

11.1 General BAT Conclusions

11.1.1 Environmental management systems (EMS)

BAT 1. In order to improve the overall environmental performance of non-ferrous metal plants, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features. (based on Section 2.12.1)

Kommentarer fra Årdal Metallverk, Øvre Årdal og Årdalstangen

Hydro Aluminium AS Årdal Metallverk er sertifisert etter ISO 14001 - Miljøstyring, under paraplysertifiseringen til Hydro Aluminium AS. Hydro sine interne styringssystem skal ut fra sertifiseringa dekke BAT 1

11.1.2 Energy management

BAT 2. In order to use energy efficiently, BAT is to use a combination of the techniques given below. (based on Section 2.12.2)

Hydro Aluminium AS Årdal Metallverk er sertifisert etter ISO 50001 - Energistyring. I forbindelse med dette er mulig energieffektivisering med tiltak og mulige forbedringer kartlagt, og de blir kontinuerlig fulgt opp. Energieffektivitet er ett av aspektene som blir vurdert også ved modifikasjoner og nye prosjekt.

11.1.3 Process control and emissions monitoring

BAT 3. In order to improve overall environmental performance, BAT is to ensure stable process operation by using a process control system together with a combination of the techniques given below. (based on Section 2.12.3)

Hydro Aluminium AS Årdal Metallverk har installert prosesskontrollsystem for oppfølging av kritiske prosessparametere; slike som innsatsmateriale, flyt, temperatur, trykk, pH, strøm, spenning m.m.. I aluminiumsproduksjonen er god prosesskontroll synonymt med godt utbytte og god miljøprestasjon

BAT 4. In order to reduce channelled dust and metal emissions to air, BAT is to apply a maintenance management system which especially addresses the performance of dust abatement systems as part of the EMS (see BAT 1).

Hydro Aluminium AS Årdal Metallverk har et forebyggende vedlikeholdsprogram på alle våre renseanlegg. Programmet er registrert i SAP PM. og er underlagt Hydros styringssystem.

11.1.1 Diffuse emissions

11.1.1.1 General approach for the prevention of diffuse emissions

BAT 5. In order to prevent or, where this is not practicable, to reduce diffuse emissions to air and water, BAT is to collect diffuse emissions as much as possible nearest to the source and treat them. (based on Section 2.12.4)

Årdal Metallverks utslipp går i all hovedsak via renseanlegg, og det er bygget posefilter knyttet til de fleste definerte utslippspunkter. Det er også etablert feierutiner for gater og områder som er spesielt utsatt for støv, for å begrense uønsket spredning mest mulig. Diffust utslipp blir i dag rapportert basert på en beregningsmodell som har vært i bruk i mange år, der en grov massebalanse har vært lagt til grunn. Det er svært vanskelig å finne gode metoder for å måle diffuse utslipp, men det arbeides for å redusere dem.

BAT 6. In order to prevent or, where this is not practicable, to reduce diffuse dust emissions to air, BAT is to set up and implement an action plan on diffuse dust emissions, as part of the environmental management system (see BAT 1), that incorporates all of the following features: (based on Section 2.12.4)

BAT 6-9: For å dra nytte av felles kunnskap og synergier ønsker Primærmetall å kjøre et samordnet løp for reduksjon av diffuse utslipp. Ved hjelp av ekstern konsulent er de nå etablert et prosjekt som skal hjelpe verkene med oppdatering av metode for kvantifisering av diffuse utslipp.

BAT 7. In order to prevent diffuse emissions from the storage of raw materials, BAT is to use a combination of the techniques given below. (based on Section 2.12.4)

Se BAT 6

1.1.1 BAT 8. In order to prevent diffuse emissions from the handling and transport of raw materials, BAT is to use a combination of the techniques given below. (based on Section 2.12.4)

Se BAT 6

11.1.4.2 Prevention of diffuse emissions from metal production

BAT 9. In order to prevent or, where this is not practicable, to reduce diffuse emissions, BAT is to optimise the efficiency of off-gas collection and treatment by using a combination of the techniques given below. (based on Section 2.12.4)

Se BAT 6

11.1.5 Removal of mercury

BAT 10. In order to reduce mercury emissions to air other than those that are sent to the sulphuric acid plant from a pyrometallurgical process, BAT is to use one or both of the techniques given below. (based on Section 2.12.5.5)

Ikke relevant

Technique

11.1.6 Reduction of NOX emissions

BAT 11. In order to prevent NOX emissions to air from a pyrometallurgical process, BAT is to use one of the techniques given below. (based on Section 2.12.5.2)

Det er i liten grad tatt i bruk NOx-hindrende tiltak, PFA-støperiet har oxyfuel-brennere.

11.1.7 Water and waste water management

BAT 12. In order to prevent or reduce the generation of waste water, BAT is to use one or a combination of the techniques given below. (based on Section 2.12.6.1)

Arbeid for å redusere forbruk av vann inngår i forbedringsarbeid der dette er relevant/mulig.

BAT 13. In order to prevent the contamination of uncontaminated water and to reduce emissions to water, BAT is to segregate uncontaminated waste water streams from other waste water streams that require treatment.

Forurenset vann fra renseanlegg holdes separat fra øvrige vannstrømmer, og slippes til dypvannsledning (-40 meter) i Årdalsfjorden. Dette gjelder både Øvre Årdal og Årdalstangen.

BAT 14. For water sampling, BAT is to use ISO 5667.

Vannprøver av utslipp fra Årdalstangen tas ved hjelp av automatisk prøvetaker. I Øvre finnes egen tappekran for avlut.

BAT 15. In order to reduce emissions to water, BAT is to treat the waste water from non-ferrous metals production, including the washing stage in the Waelz kiln process, to remove metals and sulphates by using a combination of the techniques given below. (based on Section 2.12.6.2)

Ikke relevant.

11.1.8 Noise

BAT 16. In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below. (based on Section 2.12.8)

Hydro Aluminium AS Årdal Metallverk har i dag en støygrense på 50 dB(a) gjennom hele døgnet, og overholder denne. På grunn av støy fra fosser og elver, samt trafikk mellom fabrikkgjerdet og nærmeste naboer, er det vanskelig å måle lavere verdier. Det kan derfor være vanskelig å dokumentere støy som ligger under 50 dB(a).

11.1.9 Odour

BAT 17. In order to reduce odour emissions, BAT is to use one or a combination of the techniques given below. (based on Section 2.12.9)

Ikke relevant.

11.3 BAT conclusions for aluminium production including alumina and anodes production

11.3.1 Monitoring

11.3.1.1 Monitoring of emissions to air

BAT 56. BAT is to monitor the stack emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Parameter	Standard(s)	Minimum monitoring frequency (1)	Monitoring associated with BAT	Kommentarer fra Årdal Metalverk
Dust (2)	EN 13284-2	Continuous	BAT 59, BAT 61, BAT 62, BAT 63, BAT 64, BAT 70, BAT 71, BAT 72, BAT 88, BAT 95	n/a n/a n/a n/a n/a
			BAT 59, BAT 61, BAT 62, BAT 63, BAT 64, BAT 70, BAT 71, BAT 72, BAT 73, BAT 85, BAT 86, BAT 87, BAT 88, BAT 89, BAT 95	Periodisk (BAT 61) Periodisk (BAT 62) Periodisk (BAT 64) Periodisk Periodisk Periodisk (BAT 86) Periodisk n/a
	EN 13284-1	Periodic (at least once per year)	BAT 65, BAT 68	n/a
			BAT 65, BAT 68	n/a (BAT gjelder for integrerte karbonanlegg og Søderberg) Tilleggsinfo: Utslipp fra tak/reneanlegg elektrolyse og reneanlegg anodefabrikk (stand-alone) overvåkes periodisk.
SO ₂	EN 14791	Continuous	BAT 11	n/a
NO _x , expressed as NO ₂	EN 14792	Periodic (at least once per year)	BAT 11	Beregnes, basert på netto anodeforbruk. Faktor avtalt med MD: 0,15 kg/t Al
NH ₃	No EN or ISO standard available	Periodic (at least once per year)	BAT 96	n/a
Benzo-[a]-pyrene	ISO 11338-1 ISO 11338-2	Periodic (at least once per year)	BAT 62, BAT 63, BAT 64	Periodisk (BAT 62) Periodisk
All gaseous fluorides, expressed as HF	ISO 15713	Continuous	BAT 63, BAT 64, BAT 71	n/a Kontinuerlig overvåking for takutslipp
		Periodic (at least once per year)	BAT 63, BAT 71, BAT 91	Periodisk av både takutslipp og reneanlegg (BAT 71) Periodisk også for reneanlegg anodefabrikk (stand-alone) n/a
			BAT 63, BAT 71,	n/a
		Periodic (at least once per year)	BAT 72	Beregnes fra periodiske og kontinuerlige målinger (BAT 71) Periodisk også for reneanlegg anodefabrikk (stand-alone)
Total fluorides	No EN or ISO standard available		BAT 91	n/a (klor tilsettes ikke)
All gaseous chlorides, expressed as HCl	EN 1911	Continuous	BAT 91	n/a
Chlorine, expressed as Cl ₂	No EN or ISO standard available	Periodic (at least once per year)	BAT 91, BAT 96	n/a
TVOC	EN 12619	Continuous	BAT 90	n/a
PCDD/F	EN 1948 parts 1, 2, and 3	Periodic (at least one measurement once per year)	BAT 90	Beregnes med standard utslippsfaktor på forbrukt mengde LPG.
H ₂ S	No EN or ISO standard available	Periodic (at least once per year)	BAT 96	n/a
PH ₂	No EN or ISO standard available	Periodic (at least once per year)	BAT 96	n/a

11.3.1.1 Monitoring of emissions to water

BAT 57. BAT is to monitor the emissions to water at the point where the emission leaves the installation with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Parameter	Standard(s)	Minimum monitoring frequency (1)	Monitoring associated with	Kommentarer fra Årdal Metalverk
Al Other metals, if relevant (2)	EN ISO 11885, EN ISO 17294-2	At least once a month	BAT 15	Blir ikke målt.
Fluorides (3)	EN ISO 10304-1			Tungmetaller analyseres periodisk av akkr. lab.
Total suspended solids	EN 872			Periodisk fra reneanlegg elektrolyse. NS-EN 872

11.3.2 BAT conclusions for alumina production

11.3.3 BAT conclusions for anode production

11.3.3.1 Air emissions

11.3.3.1.1 Channelled dust, PAH and fluorides emissions

BAT 61. In order to reduce dust emissions to air from a paste plant (removing coke dust from operations such as coke storage and grinding), BAT is to use a bag filter. (based on Section 4.3.2.2)

BAT-associated emission levels for dust emissions to air from a paste plant (removing coke dust from operations such as coke storage and grinding)

Parameter	Unit	BAT-AEL	Kommentarer fra Årdal Metalverk
Dust	mg/Nm ₃	2 – 5 (1)	Posefilter på alle definerte utslippspunkt. Nivået vil normalt overholdes, men dersom det går hull på en pose vil døgnmålinger kunne bryte denne grensen. I snitt over en måned vurderes dette som mulig å oppnå.

(1) As a daily average or as an average over the sampling period.

BAT 62. In order to reduce dust and PAH emissions to air from a paste plant (hot pitch storage, paste mixing, cooling and forming), BAT is to use one or a combination of the techniques given below. (based on Section 4.3.2.2)

Technique				Kommentarer fra Årdal Metalverk
Dry scrubber using coke as the adsorbent agent, with or without pre-cooling, followed by a bag filter				Kun posefilter.
Regenerative thermal oxidiser				Nei
Catalytic thermal oxidiser				Nei

BAT-associated emission levels for dust and BaP (as an indicator of PAH) emissions to air from a paste plant (hot pitch storage, paste mixing, cooling and forming)

Parameter	Unit	BAT-AEL	Kommentarer fra Årdal Metalverk
Dust	mg/Nm ₃	2 – 5 (1)	Posefilter på alle definerte utslippspunkt. Nivået vil normalt overholdes, men dersom det går hull på en pose vil døgnmålinger kunne bryte denne grensen. I snitt over en måned vurderes dette som mulig å oppnå.
BaP	mg/Nm ₃	0.001 – 0.01 (2)	Posefilter med koksstøv. Neglisjerbart gassf. bidrag. 75 % av alle målinger i perioden 2013-01 ligger under 0,01 mg/Nm ³ og 60 % under 0,001 mg/Nm ³ . Høyeste målte verdi er 0,02 mg/Nm ³ .

(1) As a daily average or as an average over the sampling period.

(2) As an average over the sampling period.

BAT 63. In order to reduce dust, PAH and fluorides emissions to air from a baking plant in an anode production plant integrated with a primary aluminium smelter, BAT is to use one or a combination of the techniques given below. (based on Section 4.3.2.3)

Technique	Applicability			Kommentarer fra Årdal Metalverk
Dry scrubber using alumina as the adsorbent agent followed by a bag filter	Generally applicable			Karbonverket er en integrert del av Metallverket, men geografisk adskilt (dist. 13 km).
Wet scrubber	Applicability may be limited in the following cases:			Installert, primært for rensing av SO ₂ . Renser også noe PAH og støv.
	- very high exhaust gas flow rates, due to the cross-media effects (significant amounts of waste and waste water);			

	- in arid areas by the large volume of water necessary and the need for waste water treatment and the related cross-media effects			
Regenerative thermal oxidiser in combination with a dust abatement system				Installert. I tillegg WESP og Dynasand/lamellefilter installert på deler av utslippet.
	Generally applicable.			

BAT-associated emission levels for dust, BaP (as an indicator of PAH) and fluoride emissions to air from a baking plant in an anode production plant integrated with a primary aluminium smelter

Parameter	Unit	BAT-AEL		Kommentarer fra Årdal Metalverk
Dust	mg/Nm ³	2 – 5 (1)		n/a
BaP	mg/Nm ³	0.001 – 0.01 (2)		n/a
HF	mg/Nm ³	0.3 – 0.5 (2)		n/a
Total fluorides	mg/Nm ³	≤ 0.8 (2)		n/a

(1) As a daily average or as an average over the sampling period.

(2) As an average over the sampling period.

BAT 64. In order to reduce dust, PAH and fluorides emissions to air from a baking plant in a stand-alone anode production plant, BAT is to use a pre-filtration unit and a regenerative thermal oxidiser followed by a dry scrubber (e.g. lime bed). (based on Section 4.3.2.3, 4.3.2.3, 4.3.2.3)

BAT-associated emission levels for dust, BaP (as an indicator of PAH) and fluoride emissions to air from a baking plant in a stand-alone anode production plant

Parameter	Unit	BAT-AEL		Kommentarer fra Årdal Metalverk
Dust	mg/Nm ³	2 – 5 (1)		Posefilter på alle definerte utslippspunkt. Nivået vil normalt overholdes, men dersom det går hull på en pose vil døgnmålinger kunne bryte denne grensen. I snitt over en måned vurderes dette som mulig å oppnå.
BaP	mg/Nm ³	0.001 – 0.01 (2)		Fordelt mellom gassfase og part. bundet. 90 % av alle målinger i perioden 2013-dd ligger under 0,01 mg/Nm ³ og 35 % under 0,001 mg/Nm ³ . Høyeste målte verdi er 0,03 mg/Nm ³ .
HF	mg/Nm ³	≤ 3 (2)		Generelt nivå ca. 0,005 mg/Nm ³ . Høyeste målte verdi er 0,06 mg/Nm ³ .

(1) As a daily average.

(2) As an average over the sampling period.

11.3.3.1.2 Sulphur dioxide

BAT 65. In order to reduce sulphur dioxide emissions to air from a baking plant in an anode production plant integrated with a primary aluminium smelter, BAT is to use one or both of the techniques given below. (based on Section 4.3.2.3)

Technique	Applicability			Kommentarer fra Årdal Metalverk
Use of raw materials and fuels containing a low amount of sulphur	Generally applicable			Tilgang på lavsvovel koks er begrenset, denne mikses nå med annen koks for å redusere totalt S-innhold. Det forventes at S-innhold i koks kommer til å øke i tiden fremover, som følge av strengere krav til utslipp av svovel fra skipsfart.
Wet scrubber	Applicability may be limited in the following cases:			Installert.
	- very high exhaust gas flow rates, due to the cross-media effects (significant amounts of waste and waste water);			
	- in arid areas by the large volume of water necessary and the need for waste water treatment and the related cross-media effects			

11.3.3.2 Waste water generation

BAT 66. In order to prevent the generation of waste water from anode baking, BAT is to use a closed water cycle. (based on Section 4.3.2.3)

Applicability		Kommentarer fra Årdal Metalverk
Applicable to new plants and major upgrades. The applicability may be limited due to water quality and/or product quality requirements.		Det benyttes ikke kjølevann i direkte tilknytning til Anodebrennovenen. Vi har internsirkulering av vann i rensetrinn WESP i renseanlegget, med en liten utskifting av vann.

11.3.3.3 Waste

BAT 67. In order to reduce the quantities of waste sent for disposal, BAT is to recycle carbon dust from the coke filter as a scrubbing media. (based on Section 4.3.2.3)

Applicability		Kommentarer fra Årdal Metalverk
There may be restrictions on applicability depending on the ash content of the carbon dust.		Karbonholdig avfall/biprodukt resirkuleres til ny anodeproduksjon så langt det er mulig, resten går til energigjenvinning eksternt. Vi har minimalt karbonholdig avfall fra denne prosessen.

11.3.4 BAT conclusions for primary aluminium production

11.3.4.1 Air emissions

BAT 68. In order to prevent or collect diffuse emissions from electrolytic cells in primary aluminium production using Söderberg technology, BAT is to use a combination of the techniques given below. (based on Section 4.3.3.3)

Technique	Applicability			Kommentarer fra Årdal Metalverk
Use of paste with a pitch content between 25 % and 28 % (dry paste)	Generally applicable			n/a
Upgrade the manifold design to allow closed point feeding operations and improved off-gas collection efficiency	Generally applicable			n/a
Alumina point feeding	Generally applicable			n/a
Increased anode height combined with the treatment in BAT 69	Generally applicable			n/a
Anode top hooding connected to the treatment in BAT 69	Only applicable when high current density anodes are used			n/a

BAT 69. In order to prevent or collect diffuse emissions from electrolytic cells in primary aluminium production using prebaked anodes, BAT is to use a combination of the techniques given below. (based on Section 4.3.3.4)

Technique	Applicability			Kommentarer fra Årdal Metalverk
Automatic multiple point feeding of alumina	Generally applicable			I bruk
Complete hood coverage of the cell and adequate extraction rates (to lead the off-gas to the treatment in BAT 71) taking into account fluoride generation from bath and carbon anode consumption	Generally applicable			I bruk
Boosted suction system connected to the abatement techniques listed in BAT 71	Only applicable to new plants			Vi har forsert avsg i deler av anlegget: celler nyere enn 1995. I/K 1-13 + RC
Minimisation of the time for changing anodes and other activities that require cell hoods to be removed	Generally applicable			Ja
Efficient process control system avoiding process deviations that might otherwise lead to increased cell evolutions and emissions	Generally applicable			Ja
Use of a programmed system for cell operations and maintenance	Generally applicable			Ja
Use of established efficient cleaning methods in the rodding plant to recover fluorides and carbon	Generally applicable			Ja
Storage of removed anodes in a compartment near the cell, connected to the treatment in BAT 71, or storage of the butts in confined boxes	Only applicable to new plants			Butts blir transportert til kjølestatjon, og står ikke over lang tid i hallen. Gjenbruksanoder kan bli stående litt i påvente av at de skal settes inn i cellene igjen.

11.3.4.1.1 Channelled dust and fluorides emissions

BAT 70. In order to reduce dust emissions from the storage, handling and transport of raw materials, BAT is to use a bag filter. (based on Section 4.3.3.1)

BAT-associated emission levels for dust from the storage, handling and transport of raw materials

Parameter	Unit	BAT-AEL (1)		Kommentarer fra Årdal Metallverk
Dust	mg/Nm ³	≤ 5 – 10		Støvutslipp fra filtre knyttet til lossing ved kai og lossing til silo i Øvre Årdal som følge av utslipp fra hjelpefilter er krevede å holde på et så lavt nivå. Lossing pågår over en begrenset periode, og bidraget fra diffus utslipp fra grab vil være høyere enn støv fra disse hjelpefiltrene. Pr i dag vil det ikke være mulig å nå dette nivået. Vi har i egenrapporten rapportert antall målinger over grensen på 25 mg/Nm ³ , de fleste av disse er knyttet til hjelpefilter for råstoffhåndtering. Aluminiumoksid er ikke klassifisert som farlig/merkepliktig.

(1) As an average over the sampling period.

BAT 71. In order to reduce channelled dust, metal and fluorides emissions to air from the electrolytic cells, BAT is to use one of the techniques given below. (based on Section 4.3.3.5)

Technique (1)	Applicability			Kommentarer fra Årdal Metallverk
Dry scrubber using alumina as the adsorbent agent followed by a bag filter	Generally applicable			
Dry scrubber using alumina as the adsorbent agent followed by a bag filter and a wet scrubber	Applicability of the wet scrubber may be limited in the following cases:			Tørrens med alumina som adsorbent, etterfulgt av våtvask (ferskvann + lut).
	- very high off-gas flow rates, due to the cross-media effects (significant amounts of waste and waste water);			
	- in arid areas by the large volume of water necessary and the need for waste water treatment and the related cross-media effects			

BAT-associated emission levels for channelled dust and fluoride emissions to air from the electrolytic cells

Parameter	Unit	BAT-AEL		Kommentarer fra Årdal Metallverk
Dust	mg/Nm ³	2 – 5 (1)		Støv fra renseanlegg beregnes med en faktor for utvasking til vann på 90 %. Normalt nivå på utg. tørrens er < 10 mg/Nm ³ , tilsvarende 0.1 mg/Nm ³ ut fra våtvask. ed posehull vil disse verdiene bli vesentlig høyere. Det er imidlertid tett oppfølging av posetilstand og våtvaskanlegget vil håndtere store variasjoner i inngående støvkonentrasjon.
HF	mg/Nm ³	≤ 1.0 (1)		Ca. 6 % av målinger på utg. våtvask i perioden 2013-dd overskrider grenseverdien. Normalt nivå for F(g) fra er 0,6 µg/Nm ³ .
Total fluorides	mg/Nm ³	≤ 1.5 (2)		Normalt kun gassformig fluorutslipp fra renseanlegget. Part. fluoridutslipp skyldes nedetid på våtvaskere og er knyttet til normalt vedlikehold og ev. avvikssituasjoner. I 2015 var part. fluorutslipp fra renseanlegget ca. 1 %.

(1) As a daily average or as an average over the sampling period.

(2) As an average over the sampling period.

BAT 72. In order to reduce the total dust and fluoride emissions to air from the electrolysis house (collected from the electrolytic cells and roof vents), BAT is to apply a combination of BAT 68, BAT 69, and BAT 71. (based on Section 4.3.3.5)

BAT-associated emission levels for the total dust and fluoride emissions to air from the electrolysis house (collected from the electrolytic cells and roof vents)

Parameter	Unit	BAT-AELs for existing plants (1) (2)	BAT-AELs for new plants (1)	Kommentarer fra Årdal Metallverk
Dust	kg/t Al	≤ 1.2	≤ 0.6	OK
Total fluorides	kg/t Al	≤ 0.6	≤ 0.35	OK. Det er foretatt måling av resirkuleringsgrad av fluorid , og det kan dokumenteres at en del fluor trekkes inn i hallen og måles flere ganger. For å unngå overrapportering ber vi om at det gis mulighet for å korrigere målt rapportert utslipp over tak med denne verdien. Dokumentasjon kan oversendes.

(1) As mass of pollutant emitted during a year from the electrolysis house divided by the mass of liquid aluminium produced in the same year.

(2) These BAT-AELs are not applicable to plants that due to their configuration cannot measure roof emissions.

BAT 73. In order to prevent or reduce dust and metal emissions to air from melting and molten metal treatment and casting in primary aluminium production, BAT is to use one or both of the techniques given below. (based on Section 4.3.3.8)

Technique				Kommentarer fra Årdal Metallverk
Use of liquid metal from electrolysis and uncontaminated aluminium material				Flytende og kald primærmetall benyttes, dette inkluderer også kaldmetall fra elektrolyse som av sikkerhetsmessige årsaker ikke kan resirkuleres i elektrolyse. Vi benytter ikke kontaminert skrap.
Bag filter				installert. Avgass fra senter 9 under toppfyring går utenom renseanlegg pga høy gasstemp.

BAT-associated emission levels for dust emissions to air from melting and molten metal treatment and casting in primary aluminium production

Parameter	Unit	BAT-AEL(1) (2)		
Dust	mg/Nm ³	2 – 25		OK for definerte målepunkt. Støvmåling i piper fra ovner på senter 9 er svært upålitelige grunnet høy temperatur og fuktighet, og det er ikke mulig å gjennomføre regulære utslippsmålinger der i dag. Det er målt utslipp i kampanje for å kartlegge nivået, analyse av dette materialet pågår.

(1) As an average of the samples obtained over a year.

(2) The lower end of the range is associated with the use of a bag filter.

11.3.4.1.2 Sulphur dioxide

BAT 74. In order to reduce sulphur dioxide emissions to air from electrolytic cells, BAT is to use one or both of the techniques given below. (based on Sections 4.3.3.6 and 4.3.3.7)

Technique	Applicability			Kommentarer fra Årdal Metallverk
Use of low- sulphur anodes	Generally applicable.			Svovelinholdet i anodene er 1,8 % og det forventes at det det vanskeligere å få tilgang til koks med lavt S-innhold.
Wet scrubber	Applicability of the wet scrubber may be limited in the following cases:			Tørrens med alumina som adsorbent, etterfulgt av våtvask (ferskvann + lut).
	- very high off-gas flow rates, due to the cross-media effects (significant amounts of waste and waste water);			
	- in arid areas by the large volume of water necessary and the need for waste water treatment and the related cross-media effects			

BAT-associated emission levels for SO₂ emissions to air from electrolytic cells

Parameter	Unit	BAT-AEL (1) (2)		Kommentarer fra Årdal Metallverk
SO ₂	kg/t Al	≤ 2.5 – 15		OK

(1) As mass of pollutant emitted during a year divided by the mass of liquid aluminium produced in the same year.

(2) The lower end of the range is associated with the use of a wet scrubber. The higher end of the range is associated with the use of low-sulphur anodes.

11.3.4.1.3 Perfluorocarbons

BAT 75. In order to reduce perfluorocarbon emissions to air from primary aluminium production, BAT is to use all of the techniques given below. (based on Section 4.3.3.2)

Technique	Applicability			Kommentarer fra Årdal Metallverk
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Automatic multiple point feeding of alumina	Generally applicable			Alle celler har 2 eller flere matepunkt.
Computer control of the electrolysis process based on active cell databases and monitoring of cell operating parameters	Generally applicable			Installert.
Automatic anode effect suppression	Not applicable to Søderberg cells because the anode design (one piece only) does not allow the bath flow associated with this technique			Installert.

11.3.4.1.4 PAHs and CO

BAT 76. In order to reduce CO and PAH emissions to air from primary aluminium production using Søderberg technology, BAT is to combust the CO and the PAHs in the cell exhaust gas. (based on Section 4.3.3.3)

11.3.4.2 Waste water generation

BAT 77. In order to prevent the generation of waste water, BAT is to reuse or recycle cooling water and treated waste water, including rainwater, within the process. (based on Section 4.2.3.3)

Applicability	Kommentarer fra Årdal Metalverk
Applicable to new plants and major upgrades. The applicability may be limited due to water quality and/or product quality requirements. The amount of cooling water, treated waste water and rainwater that is reused or recycled cannot be higher than the amount of water needed for the process.	Kjølevann resirkuleres ikke, men overskuddsvarme fra støperiet gjenvinnes. Vannet er dokumentert tilnærmet fritt for kjemisk forurensning, kvalitetskontroll av oljeinnhold som følge av teknologiskifte i støperiet pågår. Foreløpige målinger fra vårt støperi, samt nye målinger fra Høyanger tyder på at det ikke kan påvises olje i kjølevannet fra støperiet. Overflatevann går delvis via oljeutskillere.

11.4.2 Waste

BAT 78. In order to reduce the disposal of spent pot lining, BAT is to organise operations on the site so as to facilitate its external recycling, including using one or a combination of the techniques given below. (based on Section 4.3.3.9)

Technique	Applicability			Kommentarer fra Årdal Metalverk
Use of spent pot lining in cement manufacturing	Applicability may be restricted depending on the end consumer's requirements			Under vurdering, samarbeidsprosjekt med mulig mottaker er etablert.
Use of spent pot lining as a carburiser in the steel or ferro-alloy industry				Nei
Use of spent pot lining as a secondary raw material (rock wool, salt slag recovery, etc.)				Delvis. Knusing av materialet til den fraksjonen kunden ønsker er krevende.

11.3.5 BAT conclusions for secondary aluminium production

11.3.3.1 Secondary materials