

2.C.3 - Aluminium Production

Short description

Method	AD	EF	Key Category
T2, T3	AS	D, CS	L&T: HCB / T: PAH

The category 2.C.3 - *Aluminium production* is sub-divided into primary aluminium and secondary aluminium production.

In Germany, primary aluminium is produced in electrolytic furnaces with pre-baked anodes. The pre-baked anodes are produced in separate anode production plants, where petroleum coke and tar pitch are mixed subsequently baked. This process produces PAH emissions. Hence, the aluminium production is a trend key category for PAH (TIER-2-method, TIER-3-method).

Secondary aluminium is produced in several different furnace types. According to different scrap qualities, the emissions are varying. The use of hexachloroethane for degassing purposes in refining operations of secondary aluminium production has been prohibited by law in Germany since 2002 resulting in an omission of the source for HCB. But for the period 1990-2001 no data on national emissions of HCB in secondary aluminium industries is available. To overcome this data gap the default emission factor for HCB was used.

Method

Activity data

The yearly production figures were taken from the annual statistical report of the German association for non-ferrous metals ¹⁾.

The total quantity of waste gas incurred per tonne of aluminium during the production of primary aluminium was multiplied by an average concentration value formed from several individual figures, from various different plants, with appropriate weighting.

Emission factors

The emission factors are either default values according to the 2016 EMEP/EEA air pollutant emission inventory guidebook or determined in research Projects ²⁾. The emission factors also make allowance for fugitive emission sources, such as emissions via hall roofs. ³⁾

The emission figures used for CO are the results of emission measurements within the context of investment projects. The emission factors for SO₂ are calculated from the specific anode consumption. The anodes consist of petrol coke; this material has a specific sulphur concentrations of about 1.2 %, from which an SO₂ emission factor of 10.4 kg/t Al can be calculated. The average anode consumption is 430 kg of petrol coke per tonne of aluminium. For primary aluminium production NOX emissions were not yet incorporated in the inventory due to several reasons. But emissions will be below the threshold of significance due to the abatement applied in Germany.

The following table shows some process-related emission factors.

Table 1: Emission factors applied

~ pollutant	~ Activity / Process	~ EF	~ unit	~ Trend						
PAH	anode production	300	mg/t	constant						
CO	primary aluminium	180	kg/t	constant						
SO ₂	primary aluminium	7.341	kg/t	constant						
TSP	primary aluminium	0.83	kg/t	falling						
PM ₁₀	primary aluminium	0.7055	kg/t	falling						
PM _{2.5}	primary aluminium	0.581	kg/t	falling						
Cd	primary aluminium	0.15	g/t	constant						

Ni	primary aluminium	0.162	g/t							
Zn	primary aluminium	10	g/t	constant						
TSP	resmelted aluminium	0.055	kg/t	constant						
PM ₁₀	resmelted aluminium	0.047	kg/t	constant						
PM _{2.5}	resmelted aluminium	0.03843	kg/t	constant						
Cd	resmelted aluminium	7	mg/t	constant						
Cu	resmelted aluminium	8.411	mg/t							
Hg	resmelted aluminium	1.7	mg/t	constant						
Pb	resmelted aluminium	4.452	mg/t							
Zn	resmelted aluminium	4	g/t	constant						
HCB (years 1990-2001)	resmelted aluminium	5	q/t	constant						