

## 2.B.2 - Nitric Acid Production

### Short description

Method	AD	EF	Key Category
T2	PS	D	L/T: NO <sub>x</sub>

**T** = key source by Trend **L** = key source by Level

Methods	
<b>D</b>	Default
<b>RA</b>	Reference Approach
<b>T1</b>	Tier 1 / Simple Methodology *
<b>T2</b>	Tier 2*
<b>T3</b>	Tier 3 / Detailed Methodology *
<b>C</b>	CORINAIR
<b>CS</b>	Country Specific
<b>M</b>	Model

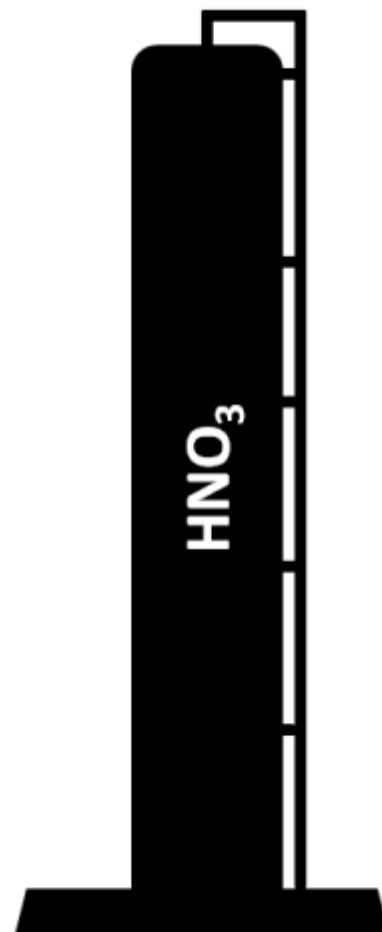
\* as described in the EMEP/CORINAIR Emission Inventory Guidebook - 2007, in the group specific chapters.

AD - Data Source for Activity Data	
<b>NS</b>	National Statistics
<b>RS</b>	Regional Statistics
<b>IS</b>	International Statistics
<b>PS</b>	Plant Specific data
<b>AS</b>	Associations, business organisations
<b>Q</b>	specific questionnaires, surveys
EF - Emission Factors	
<b>D</b>	Default (EMEP Guidebook)
<b>C</b>	Confidential
<b>CS</b>	Country Specific
<b>PS</b>	Plant Specific data

During the production of nitric acid, nitrogen oxide occurs in a secondary reaction. In Germany, there are currently seven nitric acid production plants. HNO<sub>3</sub>, production occurs in two process stages:

- Oxidation of NH<sub>3</sub> to NO and
- Conversion of NO to NO<sub>2</sub> and absorption in H<sub>2</sub>O.

Details of the process are outlined below:



### Catalytic oxidation of ammonia

A mixture of ammonia and air at a ratio of 1:9 is oxidised, in the presence of a platinum catalyst alloyed with rhodium and/or palladium, at a temperature of between 800 and 950 °C. The related reaction, according to the Oswald process, is as follows:

$$4 \text{NH}_3 + 5 \text{O}_2 \rightarrow 4 \text{NO} + 6 \text{H}_2\text{O}$$

Simultaneously, nitrogen, nitrous oxide and water are formed by the following undesired secondary reactions:

$$4 \text{NH}_3 + 3 \text{O}_2 \rightarrow 2 \text{N}_2 + 6 \text{H}_2\text{O}$$

$$4 \text{NH}_3 + 4 \text{O}_2 \rightarrow 2 \text{N}_2\text{O} + 6 \text{H}_2\text{O}$$

All three oxidation reactions are exothermic. Heat may be recovered to produce steam for the process and for export to other plants and/or to preheat the residual gas. The reaction water is condensed in a cooling condenser, during the cooling of the reaction gases, and is then conveyed into the absorption column.

## Methodology

### Activity data

As this source category is a key category for  $\text{N}_2\text{O}$ , plant specific activity data are applied here according to the IPCC guidelines.

These data are made available basically via a co-operation agreement with the nitric acid producers and the IVA (Industrieverband Agrar). As the data provided by the producers has to be treated as confidential, it is anonymised by the IVA before submitting it to the UBA. Here, one producer is delivering its data directly to the UBA. After checking these specific data, they are merged with the IVA.

According to the IVA, catalytic reduction is used as a reduction method in some of the plants.

## Emission factor

For NO<sub>x</sub>, the default emission factor from the EEA Emission Inventory Guidebook of 10 kg/t NH<sub>3</sub>,<sup>1)</sup> is used.

## Recalculations

With **activity data** and **emission factors** remaining unrevised, no recalculations have been carried out compared to last year's submission.

## Planned improvements

Germany is in contact with the IVA with the aim to get a Country-specific EF for the NO<sub>x</sub> emissions. It is expected that the Country-specific EF will be lower than the Default EF.



For pollutant-specific information on recalculated emission estimates for Base Year and 2018, please see the pollutant specific recalculation tables following [chapter 8.1 - Recalculations](#).

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<sup>1)</sup> EEA, 2013: EMEP EEA Emission Inventory Guidebook 2013, Aug 2013: page 15, table 3.3 Tier 1 emission factor for source category 2.B.2 Nitric acid production