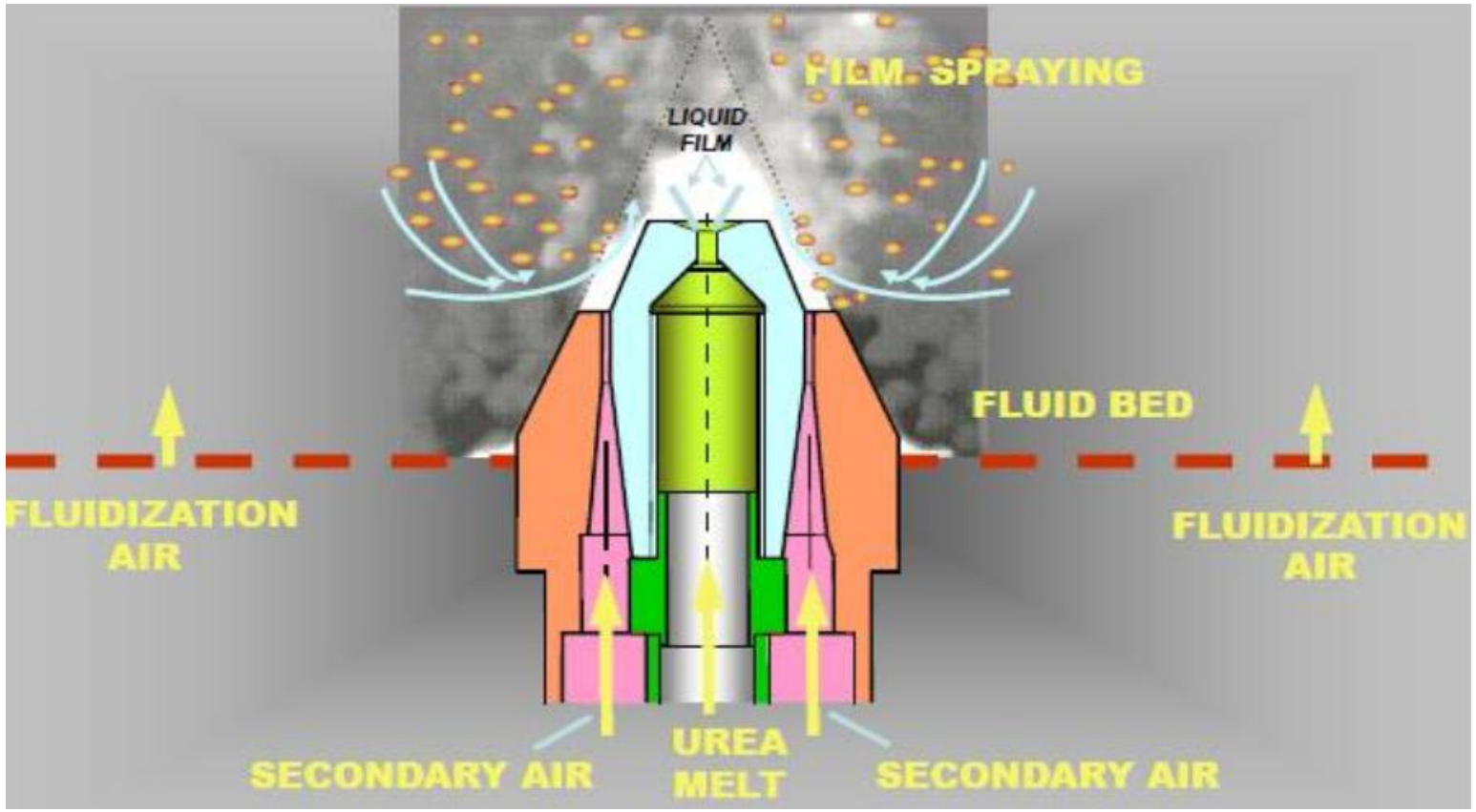

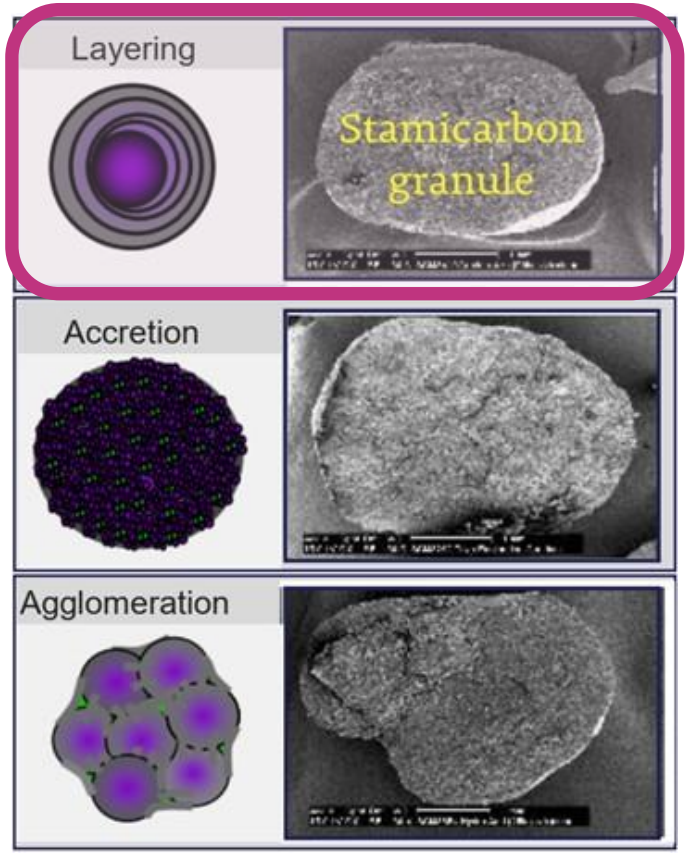

WHY REVAMP?

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ADVANTAGES STAMICARBON GRANULATION

- **Reduced formaldehyde** consumption ~ -50%
- Extended **continuous production** ~ 2 to 3 times longer

GRASSROOTS

60% market share last 5 years

REVAMPS

- Require “atomizing film spray nozzle” -> Developed **revamp nozzle**
- Minimizing CAPEX & installation time -> Developed **revamp** with **minimum new equipment**

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NOZZLE DEV. & PILOT TESTS

SCALE-UP NOZZLE

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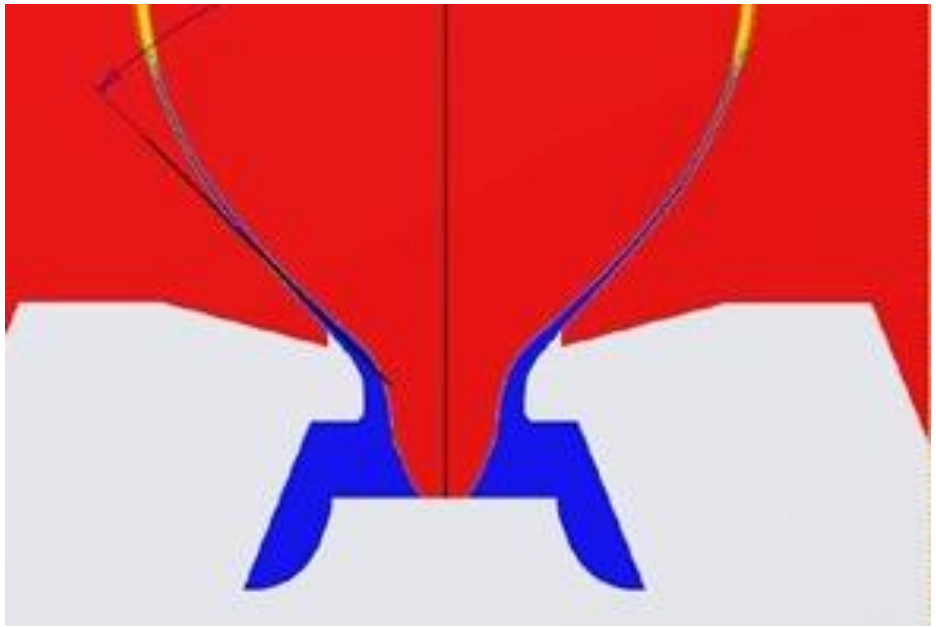
- **2x mass flow** of standard nozzle
- **Same lateral surface area to mass flow** ratio of urea melt as standard
- **Same intersection point** of the urea hollow **cone to the secondary air** as standard
- **Same film thickness** of the hollow cone nozzle at the intersection point



Spray angle with secondary air

SCALE-UP NOZZLE

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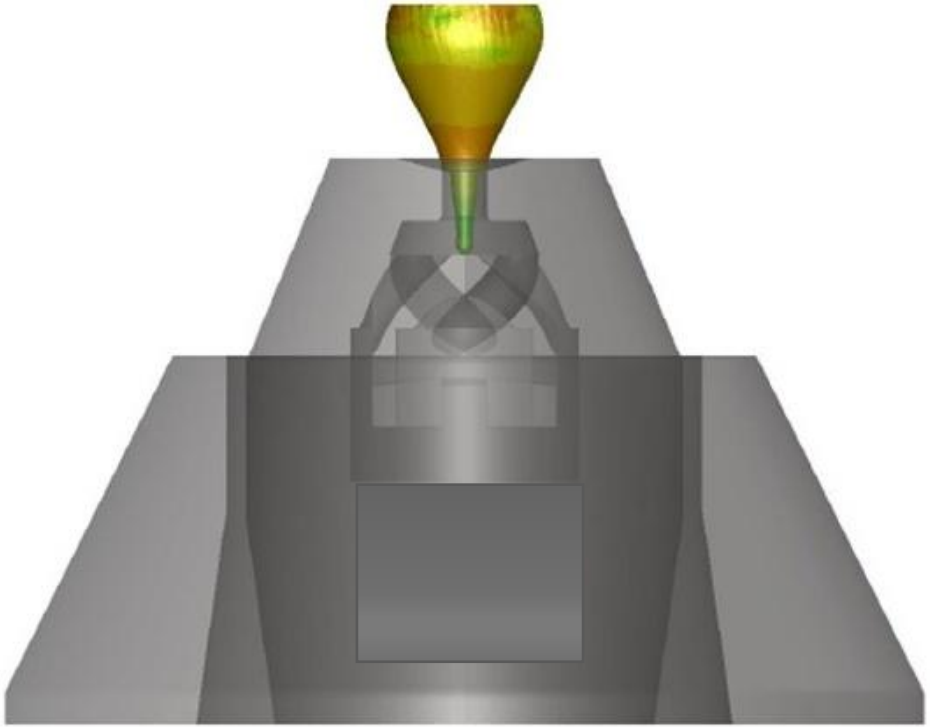
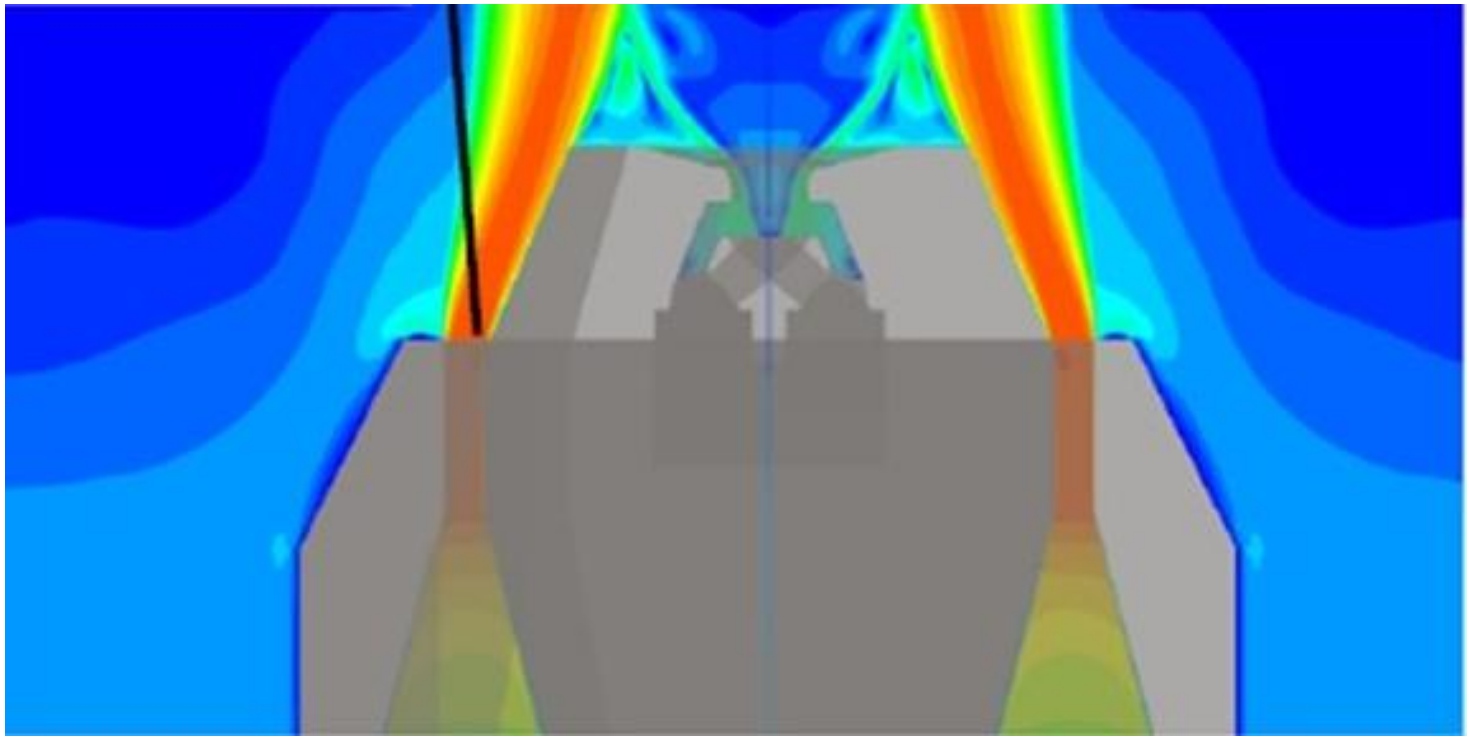
- Reached **target secondary air flowrate with ca. 10% lower ΔP than reference**
- Reached **same air velocity of secondary air at urea contact point**
- Reached **air film radius at contact height** fitting well with the scale-up criteria.

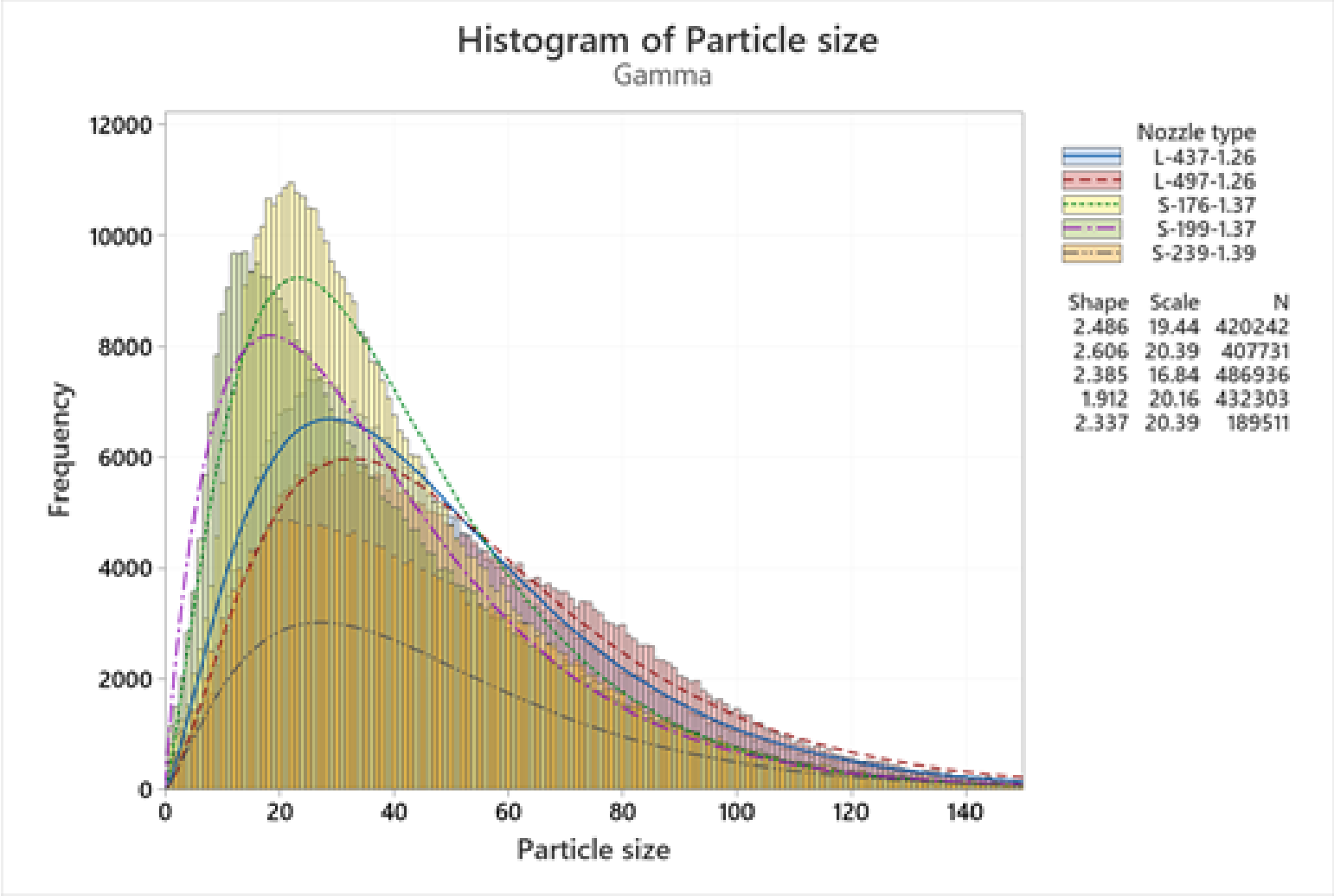


Velocity contour urea melt with secondary air



Velocity secondary air in the ring gap

WATER TEST



Large capacity nozzle produces **same size droplets** as the **standard** thus expecting **same dust formation**.

PILOT TEST

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COMPARATIVE PILOT TEST CAMPAIGN:

- Standard: **design** & **increased** (revamp) **capacity**
- High capacity: **design** & **2 increased capacities**

BIURET & WATER

Same after respective correction of residence time (coming from the different capacity of the tests) and water sources (coming from formaldehyde addition).

FORMALDEHYDE

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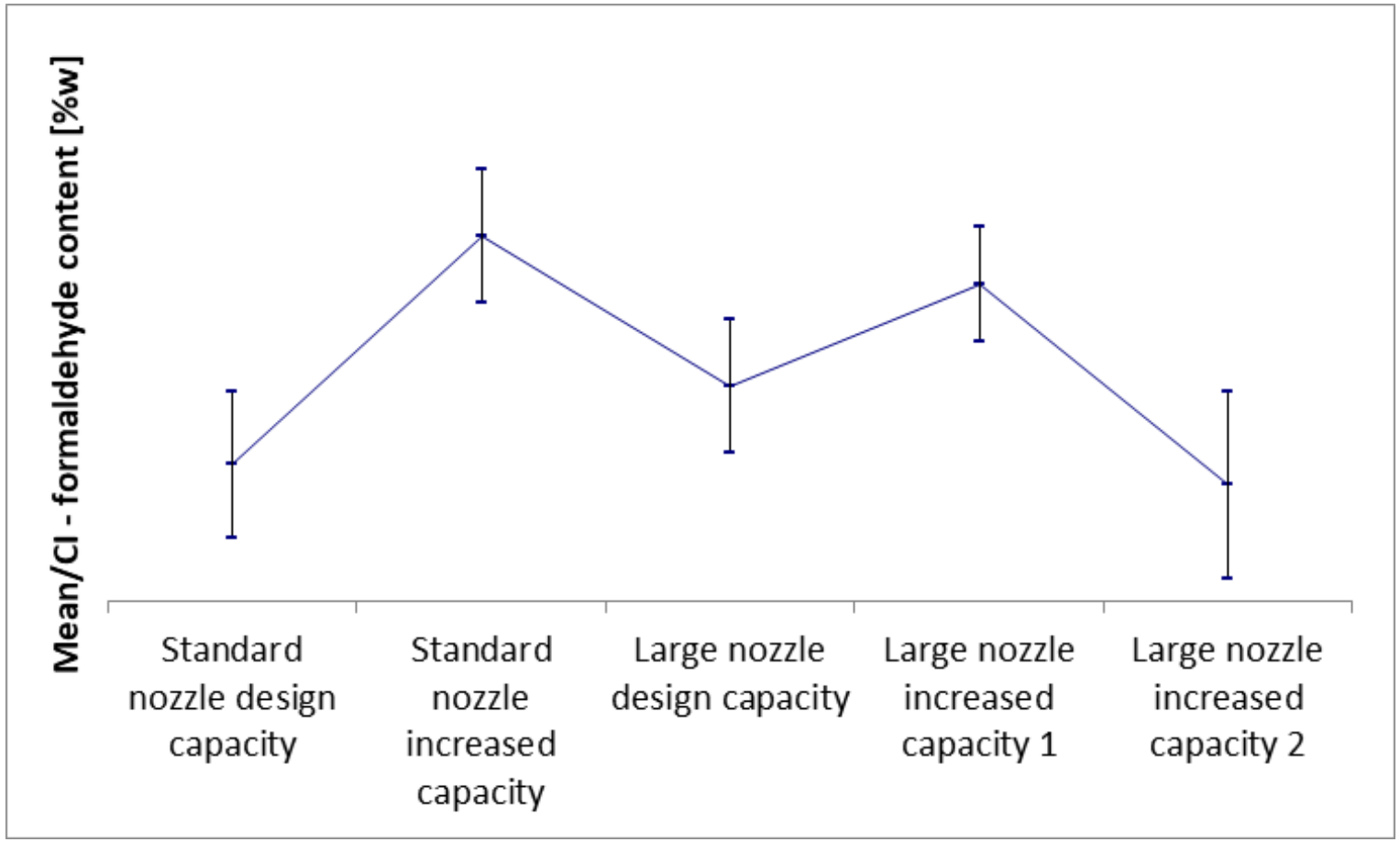

CRUSHING STRENGTH

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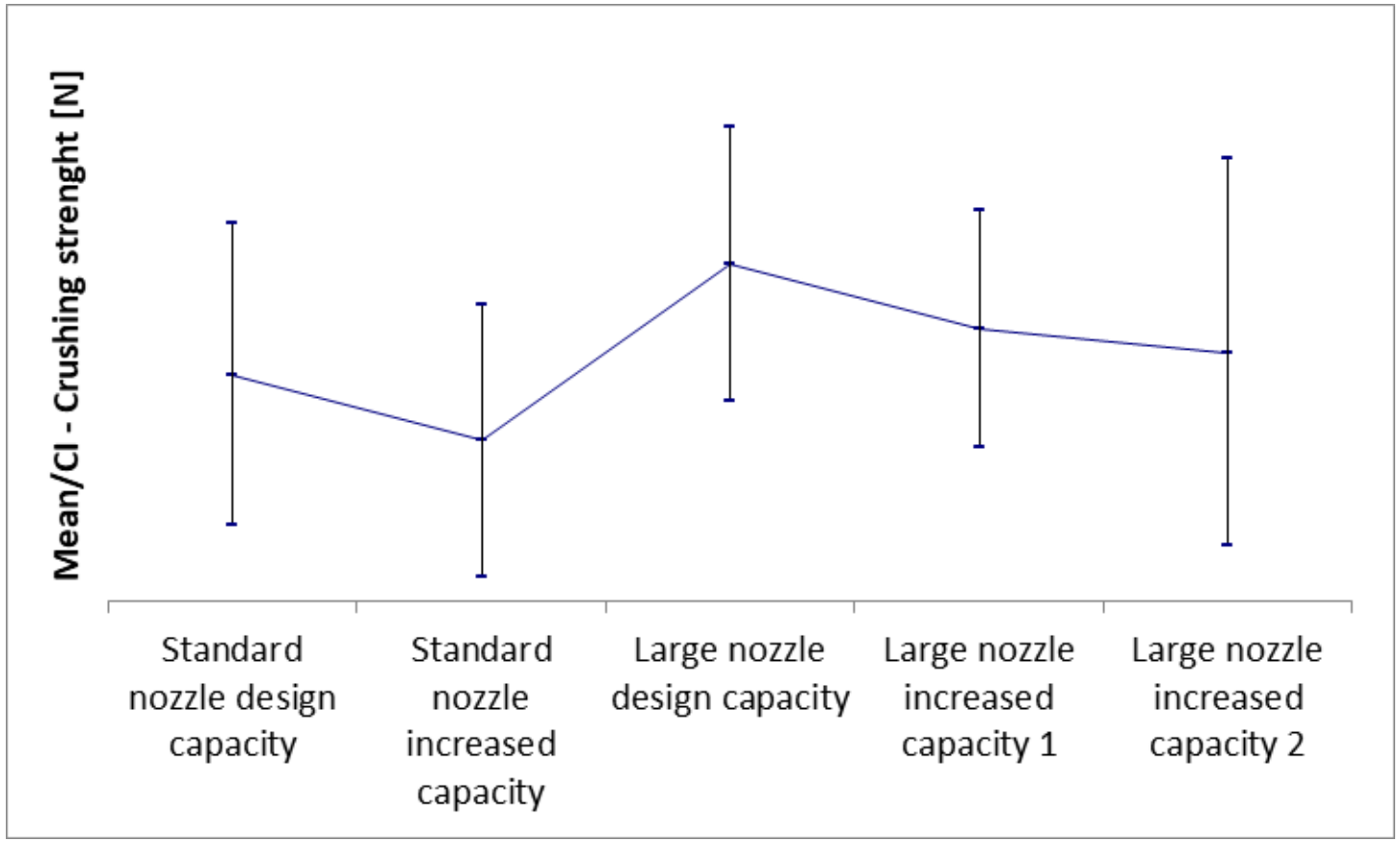
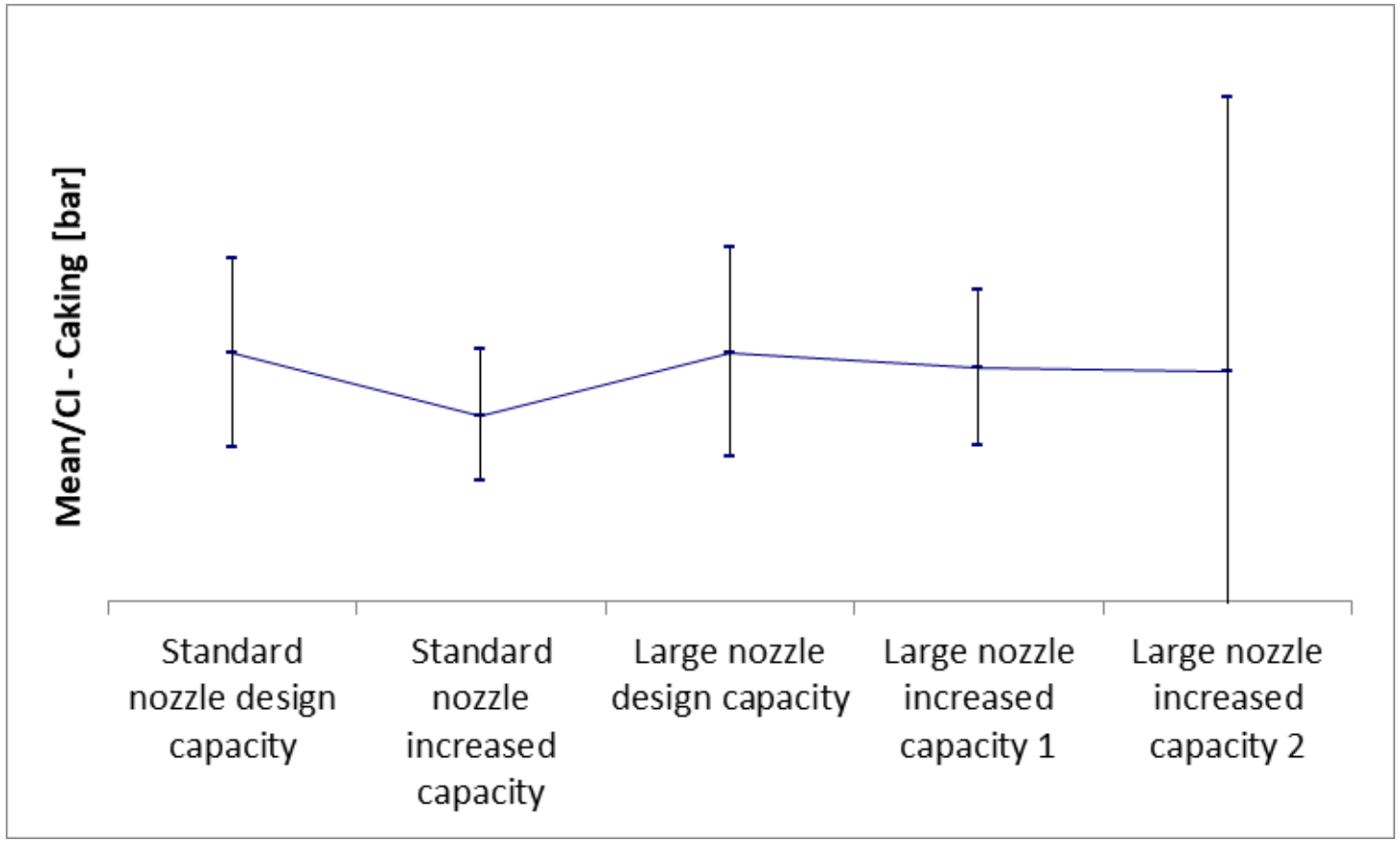


CAKING


Mean/CI - Caking [bar]
Standard nozzle design capacity
Standard nozzle increased capacity
Large nozzle design capacity
Large nozzle increased capacity 1
Large nozzle increased capacity 2

PILOT TEST

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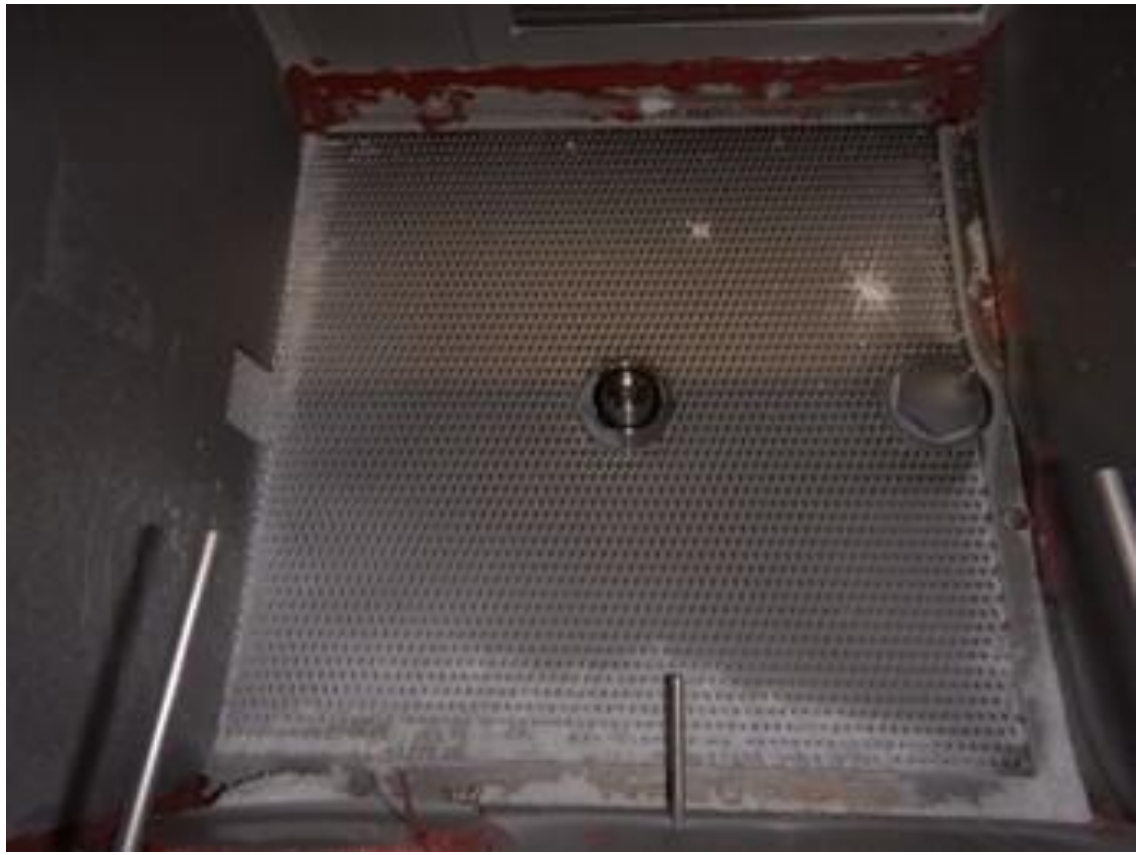
Clean compartment, nozzle & air ring after tests



Granules standard & large capacity

WHICH ONE COMES FROM STANDARD & LARGE?

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GENERIC REVAMP SCHEME

REVAMPED EQUIPMENT & OPERATING CONDITIONS

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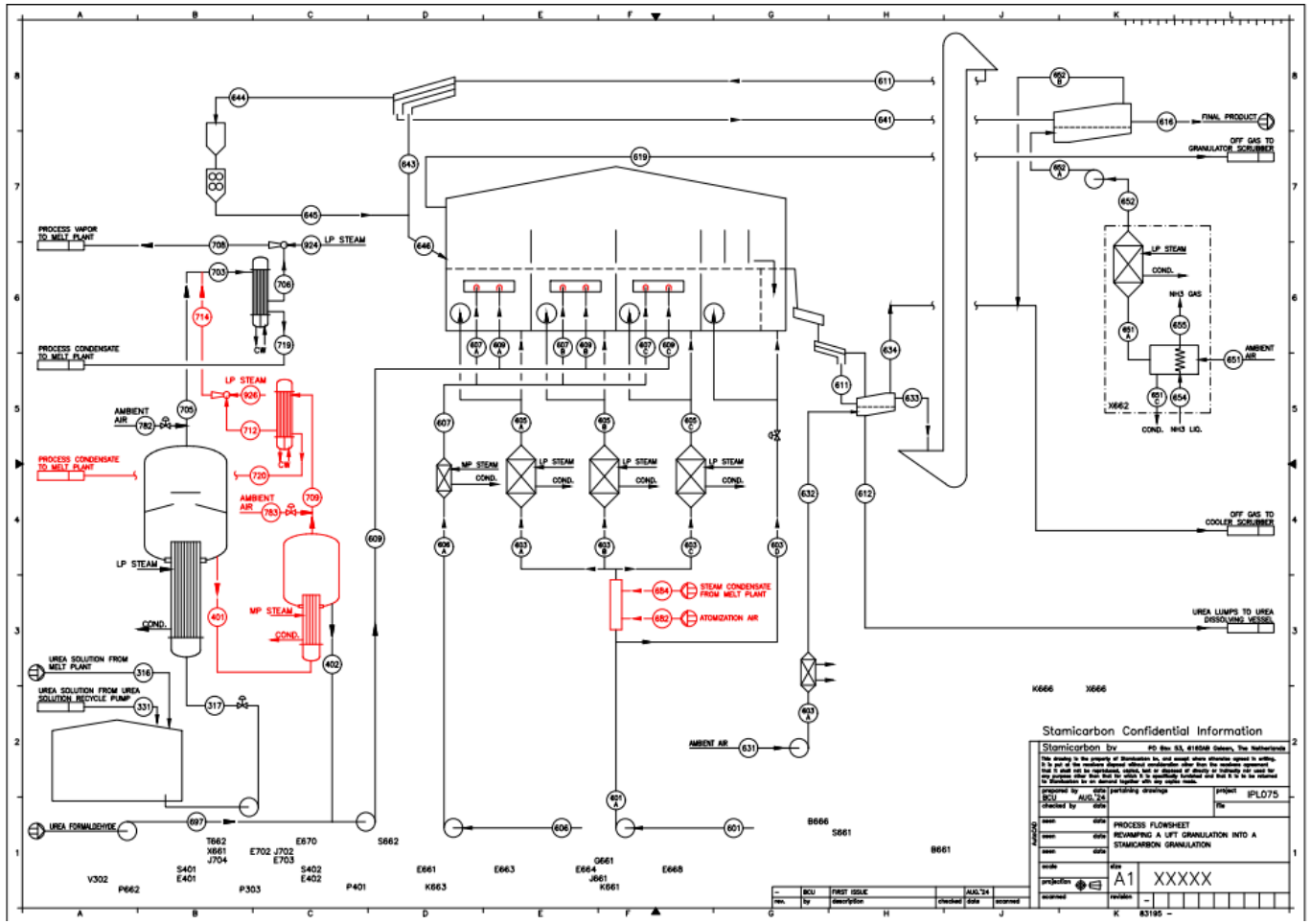

Main changes while revamping competitors atomizing fluidized bed granulation:

- High-capacity film spraying nozzles replacing the atomizing ones
- Water injection
- Additional evaporation stage

REVAMPED OPERATING CONDITIONS

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UREA MELT

		STAMI	COMPETITORS
urea mass flowrate	kg/h nozzle	500	-20%-30% less flow
water content in the melt	%-wt.	1.5	3-4
urea supply pressure	bara	Ca. 4	comparable
temperature	°C	140	lower

Revamp study parameters:

- Possibility of reduce number of working headers.
- Working with the maximum load on the evaporation section.

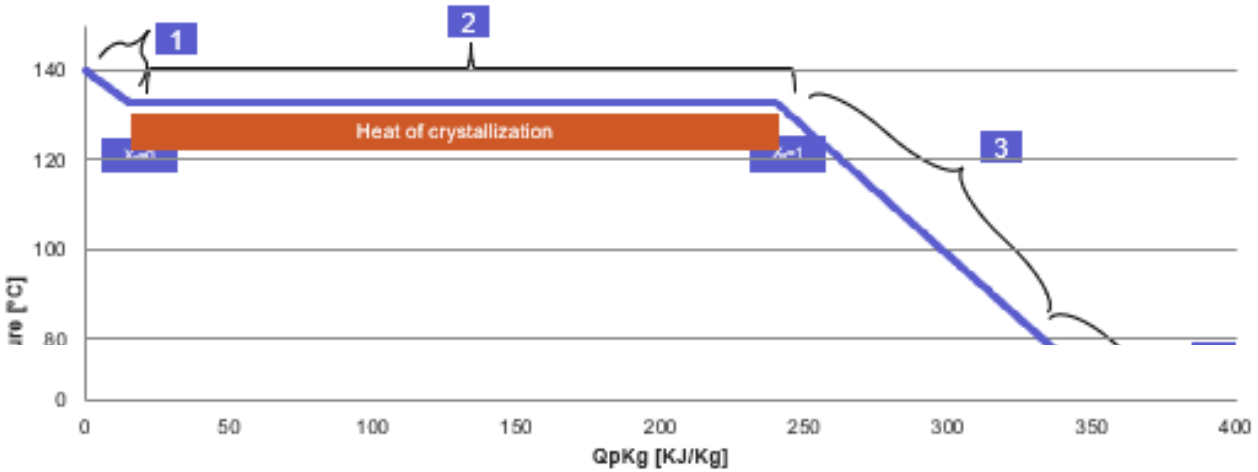
SECONDARY AIR

		STAMI	COMPETITORS
secondary air mass flowrate	kg/h nozzle	Proportional to urea melt	-10-15% Less flow
secondary air supply pressure	bara	Ca. 1.3	Slightly higher
temperature	°C	140	Lower temperature

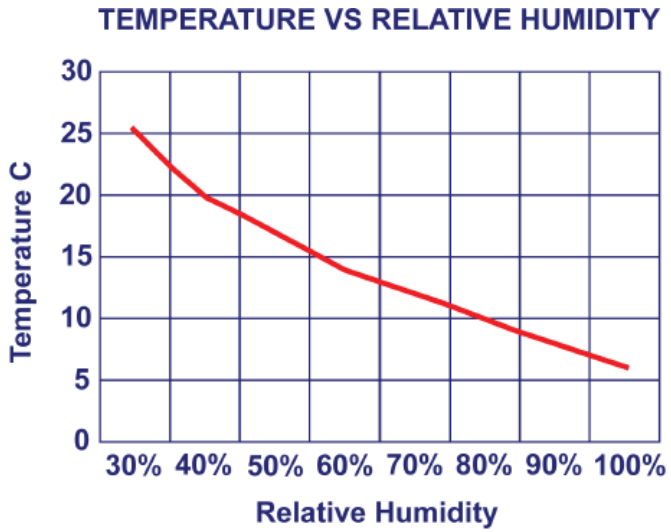
Revamp study parameters:

- Maximum load on the atomization air fan and atomization air fan curve to be checked
- Working with maximum load on the atomization air heater

NEW EQUIPMENT-WATER INJECTION



Fluidization air is used in the granulator to cool down the granules however maximum fluidization velocity should not be exceeded!



Relative Humidity	30%	40%	50%	60%	70%	80%	90%	100%
Temperature C	25	20	17	14	12	10	8	6

Increase the relative humidity via water injection will lower the temperature and ensure cooler capacity (at same fluidization air flow).

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CASE STUDY

CASE STUDY-OBJECTIVES

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- Granulation technology: Atomizing fluidized bed urea granulation from one of the competitor
- Nameplate capacity: DESIGN MTPD
- Wished Revamped capacity: EXTRA CAPACITY
- Year of Start: Relatively young

Extend running time

Increase capacity

Reduce UF consumption

Possible improvements for the plant

CASE STUDY-SITUATION AT PLANT SIDE

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Extensive dust at granulator ceilings and stiffeners

Fouling in the granulator fluidization plate in all compartments

CHALLENGES TO CONVERT

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Nozzle replacement

- High-capacity nozzle fits well
- Special fitting had to be slightly adjusted

Conclusion:
Use of special fitting

Melt concentration

- 2nd stage evaporator is available that can reach concentration as high as 97%wt

Conclusion:
Relative small modifications to the evaporator

CHALLENGES TO CONVERT

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Heat of crystallization

- Water injection was not possible in that context
- Fluidization air fan is reaching its maximum limit during summer
- The ambient temperature is colder most of the year

Conclusion:

Heat can be removed most of the year except when the ambient temperature is close to design temperature which is quite limited days in the year.

CHALLENGES TO CONVERT

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Capacity increase

- The capacity is not limited by the nozzle
- Checking on existing equipment should be performed to the air flow equipment and the solid handling equipment
- Extent of capacity increase to be checked by tailor made revamp study

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CONCLUSIONS

CONCLUSIONS

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High-capacity nozzle enables a revamp to film spraying leading to:

- **Extended run length** ~ 2 to 3 times
- **Reduced formaldehyde** consumption, **Limited CAPEX** and **fast** implementation
- Current leads show that conversion is easily achievable even with **capacity increase**

NEXTCHEM
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THANK YOU

QUESTIONS?