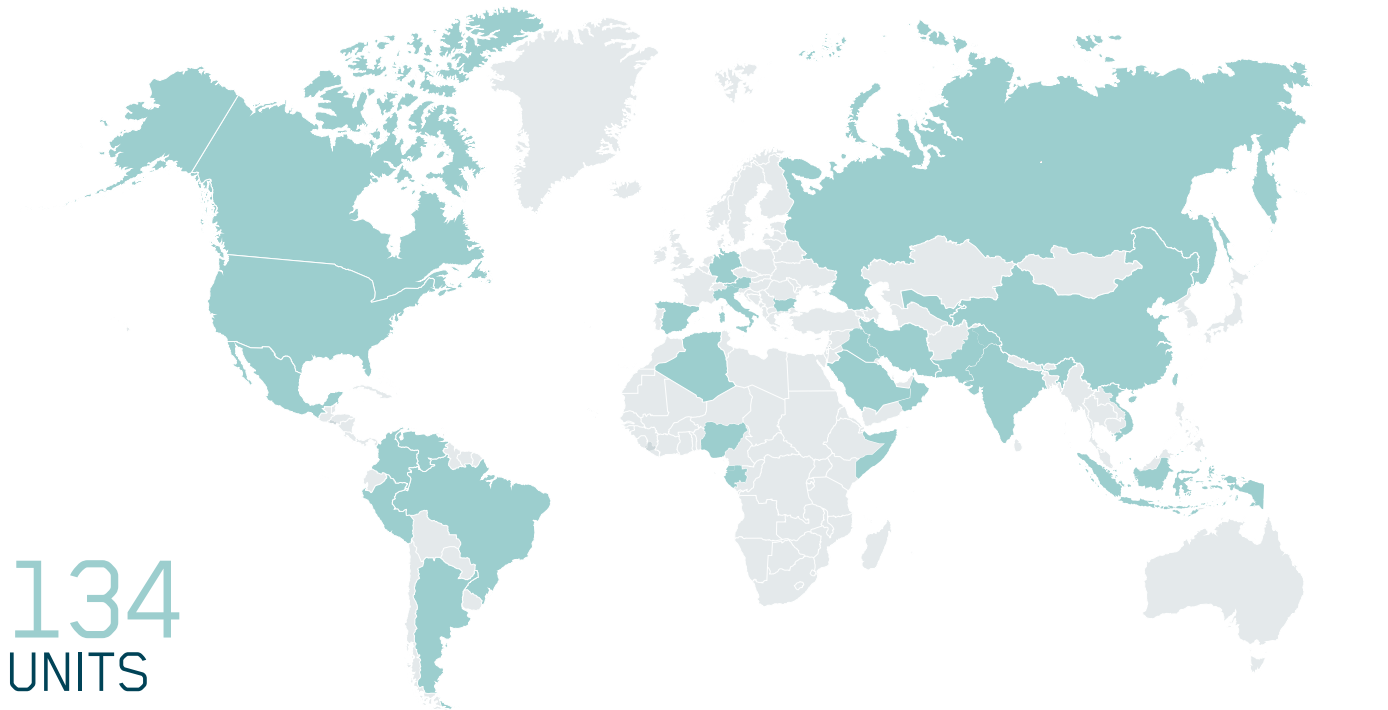


**SNAMPROGETTI™**  
**UREA TECHNOLOGY**



# SNAMPROGETTI™ UREA TECHNOLOGY

(AS OF 2016)



65  
REVAMPING

234,500 MT  
DAILY UREA PRODUCTION



ANY CAPACITY



INNOVATION



FLEXIBILITY



PERFORMANCES



ENVIRONMENT



SUPPORT



# ANY CAPACITY

## SINGLE LINE ACHIEVEMENTS

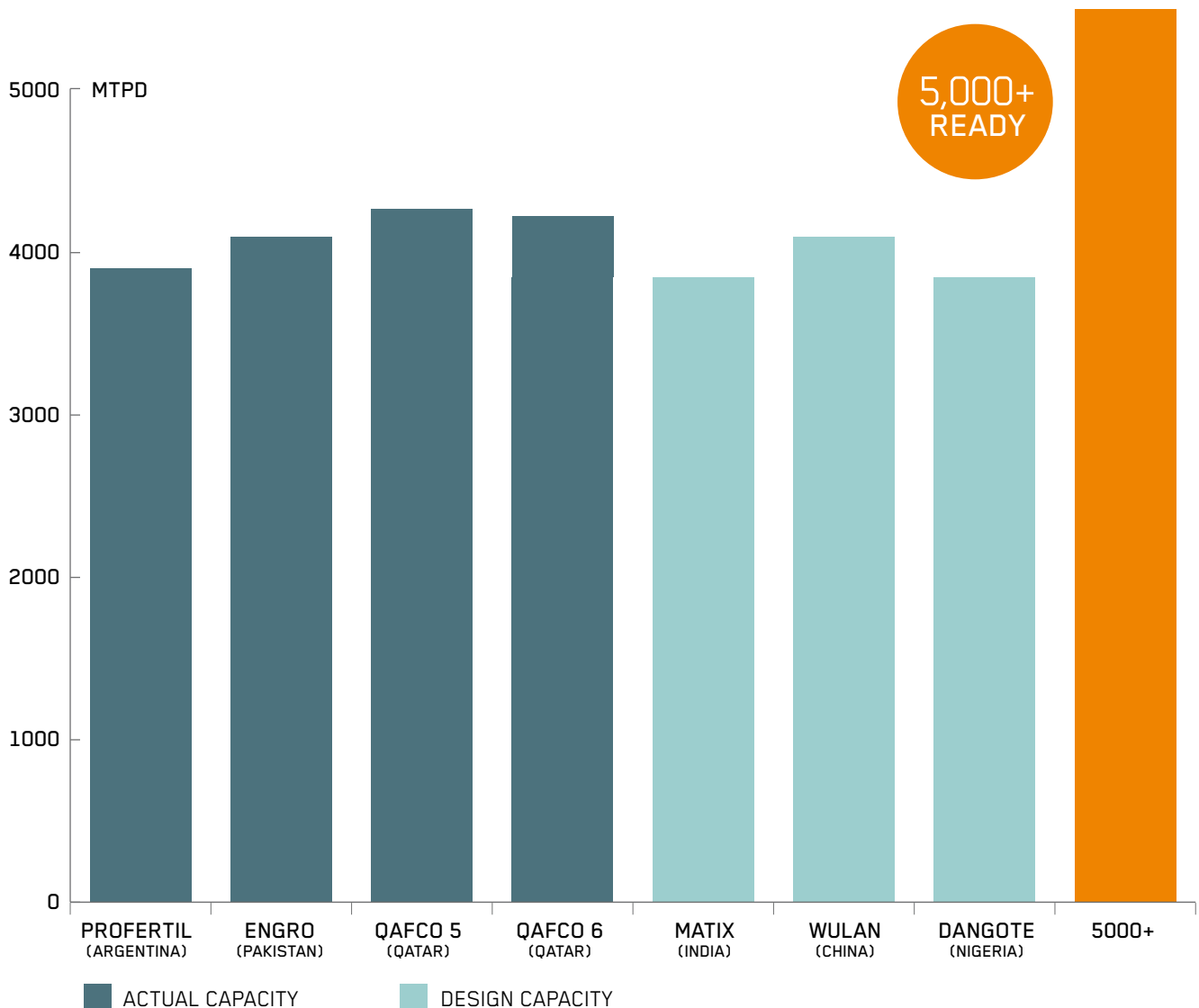


Uninterrupted  
plant operation



Capacity  
in operation

- ➔ More than 15 plants for capacities over **3,000 MTPD** since year 2000
- ➔ First **4,000 MTPD** urea plant
- ➔ Over **4,200 MTPD** in operating plant
- ➔ **5,000+** urea plant ready



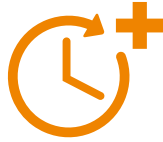


## 1. \ SNAMPROGETTI™ SUPERCUPS

Active reaction step



OPTIMAL MIXING  
OF REAGENTS



INCREASE  
RESIDENCE TIME



ENERGY  
SAVING

Gas  
Equalizer

Mixer  
Reactor

Gas  
Distributor

### BENEFITS

#### TRIPLE FLUID DYNAMIC EFFECT

The innovative concept of SuperCups lies in the realization of a confined reaction space within the tray geometry. In this way SuperCups perform as additional active reaction stages thus enhancing the conversion rate.

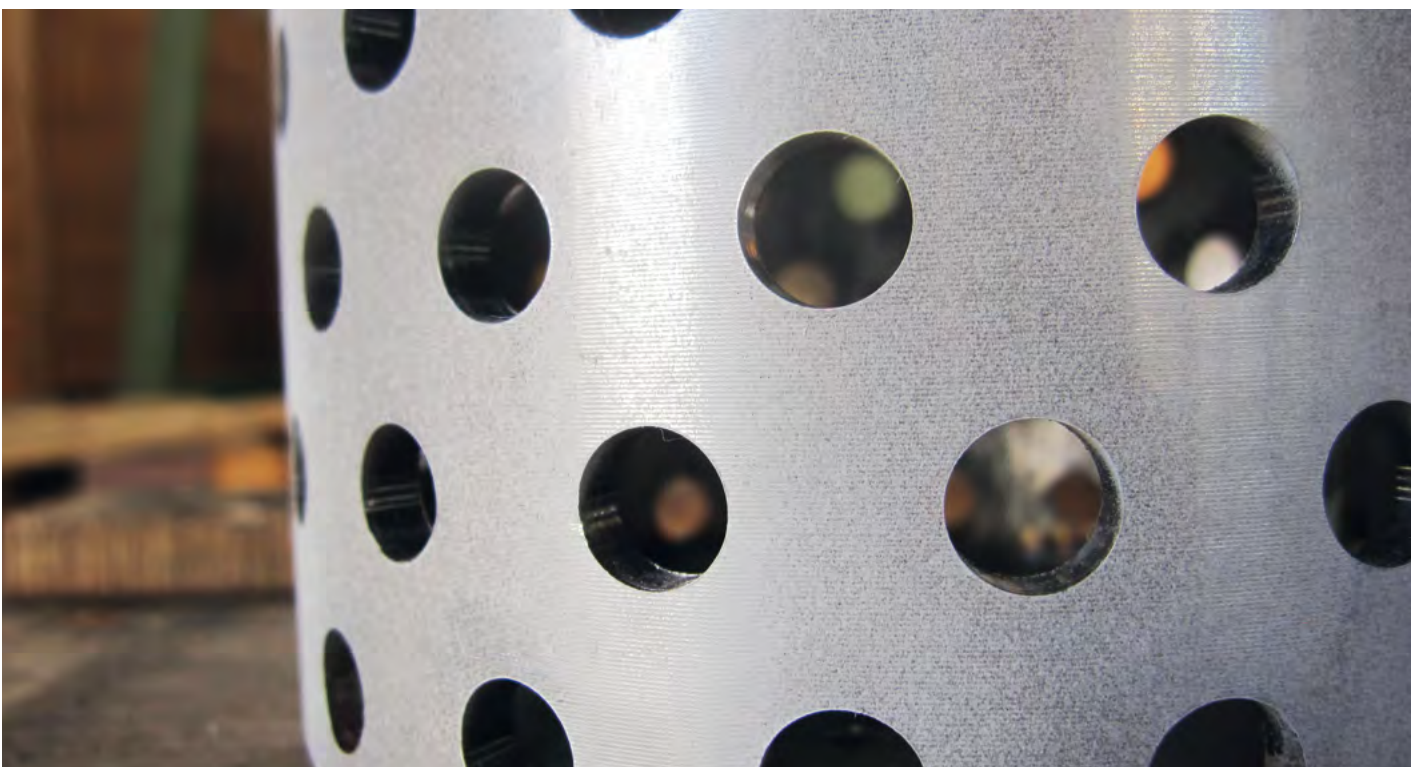
## References @2016

1 Borealis Agrolinz Melamine Int. GmbH, Austria (2014)

2 Fauji Fertilizer Company Ltd., Pakistan (2014)

3 Ordos Yiding Coal Chemical Co. Ltd., China (2015)

4 Pro-Agroindustria S.A. de C.V., Mexico (2016)



## 2. \ OMEGABOND®

High performance stripper metallurgy



HIGHER BOTTOM  
TEMPERATURE



NO PASSIVATION  
AIR FOR BOTTOM TUBE-SHEET



MAXIMUM  
LIFETIME

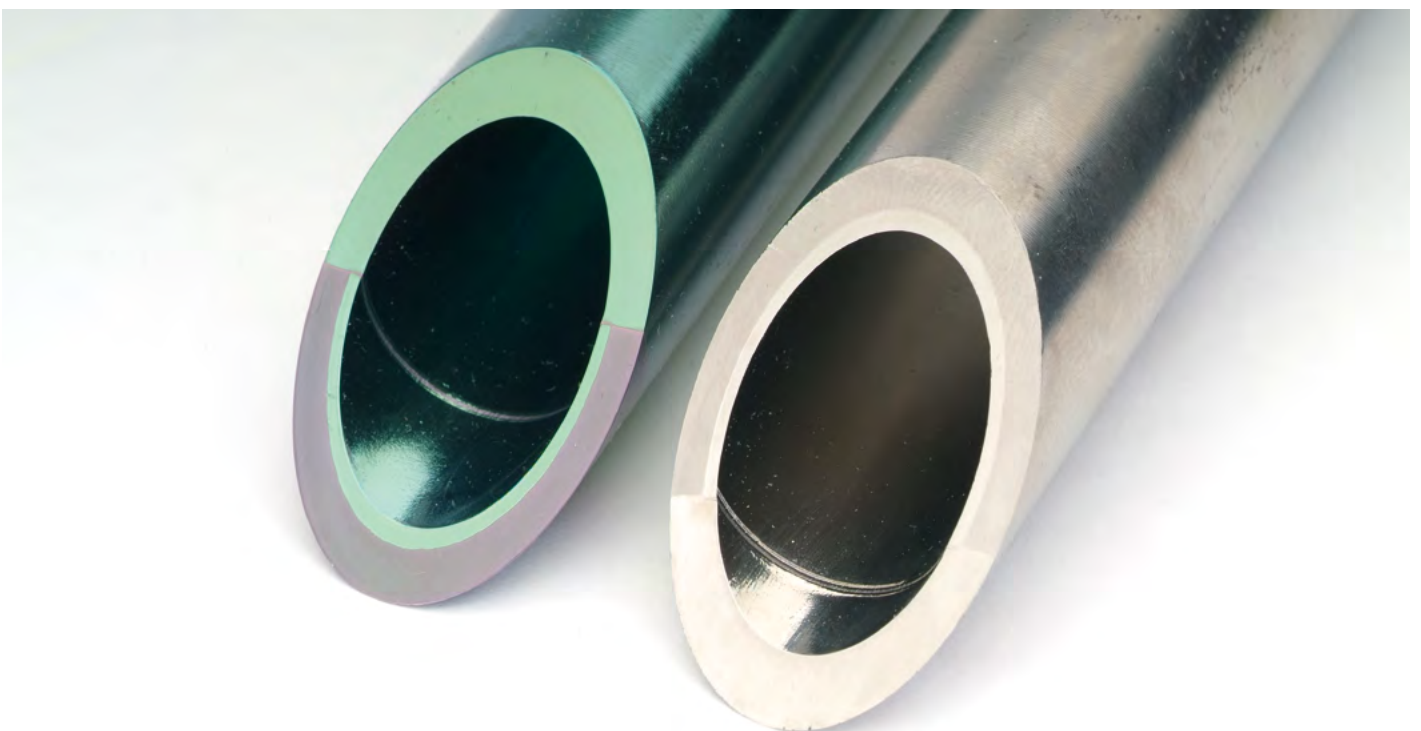


### BENEFITS

The Omegabond® tube technology utilizes a solid-state process which metallurgically bonds the titanium tubes to the zirconium via an extrusion process that prevents solution from seeping between the tube layers.

## References @2016

- 1 Gulf Petrochemical Industries Co., Bahrain (2010)
- 2 Fauji Fertilizer Company Ltd., Pakistan (2011)
- 3 State Company of Fertilizers, Iraq (2015)
- 4 State Company of Fertilizers, Iraq (2015)
- 5 CNOOC-China Blue Chemical Ltd., China (2015)
- 6 Agrium Redwater, Canada (2016)





### 3. \ LAYOUT

Minimum footprint and elevation

-25%

Plot Plan Area

-15%

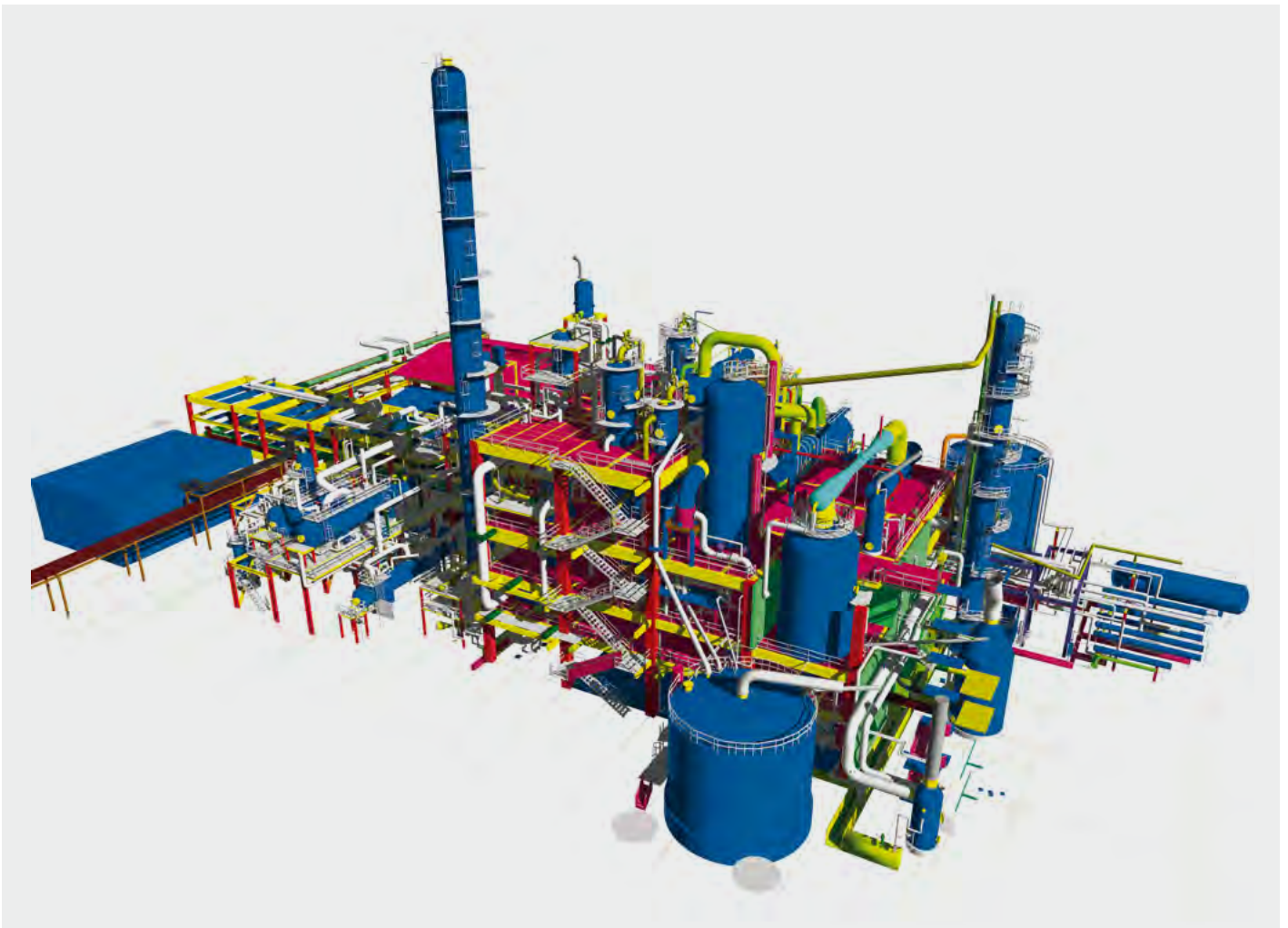
Piping

-30%

Steel Structures

#### **BENEFITS**

The compact layout facilitates construction while minimizing investment cost and permitting easy maintenance.



**WE MAKE  
GREAT THINGS  
HAPPEN**

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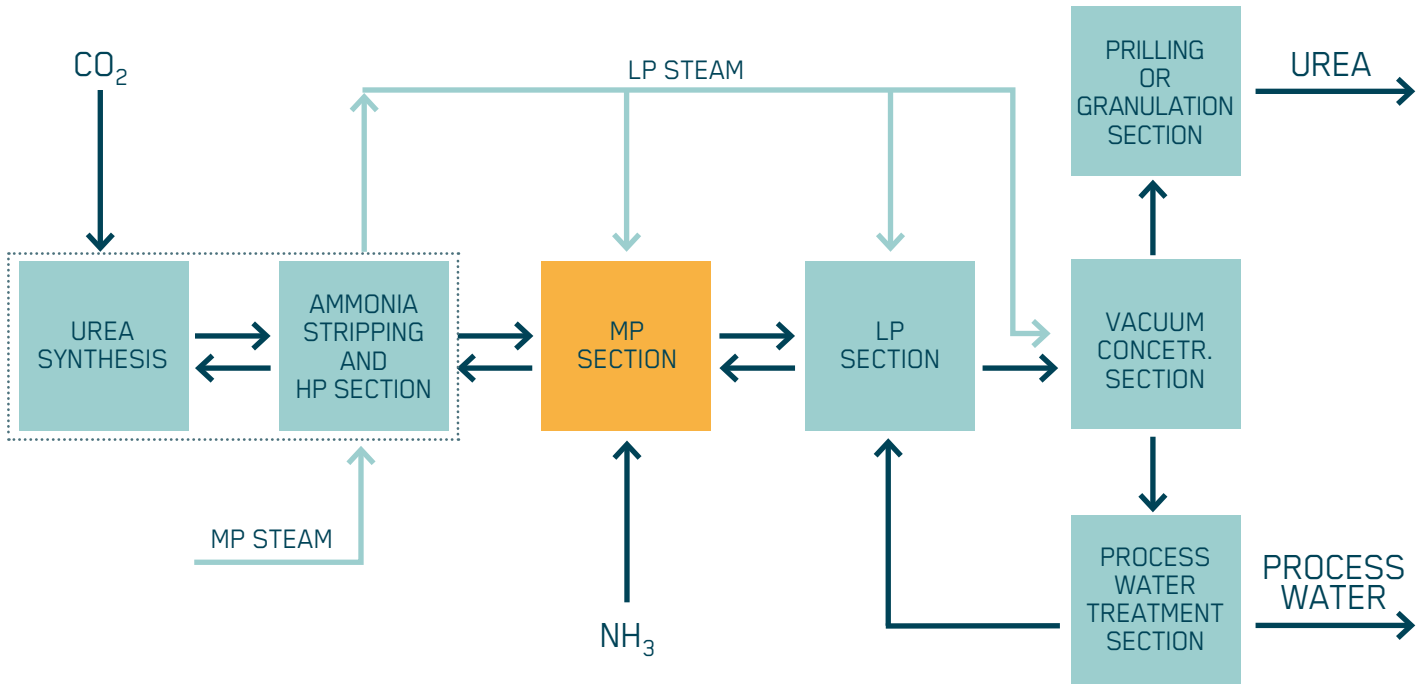
**EXTRAORDINARY  
IS OUR EVERYDAY**





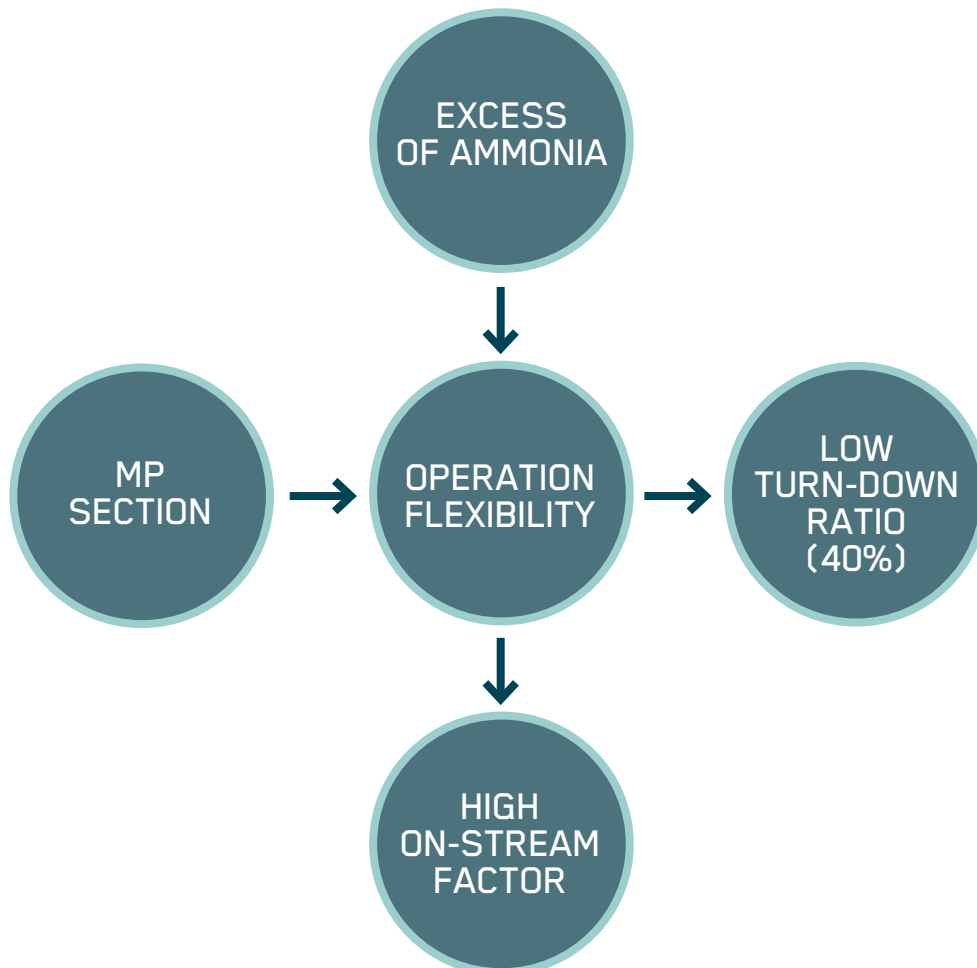


# FLEXIBILITY



Medium pressure section, a buffer for any up-set in high pressure section, assures greater flexibility in plant operation. Flexibility, excess of ammonia

and the possibility of blocking-in the high pressure section assure a high on-stream factor.







# PERFORMANCE DATA

PRODUCT QUALITY		PRILL	GRANULE
Nitrogen	% wt.	46.4	46.3
Biuret	% wt.	0.85	0.8
Moisture	% wt.	0.25	0.2
Formaldehyde	% wt.	-	0.4
Size distribution	% wt.	97% from 1 to 2.4 mm	95% from 2 to 4 mm
Crushing strength	kgf	0.8 (on 2 mm)	4.1 (on 3 mm)

Expected data.

RAW MATERIAL AND UTILITIES CONSUMPTION		PRILL	GRANULE
Ammonia (as 100%)	kg	566	563
Carbon Dioxide (as 100%)	kg	733	731
HP Steam (110 bar g, 510°C)	kg	840	810
Cooling Water ( $\Delta T = 10^\circ C$ )	m <sup>3</sup>	95	95
Electric Power	kWh	23	75

Expected data referred to 1 ton of urea product.



# ENVIRONMENTAL CARE

- Ammonia venting is reduced to nearly zero by a particular feature of Snamprogetti™ technology. This result is also facilitated by the very low quantity of passivation air required and introduced into the plant.

LOWO<sub>2</sub>

- The urea and ammonia dissolved in process condensate are removed in the dedicated section. Treated condensate is normally reused as boiler feed water.



# ZERO EMISSION



# EVERLASTING SUPPORT

## LICENSING

Saipem assures a complete technology package tailored for your project, starting from the design up to the assistance during the whole lifetime of your plant.



## LICENSING

- TECHNOLOGY PACKAGE
- AFTER SALES SERVICES
- CLIENT CARE

## CO-PRODUCTIONS

Snamprogetti™ urea technology, thanks to its features, can be easily coupled with other product lines:

- Diesel Exhaust Fluid
- Urea Ammonium Nitrate (UAN)
- Urea Ammonium Sulphate (UAS)
- Urea Formaldehyde solutions
- CalcUrea



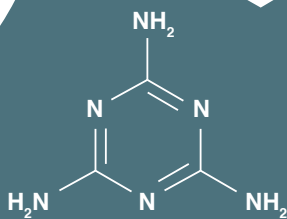
## CO-PRODUCTIONS

## REVAMPING

The longstanding experience demonstrates the capability to realize significant production increase, energy saving and environmental improvements with minimum economic impact.

### REVAMPING

- ↑ CAPACITY
- ↓ EMISSIONS
- ↑ QUALITY
- ↑ EFFICIENCY



### MELAMINE INTEGRATION

## MELAMINE INTEGRATION

Urea plants based on Snamprogetti™'s technology are easily integrated with melamine plants. Process flexibility plays a key role in accommodating recycle off gas streams, making the overall scheme extremely reliable.





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