

MEETING INCREASING ENVIRONMENTAL REQUIREMENTS

Fluid bed dryer and cooler for ammonium chloride

ANDRITZ

Breaking new ground in ammonium chloride drying and cooling

As a technology leader in the development of efficient drying processes for bulk solids, ANDRITZ was one of the first companies to introduce fluid bed technology with internal heat exchangers for numerous applications in the chemical and minerals industries.

This also applies to the soda ash industry. One special application is the drying of ammonium chloride generated with Hou's process. ANDRITZ has developed a patented solution with a closed gas loop system.

The design of the fluid bed dryer has been developed to meet increasing environmental standards with a focus on the reduction of ammonia emissions to the atmosphere.



The ANDRITZ fluid bed dryer with integrated heat exchangers is a core element of the sophisticated ammonium chloride drying process

Recovery of emissions and re-integration into the soda ash process

Due to its good solubility in water, ammonium chloride is rarely found as a mineralogical salt. It is usually a by-product in chemical processes, mainly from Hou's process for the chemical synthesis of soda ash (sodium carbonate).

Ammonium chloride is usually removed from the production cycle via crystallization and centrifugation and requires drying for proper bagging, storage, and transport. The main application for ammonium chloride is fertilizer production, where it is used as a valuable raw material for nitrogen supply.

The raw ammonium chloride from crystallization also contains other side products such as a considerable amount of ammonium carbonate. The ammonium carbonate decomposes in any thermal drying stage forming carbon dioxide and, more importantly, odor-intensive ammonia gas, which is toxic in high concentrations.

CHALLENGES

- The ammonium chloride drying process must not produce ammonia gas emissions
- The use of chemicals not employed at the plant site must be avoided
- New waste streams that cannot be integrated into the existing process must be avoided
- Since ammonia gas is both toxic and odorous, strict emission limitations to the atmosphere apply

OUR SOLUTION

Drying in a closed-loop system has the potential to substantially reduce, or completely eliminate, the emission of ammonia to the atmosphere.

The process developed by ANDRITZ removes the ammonia from the closed-loop system without using any additional acid. The waste stream from the system can be re-integrated into the upstream processes of the soda ash plant.

Drying and cooling in a closed-loop system

THE PROCESS

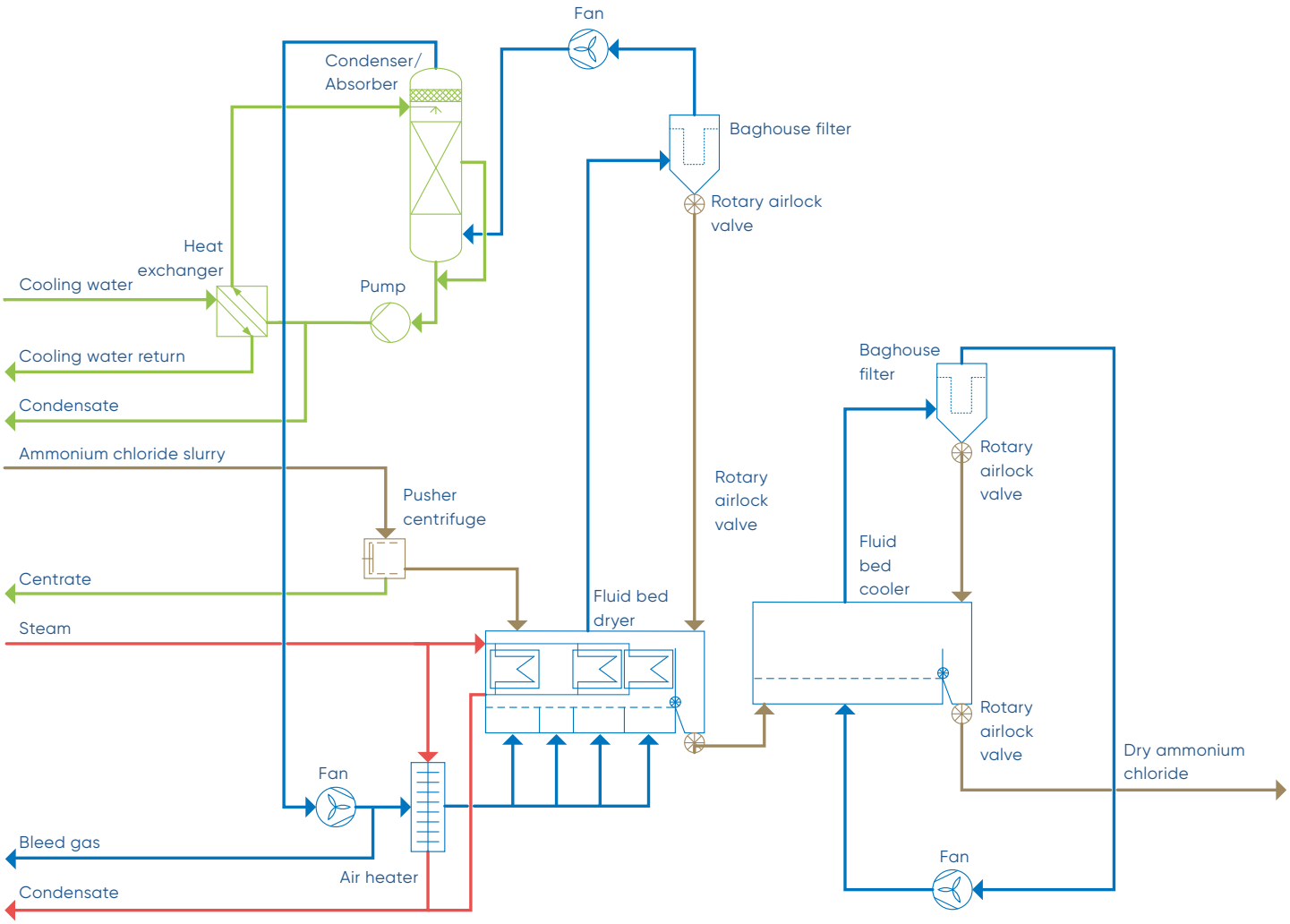
The wet ammonium chloride is dewatered in pusher centrifuges and then conveyed to a fluid bed dryer with internal heat exchangers for optimized heat transfer.

Fluidization in the closed-loop system is achieved with either water vapor, carbon dioxide, ammonia, nitrogen, air, or a mixture of these. Due to the drying and thus decomposition of ammonium carbonate, the off-gas from the dryer is enriched with evaporated water and also with a considerable amount of ammonia.

A bag filter is used for separating the fines, followed by a combined condenser/absorber column to condense the evaporated water from the drying process and to absorb the ammonia from the gas stream.

With this setup, large amounts of ammonia can be separated from the gas stream while only a small amount of fresh water is required. That way, effluent quantities can be kept small and the absorber can be operated without additional acid dosing.

A second, smaller absorber column treating a bleed gas stream can be used to reduce the ammonia content to close to zero.



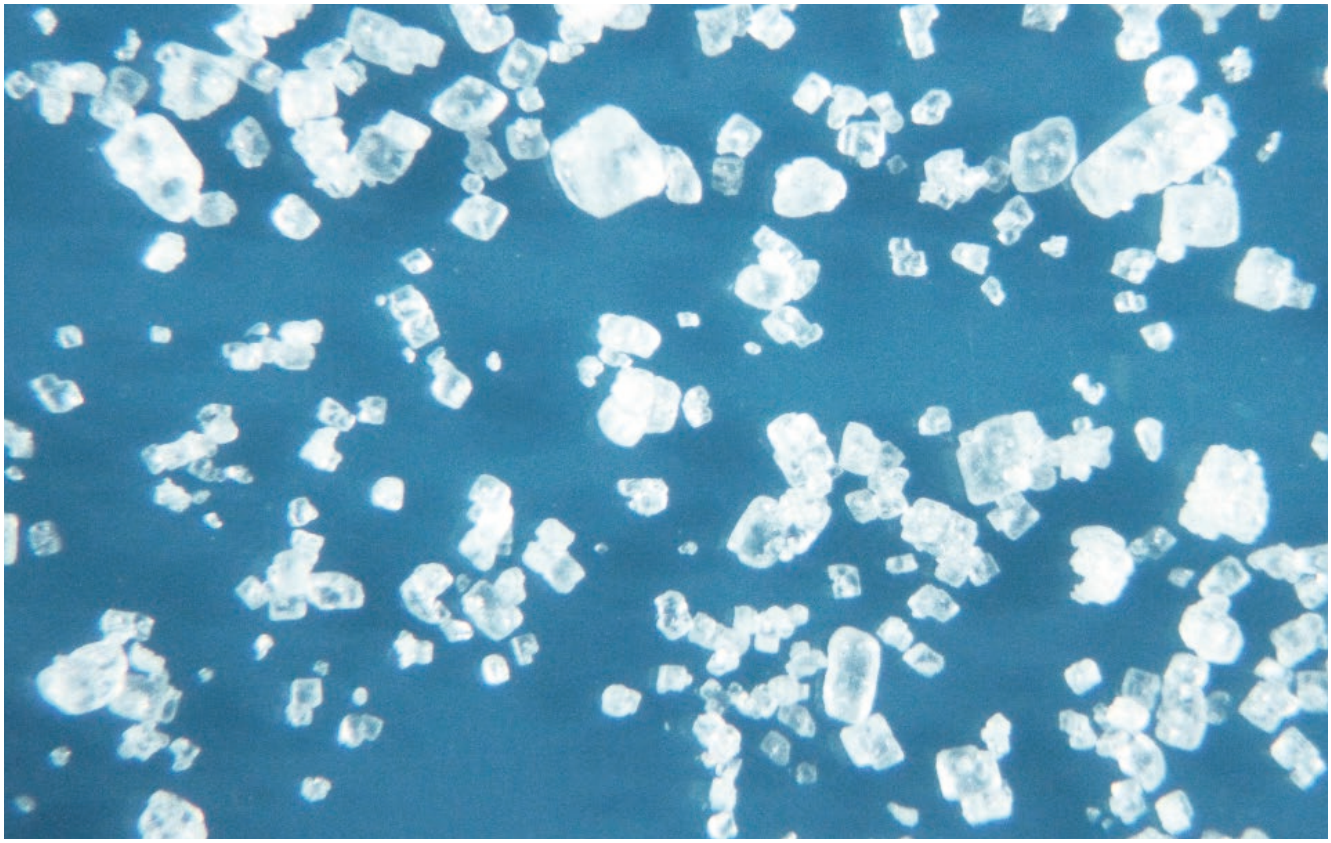
Flowchart for ammonium chloride

OUTSTANDING FEATURES

- Drying and cooling system with a minimum of emissions
- Removal of ammonia gas by absorption
- No requirement for additional utilities (acids) for ammonia depletion
- Closed-loop economy

YOUR BENEFITS

- **Best available technology for ammonium chloride drying**
- **Reduction of carbon dioxide and ammonia gas (direct and indirect greenhouse gases) to meet highest environmental standards**
- **Less utility infrastructure required**
- **Operational safety**
- **Excellent product quality**



Ammonium chloride (magnification 7.5)

Engineered solutions for a wide range of products

SAFETY FIRST

By drying in a closed-loop system and choosing the right de-dusting system or a closed operation under low vacuum, ANDRITZ meets all strict environmental and safety standards needed for a sustainable ammonium chloride production process.

LAB-SCALE AND PILOT TESTING

Our R&D center with its qualified personnel and integrated laboratory is at your disposal to develop your process or examine your specific tasks. It has capacities for development of components and processes, and for providing product samples (over 2,100 products already tested on lab and pilot scale).



YOUR BENEFITS

- One-stop shop: Drying and dewatering technologies for ammonium chloride and related products available from ANDRITZ
- Controlled and gentle drying to produce an abrasion-resistant crystal structure
- Tailor-made solutions for your particular challenges
- Lab and pilot test facilities to resolve your specific drying challenge
- Process consulting and optimization of existing installations



Main services

Our services include development, planning, design, manufacturing, and delivery of single key-components or complete systems, as well as supervising their installation and commissioning.

The right solution for any separation challenge

PEACE OF MIND, COST EFFICIENCY, AND SUSTAINABILITY – ALL FROM ONE TRUSTED PARTNER.

Regardless of your industry – whether environmental, chemicals, mining and minerals, or food and beverage – efficient separation processes are essential for high product quality, reduced waste, and the responsible use of valuable resources. With our advanced technologies, comprehensive services, and smart automation and digitalization solutions, we deliver peace of mind today and lasting success for tomorrow – efficiently, responsibly, and with measurable impact. What's more, with us you also gain access to one of the world's largest OEM manufacturers for solid/liquid separation for well-known brands such as 3Sys Technologies, Bird, Dedert, Delkor Capital Equipment (Pty) Ltd., Escher Wyss dryers, Guinard Centrifugation, KHD Humboldt Wedag, Krauss-Maffei centrifuges, dryers, and filters, LENSER Filtration, Netzsch Filtration, REINEVELD centrifuges, Rittershaus and Blecher, Royal GMF Gouda, Sprout Bauer, and Vandenbroek.

SEPARATION EQUIPMENT AND SYSTEMS

- Decanter and filter centrifuges
- Filter presses
- Dryers
- Presses and screens
- Extractors
- Thickeners
- Evaporators and crystallizers
- Disc and drum filters
- Screening and filtration components
- Specialized thermal systems



FULL-SERVICE OFFERING

- OEM spare and wear parts
- Maintenance and repairs
- Service agreements
- Automation and digitalization
- Machine and process optimization
- Second-hand and rentals

AUTOMATION AND DIGITALIZATION SOLUTIONS

Site assessment and integration • Advanced process control and artificial intelligence • Simulation and training • Digital twin technology • Data analytics and prediction • Electrification, instrumentation and controls

Enabling the green transition

As a technology leader in a changing world, we strive to make a positive impact on our environment. We believe that what we do today can make a difference tomorrow and in the future. We drive change and enable our customers to achieve their sustainability goals and make the world greener with our sustainable solutions in decarbonization, circular economy, renewable energy, and environmental technologies. It all starts with your specific process requirements and ends with a system that gives you the best results – day in and day out, for decades to come.

ANDRITZ. FOR GROWTH THAT MATTERS.

A WORLD OF SEPARATION SOLUTIONS

ANDRITZ provides mechanical and thermal solid/liquid separation technologies, complemented by comprehensive services, automation, and digitalization solutions for the chemicals, environment, food and beverage, as well as mining and minerals industries. Our customized, innovative solutions focus on minimizing resource consumption and maximizing process efficiency, thus making a substantial contribution towards sustainable environmental protection. With over 150 years of experience and more than 2,700 separation specialists around the globe, we are a driving force in the evolution of separation solutions – enabling industries to meet tomorrow's demands responsibly. **ANDRITZ. FOR GROWTH THAT MATTERS.**

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