**Technical Details of Different Grades of Ammonium Nitrate**

The prilling of Ammonium Nitrate is same for both LDAN & HDAN. Below are the specifications of all grades.

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| --- | --- | --- |
| **Low Density Ammonium Nitrate (LDAN)** | | |
| **Description** | **Value** | **Unit** |
| Total Nitrogen Mass | 34 | % wt. min |
| Ammonium Nitrate | 99 | % wt. min |
| Humidity (H2O) | 0.2 | % wt. min |
| Acidic Nature (pH) | 4.8-5.2 | -min |
| Oil Absorption | 6 | % wt. min |
| Free Flow Bulk Density | 0.72 - | g/cm3 |
| Total Organic Carbon | 0.2 | % max |

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| --- | --- | --- |
| **High Density Ammonium Nitrate (HDAN)** | | |
| **Description** | **Value** | **Unit** |
| Ammonium Nitrate | 99 | % wt. min |
| Humidity (H2O) | 0.5 | % wt. min |
| Acidic Nature (pH) | 4.8 | -min |
| Chloride as Cl | 10 | ppm max |
| Iron as Fe | 10 | ppm max |
| Sulphates as H2SO4 | 15 | ppm max |

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| --- | --- | --- |
| **Ammonium Nitrate Melt** | | |
| **Description** | **Value** | **Unit** |
| Ammonium Nitrate | 84-86 | % wt. min |
| Humidity (H2O) | 14-16 | % wt. min |
| Acidic Nature (pH) | 5 | -min |

**Storage Requirements**

* Belt conveyors are not covered but prilling towers are temperature controlled.
* Storage conditions are followed as per Ammonium Nitrate Rules. Ammonium Nitrate prill are stored in the silos (prill colling systems) before they are sent to bagging plant for bagging. Silos are temperature controlled and equipped with ventilation systems, cooling systems, instrument air system, etc.
* Bagging is not a continuous process.
* Storage area equivalent to storing 5 days’ of final production capacity is created to store product in case of non-availability of trucks during dispatch.

**Manufacturing Process of Ammonium Nitrate**

Below is the detailed manufacturing process of AN.

The ammonium nitrate manufacturing plant is divided into two parts:

* Ammonium Nitrate solution preparation
* Prilling, drying/ and cooling the product

**Ammonium Nitrate solution preparation**

* **Reaction of reactants in pipe reactor:**

Liquid ammonia is super-heated and fed to pipe reactor where it reacts with weak nitric acid, to form ammonium nitrate solution. This reaction produces process steam and concentrated solution. Ammonium nitrate solution of 85-92% concentration is obtained at is obtained at the bottom of the separator which flows to a Tank. Mist of ammonium Nitrate is removed from Process steam in a scrubber and the clean steam is used to evaporate and heat the ammonia gas.

* **Concentration of the diluted AN solution:**

The obtained ammonium nitrate solution is pumped into the tube side of Falling Film Evaporator. Steam is fed to the evaporator to provide necessary heat for the concentrated solution. The concentrated AN solution then leaves the Falling Film Evaporator and is either collected in the intermediate tank or goes for prilling (in case of LDAN & HDAN).

In case of AN melt solution, the tank has internal coils, which are fed with low pressure steam to increase the solution temperature.

In case of LDAN & HDAN, the AN melt solution is pumped into the upper part of prilling tower for further processing.

**Prilling, drying/ and cooling the product**

* **Ammonium Nitrate Solution Prilling:**

The prilling is done by a prilling bucket or spray nozzles which are then gravity dropped within the prilling tower. In the prilling tower the AN prill get solidified against a counter-current air stream.

AN prill thus obtained are collected on the belt conveyors located at the bottom of the prilling tower. The solid ammonium nitrate at the bottom of prilling tower has a temperature of 80-110 degree Celsius.

The air which leaves the top of the prilling tower is scrubbed and cooled in the prilling scrubber by using AN solution recycled from the prilling scrubber pumps. This process recovers most of the AN contained in the air.

The washing AN solution is cooled in exchanger with cooling water. In the scrubber, the washing AN solution cools the air, which is partially recycled in the prilling tower by means of the air blowers while the rest of the air is sent to the stack.

The ammonium nitrate prill thus collected at the bottom of prilling tower is sent to the drying section by conveyor belts.

* **Drying of the prill:**

The drying process is done by slow vaporization of water present in AN solution which allows progressive drying and does not damage the prill.

The exhausted hot air which leaves the dryer drums is sucked into the scrubber by using a blower. The air is washed in the ventures and scrubber using the AN solution. The clean air is sent to the stacks using air blower. From the dryer, the prill are sent to the screens through belt conveyors.

* **Screening, Cooling and Coating of the product:**

Oversized or defective prill are recycled and sent to be re-melt with ammonium nitrate solution. The correct product is either cooled in the fluidized bed cooler against air-conditioned cooler or in the bulk flow cooler against chilled water.

After cooling, depending on the product applications, the prill are then sent to the coating drum and a coating agent is sprayed on the outer surface to attain anti-caking characteristics.

Both the coated/uncoated product is sent to storage or bagging plant through conveyor belts.

Ammonium Nitrate prill are stored in the silos (prill colling systems) before they are sent to bagging plant for bagging. Silos are temperature controlled and equipped with ventilation systems, cooling systems, instrument air system, etc.

* **Product Handling & Bagging:**

The coated/uncoated prill are sent to the bin/hopper in the Bagging Plant, where they are packed in HDPE bags.   
Automatic bagging machines are installed to bag entire production in different packing sizes.

Bagging is not a continuous process.

* **Bagged Storage & Dispatch:**

Two portable type truck loaders are available to load AN bags on trucks.

Storage area equivalent to storing 5 days’ of final production capacity is created to store product in case of non-availability of trucks.

* **AN Melt Dispatch:**

Loading bays for tankers are installed to provide proper dispatch of AN Melt. Facilities are also built with blast proof wall.