

### Benefits of R.I. measurement

- Refractometer provides real-time, precise measurements of ammonium nitrate concentration, ensuring consistent product quality and reducing the need for reprocessing.
- Refractometer allows operators to quickly detect and respond to any changes in the process.
- Unlike traditional methods that rely on nuclear density calculations and paper charts, the refractometer simplifies the monitoring process, saving time and reducing the complexity of the operation.

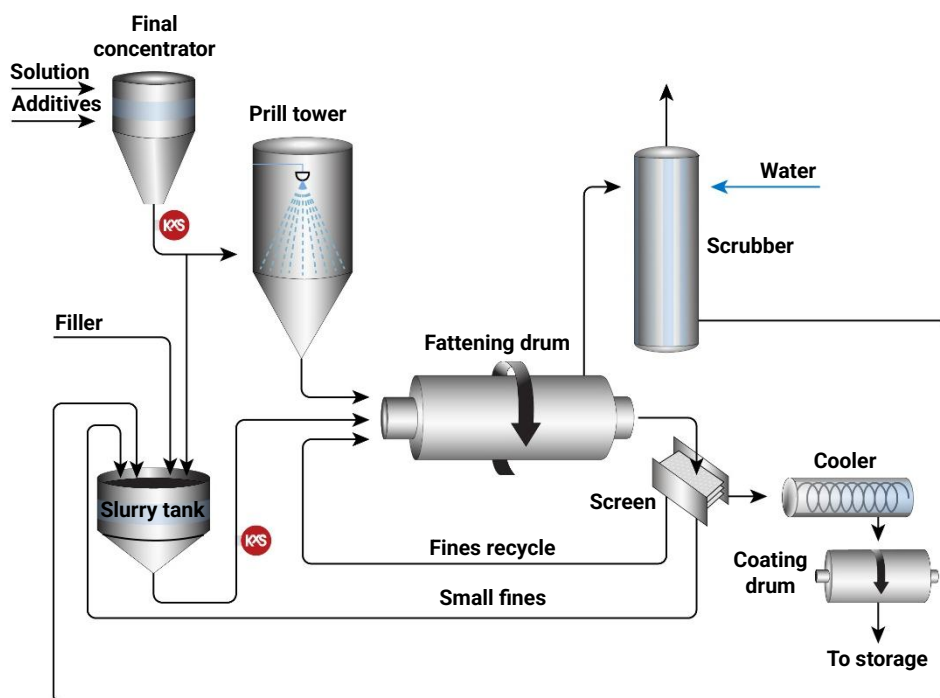
### Overview

Ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ) is a salt composed of two ions: the ammonium ion ( $\text{NH}_4^+$ ) and the nitrate ion ( $\text{NO}_3^-$ ). It serves as a critical component in the explosives and fertilizers industries and is also utilized in the treatment of titanium ores.

Ammonium nitrate production involves the reaction of nitric acid with ammonia, resulting in a solution that is concentrated to 97.5-98% in a final concentrator. This concentrated solution, along with specific quality additives, is then fed into a prilling tower. A portion of this solution is also gravity-fed into a slurry tank.

Within the prilling tower, small pellets of ammonium nitrate are formed. Meanwhile, in the slurry tank, filler materials are dispersed, oversized particles and small fines are melted, and the 97.5% ammonium nitrate solution from the concentrator is introduced. Moisture content is carefully adjusted by adding scrubbing liquor to ensure optimal consistency.

The slurry is then conveyed through a hot air atomizing system, creating tiny droplets. These droplets are sprayed onto a curtain of falling granules, which are comprised of the prilled product and fines separated during screening.



The material passes through a fattening drum before being discharged to screens where it is classified into four fractions. The graded product is subsequently fed into a fluidized bed cooler.

To prevent caking during storage, the cooled ammonium nitrate is treated with a liquid coating agent, a derivative composed of oil and amine, applied in a rotary drum.

### Refractive index measurement application

The KxS Process refractometer DCM-20 plays a vital role in the continuous monitoring of the ammonium nitrate production process, ensuring a high-quality product. This instrument is installed at the outflows of both the concentrator and slurry tank, where it provides critical measurements necessary for the creation of uniform prills, reducing the need for reprocessing.

Traditional methods, such as calculating concentration based on nuclear density and using paper charts, are often confusing and time-consuming. In contrast, the KxS refractometer offers a direct measurement of ammonium nitrate concentration. The DCM refractometer provides two independent 4-20mA

outputs and a digital Modbus TCP output for connectivity to automatic process control systems, allowing operators to detect process changes promptly and make real-time adjustments.

For the  $\text{NH}_4\text{NO}_3$  solution, concentration at the outflow typically ranges from 90-98%, with a process temperature of 160-180 °C (320-356 °F). In the slurry tank, the concentration remains in the 90-98% range, while the process temperature is slightly lower, between 150-160 °C (302-320°F).

### Instrumentation and installation considerations

The KxS refractometer DCM-20 operates within a measurement range of 60-100%  $\text{NH}_4\text{NO}_3$ , delivering a typical accuracy of  $\pm 0.2\%$   $\text{NH}_4\text{NO}_3$ .

Given the nature of the application, an automatic prism wash using steam may be required. Additionally, equipment with hazardous area ATEX/IECEx Zone 2 approval is available.