Green Granulation Technology
绿色造粒技术公司

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Green Granulation Technology (GGT) was established in 2011 and is active in the Ammonia and Urea industry, licencing technology and providing engineering for plants to produce granules from synthesis Urea, to be used as fertilizer.

GGT has developed revolutionary new elements to the fluidized bed granulation technology used to produce urea fertilizer granules, giving GGT a technological edge over its competitors and combined these in its Cold Recycle Urea Granulation (CRG) Technology.

Since 2011, GGT has signed contracts for 11 urea granulation projects, all located in the People's Republic of China, supplying technology license, PDP design services, technical services and proprietary equipment.

Introduction of the Cold Recycle Urea Granulation (CRG) Technology

The GGT-fluid bed urea granulation plant receives concentrated urea solution from the evaporation section of the urea synthesis plant. This solution is sprayed in the granulator injection compartment where it is transformed from liquid into solid granules of the desired size and quality. After cooling, the end product is sent to a bulk storage and/or bagging section.

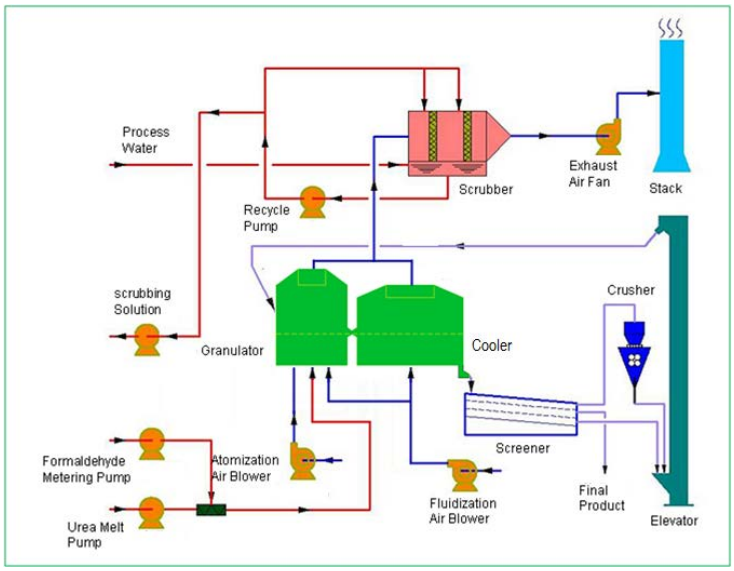
The GGT- fluid bed urea granulation process is characterized by producing granular urea by spraying the urea solution onto urea seed particles, which are kept in a fluidized state. The seeds grow up by continuous evaporation, crystallization and solidification. The spraying system produces a large number of very fine droplets, which guarantees a highly homogeneous granule structure.

The GGT-fluid bed urea granulation process uses a feed of melt urea solution with a concentration of 96~97% (Urea+Biuret). This feedstock comes from the evaporation section of the upstream urea plant.

The process can be subdivided into three sections:

- Fluid bed granulation including its solids recycles loop and product cooling;
- Screening and crushing of granular product;
- Dust recovery and emissions treatment.

Process description



Upstream of the granulation plant, the urea feed solution from the urea synthesis plant is pumped to the Granulator. Formaldehyde, in the form of a UF85 solution or 37% solution, is injected into the urea feed solution in the suction of the urea feed pump. The total rate of formaldehyde added into the process amounts to about 4.5 kg formaldehyde (converted into pure formaldehyde) per ton of granular end product. The urea feed solution containing formaldehyde (at concentration of around 96.5~97% and temperature of 130~135°C) is delivered into the main distribution header of the granulator at the pressure of 0.4MPa (g). Inside the Granulator, the urea solution is sprayed into a fluidized layer of seed material, which is intensively mixed by the “optimized dynamics” principle in the fluidized bed layer to achieve a uniform size-enlargement of the granules.

The atomization air at fairly low pressure of 0.045 MPa (g) is used to assist to the solution sprayers to produce fine droplets and ensures that the sprayed fine droplets are carried deep inside the fluidized bed, while at the same time pushing seeds into the spray area. Ambient air is used as atomization air, which is preheated to 125-135°C before entering into the granulating compartments. Ambient air is also used as fluidization air. When operating at lower capacity or at low ambient temperature, part of the air to the injection compartments is slightly preheated to design temperature by means of LP steam heaters. After going through the fluidized bed, the atomization/fluidization air contains entrained urea dust and is extracted from the top of Granulator and sent to the Granulator Scrubber for washing. The dust air from the top of Fluid Bed Cooler is sent directly to the Cooler Scrubber for washing. Then, these two streams of cleaned air are finally discharged to the atmosphere via Stack respectively by the Granulator Scrubber Exhaust Fan and the Cooler Scrubber Exhaust Fan.

The urea particles from the Granulator enter the Fluid Bed Cooler, where the urea particles are cooled down to the requested temperature. The urea granules come out of the Fluid Bed Cooler by means of the Vibrating Extractor and then are directly fed into the Vibrating Screen(s), where the stream is classified into three separate streams: oversize, undersize and on-size. The oversize stream is fed to the Roll Crusher in order to break down the over-size product into small seed particles. The undersize stream is, together with crushed oversize stream, again fed by means of the recycle Bucket Elevator to the granulator injection compartment as seed material to generate full size granules. The on-size stream is transferred via the end-product Bucket Elevator to the Final Cooler for further cooling down to product end temperature. After the cooling process, the product is finally sent to the storage or packing section.

The amount of urea dust in the exhaust air from Granulator and fluid bed Coolers accounts for approx. 3-5% of the total production capacity, and will be recovered in the wet scrubbing section as 45-50%-urea solution and recycled 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 wet saturation of the exhaust air. A small solution tank (Recycle Tank) is preinstalled within the battery limits, to collect all possible solid and liquid overflows. The diluted urea solution is recycled back to the urea synthesis plant by means of the urea recycle pumps. The amount of ammonia, which is released into the atmosphere, is controlled by acid washing with sulfuric acid in the granulator scrubber. The ammonia is recovered in the wet scrubbing section as 40%-urea ammonium sulfate solution and finally sent out of the battery limits.

Process Features

GGT’s fluid bed granulation technology is a simple, optimized system. The capacity of the bucket elevator and recycle belt can be reduced since the final product will not be elevated to the highest point of the Building. Cleaning of roll crushers and screens during normal operation can be greatly reduced as well, since the granules of lower temperature and higher brittleness are treated there. A lower Building height reduces the total investment and leads to more convenient operation.

The granules produced in the GGT process are characterized by high mechanical strength, low moisture content, low biuret content and are not subject to “caking”, which ensures convenient transportation and storage.

Another key feature of GGT's fluid bed granulation plant is the inherent system stability. Recycle ratios of oversized and undersized material can self-adjust during a given time. During normal operation, the ratio (total flow) / (end product) can be kept at 0.5/1. Therefore, overcapacity does not need to be considered when designing solid handling equipment (i.e. bucket elevator, belt conveyors, vibrating screens, roll crushers).

The Process uses a feedstock of 96%~97% urea concentration. This concentration can be acquired from the first evaporation unit of urea synthesis plant, which means significant savings in both investment and energy consumption. The evaporation of the extra water removes a considerable amount of crystallization heat from the granulation process, which means that a lower urea concentration will save a huge amount of fluidization air.

Plants adopting the GGT Process do not generate waste water or industrial residue. The highly efficient exhaust air scrubbers guarantee dust emission in the stack of less than 30mg/Nm3 (where requested). This is significantly less than international standards, and will easily be able to meet client's emission requirements.

Reference Pictures of CRG Urea Granulation Plant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