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GREEN GRANULATION

Casale advanced fluidized bed granulation process
for Urea and Ammonium Nitrate

 CASALE

We are a global partner
in the chemical industry,
offering **integrated technologies,
engineering, contracting
and construction solutions**
for over a century.

Our mission

Contribute to shape a new sustainable planet with our plants for the production of fertilizer, methanol, hydrogen, melamine and derivatives, and help our customers creating value respecting the environment.

We are a global company front leader in the energy transition: a key player in the sustainable transformation of the chemical and energy industry, from a social, economic and environmental point of view.

Our values

INNOVATION PEOPLE CARE **PROFESSIONAL EXCELLENCE**
QUALITY **SAFETY** ETHIC **SUSTAINABILITY**

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GREEN GRANULATION

Casale granulation process incorporates the renowned Fluidized Bed Granulation technology developed by Green Granulation Limited, which has been fully acquired by Casale in 2022.

This cutting-edge technology has seamlessly become an integral part of Casale's comprehensive suite of integrated solutions for fertilizer production, spanning from raw feedstock to finished products.

Application fields

Casale's Fluidized Bed Granulation technology offers remarkable flexibility and versatility.

It can be integrated in new plant as well as used for revamping existing facilities, serving as the final finishing stage of a wide range of products:

- Urea
- Urea + Ammonium Sulphate (UAS)
- Enhanced Urea, to obtain nitrogen fertilizers incorporating plant's essential micronutrients or other additives, for tailor made ends
- Urea for use in DEF/AD Blue production or as technical grade, without added formaldehyde
- Ammonium Nitrate & Calcium Ammonium Nitrate (CAN), at different grades

Benefits

- Low investment cost
- Low energy consumption
- Minimum or no use of formaldehyde
- High product quality
- Simple plant operation
- High operating flexibility
- Reduced maintenance requirement

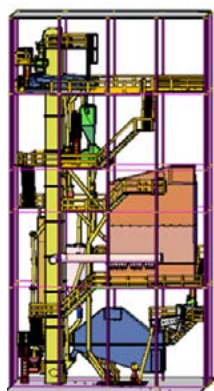
Casale technical assets

The core strengths of this technology lie in its optimized layout, improved performance, and cost-effectiveness.

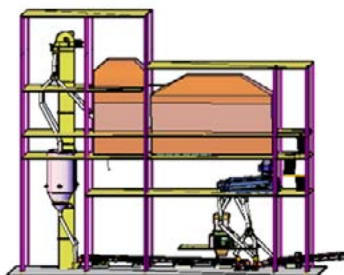
Furthermore, the fact of handling a product colder than as in other process leads to improved efficiency of screens and crushers with consequent less dust generation. State-of-the-art scrubbing technology allows the lowest emissions in the market. Optimized movement in the fluidized bed layer results in improved overall quality aspect of the granules and reduces the energy consumption of the process.

The layout of a Casale Fluidized Bed urea granulation plant, compared to other technologies available on the market, is characterized by:

- Low elevation building
- Optimized solid product flows
- Reduced pressure drop for the airflows through the system.



Traditional Process Frame



Frame of Casale's Green Granulation Process

Figure 1 - Process layout

The compact design of the urea granulation plant combines straightforward operation with lower capital investment.

The proprietary "Optimized Fluid Bed Dynamics" principle underpinning our granulation technology features a low-level fluidized bed, resulting in reduced system pressure drop over the system and a more consistent and uniform particle build-up.

Our in-house developed Hydraulic Urea Melt Sprayers contribute to minimal dust production during the spraying process and extend the duration between required wash stops.

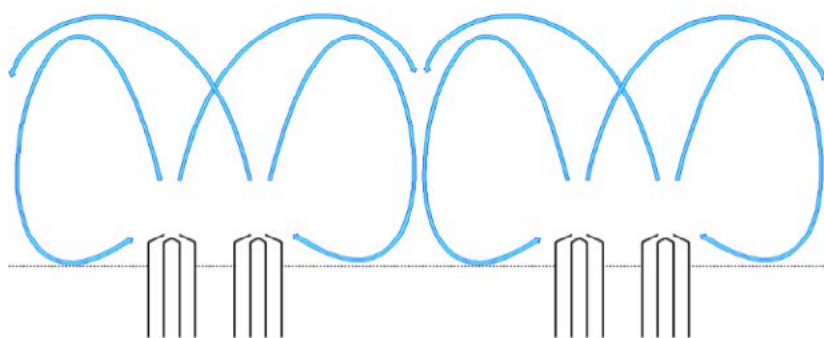


Figure 2 - Another remarkable feature is our Double Temperature Scrubbing Technology, which harnesses condensation to capture sub-micron-sized particles in the airstream, ensuring compliance with extremely stringent dust emission standards.

Lastly, the urea concentration fed to the Casale Fluidized Bed granulator can be as low as 96-97%, in contrast with other competing processes requiring at least 98,5%. This significant reduction in urea concentration leads to substantial savings in steam consumption in the upstream urea concentration unit and lowers the overall power consumption due to reduced air volume throughout the system. This, in turn, results in smaller air fans and more compact Granulator and Granulator Scrubber units.

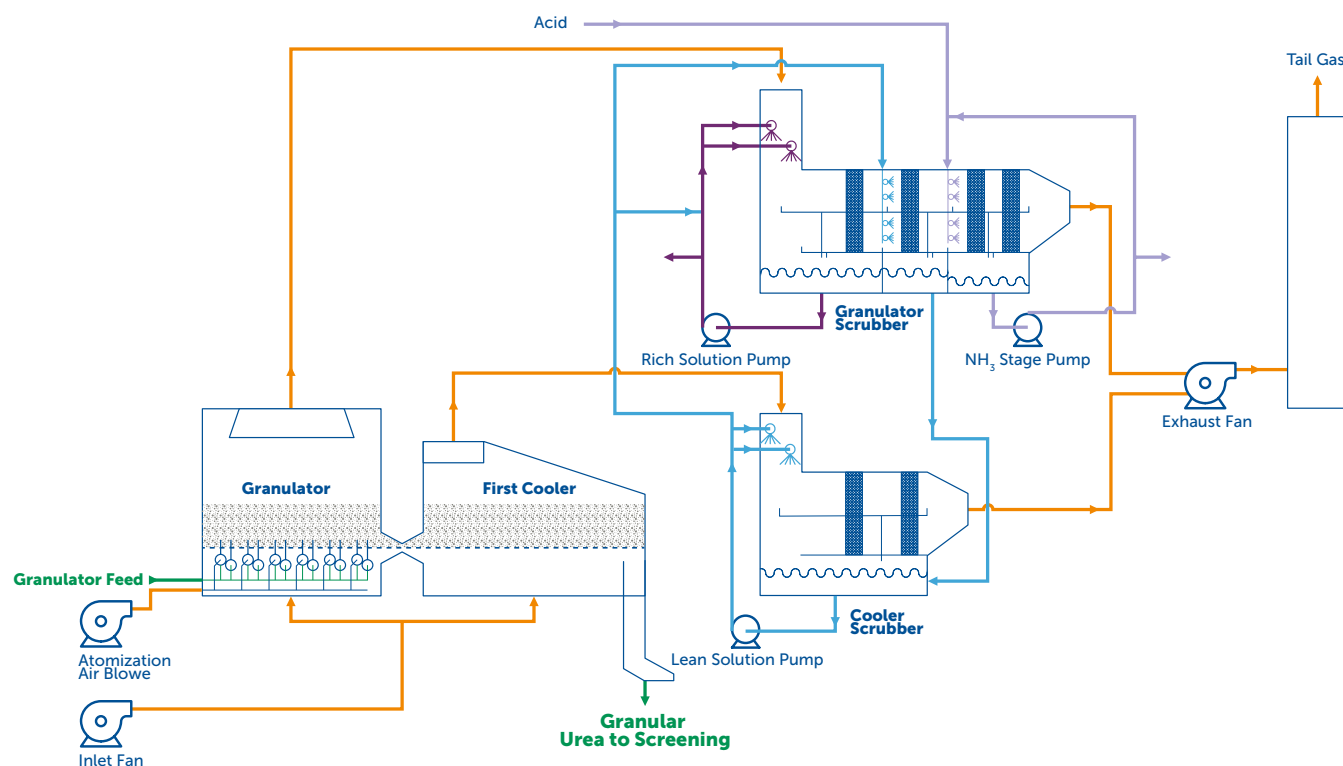


Figure 3 - Fluidized Bed Granulation flow diagram

The urea feed solution, at 96.5-97% concentration, added with formaldehyde to the amount required, is pumped to the main distribution header of the granulator.

Here the solution is sprayed into a fluidized layer of seed material, intensively mixed in accordance the Optimized Fluid Bed Dynamics concept, which is key to achieving a uniform size-enlargement of the granules.

Ambient air at fairly low pressure is injected in the urea solution sprayers to generate the droplets and ensuring that they are carried deep inside the fluidized bed, while at the same time entraining the seeds in the fluidized bed within the spraying area. Ambient air is also used as fluidization air. After passing through the fluidized bed, the atomization/fluidization air, containing urea dust, is extracted from the top of the Granulator and sent to Granulator Scrubber for washing. The dust air from the top of the First and Final Cooler respectively are sent directly to the Cooler Scrubber for deep washing. Then, both streams of cleaned air are eventually discharged to the atmosphere via a Stack respectively by Granulator Scrubber Exhaust Fan and Cooler Scrubber Exhaust Fan.

The urea leaving the Granulator is cooled to the requested temperature in the First Cooler and then by means of a vibrating extractor is directly fed to a Vibrating Screen which separates the on-spec granules. The oversize product is crushed into small particles and, together with small size product, recycled back to the granulator as seed material.

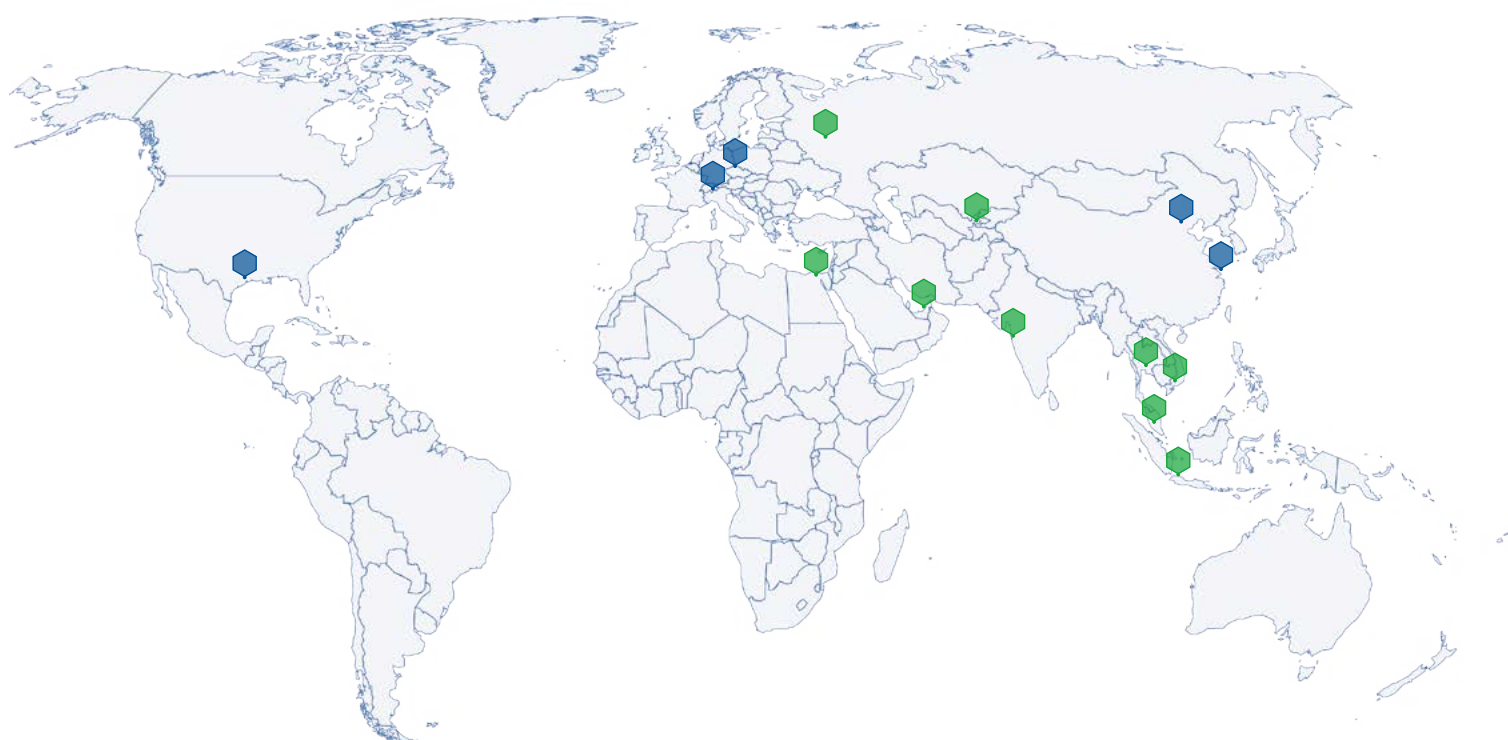
The on-size stream is transferred to the Final Cooler for further cooling down to end temperature. The cooling air to Final Cooler is first chilled by an ammonia chiller and then sent by an air fan to the air inlet of Final Cooler. After cooling, the product is sent to the storage.

The urea dust in the exhaust air from Granulator and First Cooler is recovered in the patented Double Temperature Wet Scrubbing section as 45-50% urea solution (and recycled back to the evaporation section of the urea synthesis plant. Usually, the wet scrubbing section uses process condensate or desorption solution (free of ammonia) from the urea synthesis plant as scrubbing make-up water. This also compensates for water evaporation due to the wet saturation of the exhaust air. To safeguard against any potential overflows, a Recycle Tank is installed to collect both solid and liquid excess. The diluted urea solution is then recirculated back to the urea synthesis plant. The diluted urea solution is recycled back to the urea synthesis plant by means of the urea recycle pumps. The final amount of ammonia, which is released into the atmosphere, is controlled by acid washing with sulfuric acid in the scrubbers.

The ammonia is recovered in the wet scrubbing section as ammonium sulfate solution and finally sent out of the battery limits.

**PLANTS FOR
A NEW PLANET.
SINCE 1921.**

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