



PRILLED AMMONIUM NITRATE: SHIFTING FROM LDAN TO HDAN











Sept 2016



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The Process

Product Change Over

Off Gas Control Equipment

ANNA Eindhoven Sept 2016



Owner Eurochem, Site : Novomoskov; Russia



Temperatures: -30 to + 30 C





Owner Eurochem, Site : Novomoskov; Russia



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Vertically Integrated Producer



Note: all volumes expressed in thousands of tonnes; in brackets: initial commissioning date.





Owner Eurochem, Site : Novomoskov; Russia





The products for the project

1 st Stage Proposal LDAN				
AN Content	> 99,6%			
Moisture	< 0,12%			
Fuel Absorption	>12 w/w			
Granulometry	90% 1-2mm			

2nd Stage Proposal HDAN			
AN Content	> 98%		
Moisture	< 0,3%		
Granulometry	95% 1-4mm		

Commissioning HDAN				
AN Content	> 98%			
Moisture	< 0,3%			
Granulometry	95% 1-4mm			
Granulometry	80% 2-4 mm			
Granulometry	<3% < 1 mm			

EUROCHEM





The Process: LDAN









EUROCHEM







The Process: Differences

LDAN	HDAN
AN Solution: 96-97%	AN Solution: 98-99,8%
Moisture< 0,12%	Moisture < 0,3%
Needs Drying	Needs cooling
Internal additive	Magnesium Nitrate
Off Gas Particles	Off Gas: Submicron and aerosol





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Product Change Over

- 1. Empty products, in case off spec to be reprocessed
- 2. Clean vessels to remove internal additives
- **3.** Check dust accumulations in ducts
- 4. Adjust blowers and air make up and purges to prill tower



PRODUCT CHANGE OVER



Final Product



HDAN





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espindesa

TECNICAS REUNIDAS

OPIND

MECS







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Offgas Control Equipment - Brink[®] Mist Eliminator Scrubber System

- 20/Sept/2016
- NH Eindhoven Conference Centre Koningshof
- Steve Ziebold Principal Consultant MECS / DuPont Clean Technologies





Brink® Mist Eliminator Scrubber System for Eurochem



As part of the AN gas recycle tower project at Eurochem-Novomoskovsk, MECS and Espindesa worked together to provide a Brink[®] Mist Eliminator Scrubber System in 2013 for emission control on the off-gas.







Earlier Brink[®] Mist Eliminator Scrubber System for Recycle AN Prill Tower Project

- In 1995, MECS supplied a Brink[®] Mist Eliminator Scrubber System for an Espindesa AN gas recycle tower project in Austria.
- Installation has since operated successfully for 21 years.
- Original emissions were close to 350 ppm AN dust per Nm³ at times.
 - For above dust level, visible stack plume is typically greater than 20 percent as measured by EPA Method 9.
- After Installation
 - No visible aerosol plume originating from the plant
 - Emission 5 to 10 mg/Nm3.
 - No increase in pressure drop was observed across the Brink[®] Mist Eliminators after ten years of operation.



Brink® Mist Eliminator Scrubber Systems





Brink[®] Fiberbed Mist Eliminators have been successfully used for over 40 years in several large Brink[®] Scrubber System installations worldwide to:

- Control emissions from HDAN & LDAN prill towers
- Scrub purge gas from AN prill tower gas recycle systems
- Control granulator emissions





Brink® Mist Eliminator Scrubber Systems

Example: In 2015, multiple large Brink[®] scrubber systems installed in a US plant on HDAN and LDAN prill towers resulted in less than ~2 mg/m³ AN stack emissions.



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Brink[®] HE "Plus" High Efficiency Mist Eliminator Provides AN Distribution, Dissolution & Drainage Diffusion fiber bed design in soluble salt mist applications is a balance to provide sustained mist capture while at the same time lowest operating pressure drop.

The Brink[®] Scrubber System provides proper control to humidify the vent gas and solubilize captured undissolved ammonium nitrate particles in order to ensure low operating pressure drop.



Brink[®] Diffusion Fiber Bed Mist Eliminators



Penetration vs Pressure Drop Example



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Brink® Diffusion Fiber Bed Mist Eliminators



Element cages can be reused with a correct design. Here is an example of repacked HE cages showing some signs of age but still in good condition.

Service life of fiber bed mist eliminators can be extended in Brink[®] Scrubber Systems by maintaining equipment and proper operation.

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AMMONIUM NITRATE MIST COLLECTION AND COALESCENCE





Standing Style Mist Eliminator Installation Example





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Recycle AN Prill Tower Brink® Scrubber Design

It is important to know inlet particle AN loading and size distribution when designing Brink[®] Scrubber installations because mist eliminator design (and resulting performance) is very sensitive to undissolved AN particulate as well as particulate size.

Since recycle AN prill towers are different than full flow AN prill towers, there was concern regarding actual inlet loading and particle size for the Eurochem project.





Recycle AN Prill Tower Brink[®] Scrubber Design



Due to increased residence time of the ammonium nitrate particles in the wet gas recycle stream however, the overall mass mean particle size was expected to be larger compared to full-flow tower designs (which makes capture easier).





OUPOND



Recycle AN Prill Tower Brink® Scrubber Design

Eurochem design inlet AN loading was ~700 mg/Nm3 (higher compared to Austrian installation).

Particle size distribution measurement in the off-gas at the Austrian installation found a high level of submicron mist which was assumed at Eurochem.





Fiberbed Mist Collection





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Estimating AN Emission Example

Mean Size -	% Mass	Predicted fractional	Predicted Mass Emission
Microns	Fraction	penetration	(mg/Nm3)
0.2	10	0.001	0.1
0.4	35	0.025	6.1
0.8	40	0.002	0.6



Benefits of Eurochem-Novomoskovsk Brink[®] Scrubber System



- 1. Remove AN Emission to less than 10 mg/Nm3 (allowance 49 mg/Nm3)
- 2. Eliminate visible stack opacity caused by AN mist
- 3. Remove ammonia upstream of mist eliminators
- 4. Recover extra product that would be lost to the environment
- 5. Set a good example for environmental stewardship within the industry
- 6. Improve long term relations with the local community and environmental agency



Brink® Mist Eliminator Scrubber Systems



Example: A large Brink[®] Scrubber System started up on high density full flow AN prill tower in 2013 resulting in AN stack emission of less than 5 mg/m³







Brink® Mist Eliminator Scrubber Systems



Example: A large Brink[®] Scrubber System started up on high density full flow AN prill tower in 2013 resulting in AN stack emission of less than 5 mg/m³



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Special Thanks & Acknowledgements!!! Jose R Ferrer & ESPINDESA

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Thank You For Your Participation !

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