"Capacity Building and Strengthening Institutional Arrangement"

Workshop: "Best Available Techniques (BAT)

BAT on Fertilizers Industries (Section 2)

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1. BAT for productive cycles

Production of NPK Fertilisers

BAT is to improve the environmental performance of the finishing section, e.g. by applying plate bank product cooling, recycling of warm air, selecting proper size of screens and mills, e.g. roller or chain mills, applying surge hoppers for granulation recycle control or applying online product size distribution measurement for granulation recycle control.

BAT is to minimise the NOx load in exhaust gases from phosphate rock digestion, for example, by accurate temperature control.

1. BAT for productive cycles

A proper rock/acid ratio, phosphate rock selection or by controlling other relevant process parameters.BAT is to reduce emissions to air from phosphate rock digestion, sand washing and CNTH filtration by applying, e.g. multistage scrubbing, and to achieve emission levels given in the Table:

	Parameter	Level mg/Nm^3	Removal efficiency in %
Phosphate rock digestion, sand washing, CNTH filtration	NO_x as NO_2	100 – 425	
	Fluoride as HF	0.3 – 5	
Neutralisation, granulation, drying, coating, cooling	NH_3	5 – 30 [x]	
	Fluoride as HF	1 – 5 [xx]	
	Dust	10 – 25	>80
	HCl	4 – 23	

[x] the lower part of the range is achieved with nitric acid as the scrubbing medium, the upper part of the range is achieved with other acids as the scrubbing medium. Depending on the actual NPK grade produced (e.g. DAP), even by applying multistage scrubbing, higher emission levels might be expected

[xx] in the case of DAP production with multistage scrubbing with H_3PO_4, levels of up to 10 mg/Nm^3 might be expected

1. BAT for productive cycles

BAT is to reduce emission levels to air from neutralisation, granulation, drying, coating, cooling by applying the following techniques and to achieve the emission levels or removal efficiencies given in the previous Table:

- dust removal, such as cyclones and/or fabric filters
- wet scrubbing, e.g. combined scrubbing.

BAT is to minimise waste water volumes by recycling washing and rinsing waters and scrubbing liquors into the process, e.g. and by using residual heat for waste water evaporation.

BAT is to treat the remaining waste water volumes.

1. BAT for productive cycles

Production of Urea and UAN

BAT is to improve the environmental performance of the finishing section, for example, by applying plate bank product cooling, redirecting urea fines to the concentrated urea solution, selecting proper size of screens and mills, e.g. roller or chain mills, applying surge hoppers for granulation recycle control or applying product size distribution measurement and control.

BAT is to optimise the total energy consumption for urea production by applying one or a combination of the following techniques:

1. BAT for productive cycles

- for existing stripping installations, continue applying stripping technology
- for new installations, applying total recycling stripping processes
- for existing conventional total recycling installations, only in case of a substantial urea plant capacity increase, upgrading to stripping technology
- increasing heat integration of stripping plants
- applying combined condensation and reaction technology.

BAT is to treat all exhaust gases from the wet sections by scrubbing, taking into account the lower explosion limit and to recycle the resulting ammonia solutions to the process.

1. BAT for productive cycles

BAT is to reduce ammonia and dust emissions from prilling or granulation and to achieve ammonia emission levels of 3 – 35 mg/Nm3, e.g. by scrubbing or optimising the operation conditions of prilling towers, and to re-use scrubber liquids on-site.

If the scrubbing liquid can be re-used, then preferably by acidic scrubbing, if not, by water scrubbing.

In optimising the emission levels to the values mentioned above, it is assumed that dust emission levels of 15 – 55 mg/Nm3 are achieved, even with water scrubbing.

1. BAT for productive cycles

Where process water with or without treatment is not re-used, BAT is to treat process water, e.g. by desorption and hydrolysation and to achieve the levels given in the Table:

		NH_3	Urea	
After process water treatment	New plants	1	1	ppm w/w
	Existing plants	<10	<5	

BAT levels for the treatment of process water from urea production

If, in existing plants, the levels cannot be achieved, it is BAT to apply subsequent biological waste water treatment. It is also BAT to monitor the key performance parameters as described in the full text.

1. BAT for productive cycles

Production of AN/CAN

BAT is to optimise the neutralisation/evaporation stage by a combination of the following techniques:

- using heat of reaction to preheat the HNO3 and/or to vapourise NH3
- operating the neutralisation at an elevated pressure and exporting steam
- using the generated steam for evaporation of the ANS
- recovering residual heat for chilling process water
- using the generated steam for the treatment of process condensates
- using the heat of reaction for additional water evaporation.

1. BAT for productive cycles

BAT is to effectively and reliably control pH, flow and temperature. The options to improve the environmental performance of the finishing section are applying plate bank product cooling, recycling of warm air, selecting proper size of screens and mills, e.g. roller or chain mills, applying surge hoppers for granulation recycle control or applying product size distribution measurement and control.

BAT is to reduce dust emissions from dolomite grinding to levels <10 mg/Nm3 by applying, e.g. fabric filters. Because of an insufficient data basis, no conclusions could be drawn for emissions to air from neutralisation, evaporation, granulation, prilling, drying, cooling and conditioning. BAT is to recycle process water on site or off site and to treat the remaining waste water in a biological treatment plant or using any other technique achieving an equivalent removal efficiency.

1. BAT for productive cycles

Production of SSP/TSP

BAT for waste water treatment is to apply BAT given in the BREF on Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector.

BAT is to improve environmental performance of the finishing section by one or a combination of the following techniques:

1. BAT for productive cycles

- applying plate bank product cooling
- recycling of warm air
- selecting proper size of screens and mills, e.g. roller or chain mills
- applying surge hoppers for granulation recycle control
- applying online product size distribution measurement for granulation recycle control.

BAT is to reduce fluoride emissions by the application of scrubbers with suitable scrubbing liquids and to achieve fluoride emission levels of 0.5 – 5 mg/Nm3 expressed as HF.

1. BAT for productive cycles

BAT is to reduce waste water volumes by the recycling of scrubbing liquids, where, besides the manufacture of SSP or TSP, partially acidulated phosphate rock (PAPR) is also produced.

BAT for the production of SSP/TSP and multi purpose production is to reduce emissions to air from neutralisation, granulation, drying, coating, cooling by applying the following techniques

- cyclones and/or fabric filters
- wet scrubbing, e.g. combined scrubbing.

and to achieve the emission levels or removal efficiencies given in the next Table:

1. BAT for productive cycles

	Parameter	Level mg/Nm³	Removal efficiency in %
Neutralisation, granulation, drying, coating, cooling	NH_3	5 – 30 [x]	
	Fluoride as HF	1 – 5 [xx]	
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[x] the lower part of the range is achieved with nitric acid as the scrubbing medium, the upper part of the range is achieved with other acids as the scrubbing medium. Depending on the actual NPK grade produced (e.g. DAP), even by applying multistage scrubbing, higher emission levels might be expected

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Emission levels to air associated with the application of BAT for production of SSP/TSP

2. Conclusions

The information exchange on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers was carried out from 2001 to 2006.

The EC is launching and supporting, through its RTD programmes, a series of projects dealing with clean technologies, emerging effluent treatment and recycling technologies and management strategies.

Potentially these projects could provide a useful contribution to future BREF reviews.