



Aluminium Task Force

Action Plan

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Introduction

The six countries of the Asia-Pacific Partnership on Clean Development and Climate—Australia, China, India, Japan, the Republic of Korea, and the United States of America—are cooperating to meet both their increased energy needs and associated challenges, including those related to air pollution, energy security, and greenhouse gas intensities.

The Partnership has established public-private Task Forces in eight key sectors: (1) cleaner fossil energy; (2) renewable energy and distributed generation; (3) power generation and transmission; (4) steel; (5) aluminium; (6) cement; (7) coal mining; and (8) buildings and appliances. The Task Forces are designed to meet Partnership goals through international cooperation to facilitate the development, diffusion, deployment, and transfer of existing, emerging and longer term cost-effective, cleaner, more efficient technologies and practices among the Partners through concrete and substantial cooperation so as to achieve practical results.

As a product of its first stage of collaboration, each Task Force has created an Action Plan which has been endorsed by the Policy and Implementation Committee. The Action Plans contain an initial set of priority activities for implementation. Some projects contained within the Action Plans may need to be refined or elaborated. Financial resources are needed for the implementation of the Action Plans. Some initial funding from some government and industry sources has already been identified for the implementation of projects. Partner countries will continue to work to mobilize further funding from both public and private sectors in order to bring about full implementation of the practical projects identified in the Action Plans and will continually develop new projects and add them to this set of activities.

Sector Review

Asia-Pacific Partners account for 37% of the world's aluminium production. The aluminium industry is one of the fastest-growing sectors, with rapid growth in developing countries. The industry can make further improvements in environmental performance, while reducing costs, through best practice use of existing equipment (in particular perfluorocarbons (PFC) emissions management), increased uptake of best available and affordable technology (including improved instrumentation), the continued development and deployment of new technologies, and by increasing levels of recycling. Through the Partnership, countries can advance industries towards global PFC reduction objectives and address energy efficiency and other CO₂ process emissions by promoting best practice performance, increasing technical support and identifying impediments to the deployment of best available and affordable technology.

A summary of the emissions, effluents, by-products and solid wastes from alumina refining and primary and secondary aluminium production is provided in Table 1.

Table 1 Emissions, Effluents, By-Products and Solid Wastes from Primary and Secondary Aluminium Production

Process	Air Emissions ^a	Effluents	Byproducts and Solid Wastes
Alumina Refining	Particulate	Wastewater containing starch, sand, and caustic	Red mud, sodium oxalate
Anode Production	Particulate, fluorides, polycyclic organic matter, SO ₂	Wastewater containing suspended solids, fluorides, and organics	Carbon dust, tar, refractory waste
Aluminum Production (Smelting)	CO ₂ , CO, SO ₂ , fluorides (gaseous and particulate), perfluorocarbons (CF ₄ , C ₂ F ₆), polycyclic organic matter	Wet air pollution control (APC) effluents (if applicable)	Spent potlining (RCRA-listed K088), environmental abatement wastes (e.g., wet APC sludge)
Scrap Pretreatment	Particulate, organics, chlorides	Wet air pollution control effluents (if applicable)	Environmental abatement wastes
Scrap Smelting/Refining	Particulate (including trace metals), organics, chlorides, fluorides	Magnesium removal ("demagging") effluents	Dross, salt cake
Semi-Fabrication	Particulate, chlorides, organic droplets and vapors	Cast water blowdown, cooling water blowdown, roll coolant waste, coating line waste	Oils, greases

a. Excluding combustion-related emissions.

Source: *Energy and Environmental Profile of the U.S. Aluminium Industry*, July 1997, Energetics Inc, Columbia, Maryland for the U.S. Department of Energy, Office of Industrial Technologies.

From Table 1 it can be seen that each part of the aluminium production process has environmental impacts that need to be managed in different ways. One of the primary environmental focuses of the Partnership relates to greenhouse gas emissions. The air emissions column of the table highlights that the aluminium production process produces significant greenhouse emissions.

Table 2 details process emissions, which are those emissions associated with the manufacturing processes and do not include combustion emissions associated with the combustion of fuels, including fuels used in the generation of purchased electricity. These combustion-related emissions vary widely both within and between countries, as they depend on the fuel sources used within facilities and for electricity generation.

Table 2 Process-Related Air Emissions for Major Aluminium Industry Processes (kg/metric ton of aluminium, except as noted)

Process	Emission Factor [lb/ton]							
	SOx	NOx	CO ₂	CO ^c	Particulate	Organics	Chlorides	Fluorides
Alumina Refining	--	--	--	--	0.5 [1.0]	--	--	--
Coke Production ^a	0.81 [1.62]	0.18 [0.36]	--	0.37 [0.74]	0.40 [0.80]	0.29 [0.58]	--	0.0004 [0.0008]
Anode Production ^a	0.70 [1.40]	0.16 [0.32]	--	0.25 [0.50]	0.63 [1.26]	0.20 [0.40]	--	0.25 [0.50]
Aluminum Production (Smelting)	18.0 [36.0]	2.9 [5.8]	1,400.0 [2,800.0]	125.0 [250.0]	4.2 [8.4]	0.13 [0.26]	--	1.3 [2.6]
Primary Ingot Casting	--	--	--	--	0.10 [0.20]	--	0.0078 [0.0156]	--
Scrap Pretreatment	--	--	--	--	0.20 [0.40]	0.05 [0.10]	0.20 [0.40]	--
Secondary Melting/Casting	--	--	--	--	0.19 [0.38]	0.05 [0.10]	0.17 [0.34]	--
Hot Rolling Softer alloy ^c Harder alloy ^d	--	--	--	--	0.8 [1.6] 1.2 [2.4]	1.0 [2.0] 0.3 [0.6]	--	--
Cold Rolling	--	--	--	--	0.42 [0.84]	1.80 [3.60]	--	--

a Emission factors per unit of anode produced.

b Emission factors per unit of scrap input.

c Softer alloys are represented by 3104.

d Harder alloys are represented by 5182.

Source: Data reported by Nolan Richards, 1997. (Note: the date refers to the release of the information, some of which was developed in 1991).

Source: *Energy and Environmental Profile of the U.S. Aluminium Industry*, July 1997, Energetics Inc, Columbia, Maryland for the U.S. Department of Energy, Office of Industrial Technologies

A summary of each Partner country's aluminium industry is provided in Table 3. This table clearly indicates the diversity of the aluminium industry throughout the Partnership and the importance of the projects that have been developed for the action plan.

Table 3 Overview of the Asia-Pacific Partnership Aluminium Industry

	Australia	China	India	Republic of Korea	Japan	United States
Number of bauxite mines	5	NA	NA	NA	Nil	NA
Quantity of bauxite mined (Mt)	62 Mt (2005)	NA	NA	NA	Nil	NA
Quantity of bauxite export/import (Mt)	Export: 5.3 Mt Import: Nil	Export: NA Import: NA	Export: NA Import: NA	Export: NA Import: NA	Export: Nil Import: 1.8Mt	Export: 75t Import: 10500t
Number of alumina refineries	7	NA	NA	NA	3	3
Alumina production—metallurgical grade (Mt)	17.9 Mt (2005)	NA	NA	NA	0.335Mt	NA
Quantity of alumina export/import (Mt)	Export: 14.3Mt Import: Nil	Export: NA Import: NA	Export: NA Import: NA	Export: NA Import: NA	Export: 0.26 Import: 0.144	Export: 1230t Import: 1650t
Number of aluminium smelters	6	NA	NA	NA	1	NA
Aluminium produced (Mt)	1.9Mt (2005)	NA	NA	NA	7000t	NA
Quantity of aluminium export/import (Mt)	Export: 1.6Mt Import:	NA	NA	Export: NA Import: 0.84Mt	Nil	Export: 1820t Import: 4720t
Number of extrusion mills	12	NA	NA	NA	87 (operating)	NA
Number of rolled product plants	2	NA	NA	NA	12	NA
Quantity of aluminium scrap imported/exported (Mt)	Export: 0.158Mt Import: NA	NA	NA	NA	Export: 95680t (2005) Import: 108782t (2005)	NA

*NA—Not Available

The global aluminium industry is changing in response to increased input costs, environmental performance requirements and other global pressures. As a result, the aluminium industry has been exploring ways of reducing energy consumption and increasing productivity. Tables 1 and 2 demonstrate that there are many areas within the aluminium production process that could be improved to increase efficiencies for the environment and production. A broad range of projects has been developed on this basis.

Table 2 highlights aluminium production (smelting) as one of the key areas where technology development could be focused. The technology used for aluminium production has been in existence since 1886 and there have been a number of technological breakthroughs that have dramatically altered the energy efficiency and environmental performance of the industry (such as the introduction of point feed pre-bake technology with reduced PFC emissions)—although the core technology (carbon anode/cathode cell) remains in use to this day. Individual companies, however, are continuing to research and develop technology that will one day revolutionize the industry through reduced energy consumption and increased production with low environmental impacts. These technologies include “inert anodes” and “drained cathode cells.” These technologies are still under development and are highly protected due to their commercial value.

While it is not known how long it will be until these technologies are commercially available or what the actual benefits may be in energy efficiency and emission reductions, Partner countries agree that there is a need to address current industry smelter operations by using cleaner and lower emissions technologies and operating systems. In addition, development of such technologies under this Partnership may promote the deployment of promising

technologies that offer greater energy efficiency and lower air pollution and greenhouse gas intensities.

Objectives

The following objectives were outlined in the work plan and approved by the Ministers in Sydney, January 2006:

- Enhance current aluminium production processes through uptake of best-practice use of existing equipment.
- Advance the development and deployment of new best practice aluminium production process and technologies across Partnership economies.
- Enhance sector-related data, including recycling and performance.
- Facilitate increased aluminium recycling rates across the Partnership.

Table 4 outlines all the project plans.

Table 4 Action Plan, Milestones, and Near-Term Goals

Project/Activity	2006	2007	2008	2009	2010
ATF-06-01. Measuring and Benchmarking the Aluminium Industry	Adopt standard set of sustainability indices for measurement and benchmarking.		<ul style="list-style-type: none"> All Partner countries to collect data. The data collection and analysis organization will analyze data and report outcomes based on the agreed sustainability indices. 	Report the first year variation of Partner country performance against sustainability indices.	
ATF-06-02. Management of PFC Emissions		<ul style="list-style-type: none"> Adopt standard facility-specific measurement method Agree to common reporting format for primary facilities Identify and initiate training requirements for data collection and reporting Identify and initiate training requirements for smelter measurements Establish in-country data reporting processes Develop compendium of currently available mechanisms to facilitate PFC emission reductions Host workshops and study visits to disseminate PFC emission reduction information Develop PFC direct measurement strategy to identify priority smelters for measurements including cost estimates, timeline etc. 	<ul style="list-style-type: none"> Complete preliminary benchmark assessment of Partner countries' facilities against global averages. Achieve anode effect data reporting at 50% of all primary facilities. Partner countries identify mechanisms in existing smelter operations of different technology types that have facilitated PFC emissions reductions and host workshops and study visits to disseminate information. Identify financial mechanisms to implement strategies to enhance PFC emission reductions. Conduct additional training workshops as needed. Complete facility-specific PFC measurements at 10% of primary facilities. 	<ul style="list-style-type: none"> Complete facility specific PFC measurements at 20% of primary facilities. Undertake supplementary data collection training in Partner countries if required. 	Complete baseline smelter measurements at 40% of primary facilities.
ATF-06-03. Management of Bauxite Residues	Undertake a detailed literature review of currently available technology and research. Agree to a research priority list of those areas identified within the literature study that have the most promising outcomes. Engage with the Steel and Cement industries to address any cross-sectoral applications and potential project partners for future trials.		Undertake R&D activities on promising technologies and applications. Pilot test the most promising options. Identify financial mechanisms to implement strategies to enhance bauxite residue utilization.		Implement commercial scale at trial sites and exchange technology among member companies. Develop an on-going implementation plan and future benchmarks for future uptake of the technology and practices.

Project/Activity	2006	2007	2008	2009	2010
ATF-06-04. High Silica Bauxite Processing	<p>Determine bauxite sampling standards and chemical and mineralogical analysis standards of bauxite.</p> <p>Define bauxite grades and 'high silica bauxite'.</p> <p>Collect typical high silica bauxite samples from different participating countries and carry out chemical and mineralogical analysis of the bauxite samples.</p> <p>Survey practical alumina production from high silica bauxite in Partner countries and collect energy and caustic soda consumption data as the basis for comparison.</p>		<p>Cooperate on the research and development of new projects among Partner countries on finding the new types of DSP with favorable chemical and mineral compositions and crystal structures and their suitable formation conditions based on the study of the bauxites mineral compositions and the behavior of impurities minerals during bauxite digestion.</p> <p>Develop an improved Bayer process to produce alumina from high silica bauxite in which the new types of DSP with lower ratio of alumina to silica (A/S) and lower ratio of caustic soda to silica (N/S) can be formed to reduce caustic and energy consumptions in Bayer process.</p> <p>Select a suitable refinery for the case study of the project and implement the project in the refinery.</p>		<p>Prepare, collate and disseminate project study results on implementation of projects by industry presentations/workshops and/or site visits.</p> <p>Apply the project achievements and newly developed process in some participating countries and Partner refineries using high silica bauxite as raw material.</p> <p>Collect the operation and consumption data in the alumina production facilities in Partner countries and compare to the original data collected at the project beginning.</p> <p>Complete and summarize the project implementation.</p>
ATF-06-05. Fluoride Emissions Management	<ul style="list-style-type: none"> Collect data and report current status of fluoride emissions for aluminium smelters from all Partner countries. Provide smelter specific reporting which benchmarks against global average. Identify, collect and collate information on fluoride emissions reduction measures and opportunities that have been implemented by smelters in Partner countries and international experience. 	<p>Disseminate the collated information to all Partner countries. The information dissemination process could be supplemented by industry presentations/workshops and/or site visits to increase industry awareness of current opportunities/best practice for reducing fluoride emissions.</p>	<p>Establish an expert review team from Partner countries to review a small number of representative less efficient facilities to identify potential opportunities for cost-effective and practical fluoride emissions improvements as the basis for preparation of case studies to be shared with all Partner countries/facilities.</p> <p>Individual Partner countries/facilities to implement cost-effective fluoride emissions management measures.</p>	<p>Prepare, collate and disseminate case studies and lessons learned on implementation of projects.</p> <p>Collect national-level data on the fluoride emissions of production facilities in Partner countries and compare to the original data collected at the commencement of the project.</p>	
ATF-06-06. Aluminium Recycling	<ul style="list-style-type: none"> Adopt standard recycling indices for aluminium UBCs. Agree to common reporting format. 	<ul style="list-style-type: none"> Initial year of recycling rate benchmarking performance. Establish in-country data reporting process. Identify and initiate training requirements. Establish data collection systems at 70% of recycling facilities. Establish methods for assessing usage rates of long-life products. 		<p>Complete database of best practices for environmental and safety of recycling facilities.</p>	

Project/Activity	2006	2007	2008	2009	2010
ATF-06-07. Linkages to Technology Providers	Develop and agree standard reporting information for the register.	<ul style="list-style-type: none"> • Trial the technology register and circulate to task force members for comment. • The technology register will be fully 'live' and ready to accept information 			

Projects and Activities

In order to develop a task force action plan, projects need to be identified that reflect the task force objectives as agreed by Ministers. Potential projects have been grouped under these headings in addition to identifying their place within the aluminium production process.

The Vision Statement adopted by the member countries states that they will work together “to create a new partnership to develop, deploy and transfer cleaner, more efficient technologies and to meet national pollution reduction, energy security and climate change concerns, consistent with the principles of the UN Framework Convention on Climate Change (UNFCCC).” The color within the following table signifies the relationship of the project to clean development, climate or other objectives. Predominantly the projects under the “other” category relate to measuring and monitoring. Further project details are provided in Appendix A.

PROCESS	ALUMINIUM TASK FORCE OBJECTIVES			
	Enhance current aluminium production processes through uptake of best-practice use of existing equipment.	Advance the development and deployment of new best practice aluminium production process and technologies across Partnership economies.	Enhance sector-related data, including recycling and performance.	Facilitate increased aluminium recycling rates across the Partnership.
Reporting & Monitoring	Linkages to technology providers		Measuring and benchmarking of the aluminium industry Management of PFC emissions (part)	
Alumina Refining		Processing of high silica bauxites Management of bauxite residues		
Anode Production				
Aluminium Production (Smelting)	Management of fluoride emissions (part) Management of PFC emissions (part)	Management of Fluoride emissions (part) Management of PFC emissions (part)		
Scrap Pretreatment				
Scrap Smelting/ Refining				Aluminium recycling
Semi-Fabrication				

	CLIMATE (Greenhouse)
	CLEAN DEVELOPMENT
	OTHER

Appendix A: Individual Project Plans

ATF-06-01—Aluminium Measuring and Benchmarking

Project Description

This project will develop a process and indices for benchmarking and measuring aluminium sustainability and provide Partner countries with the necessary knowledge to facilitate the data collection. Included will be a selection of sustainability indices to be benchmarked and updated (period to be determined) by Partner countries. The indices will be consistent with those currently used by the International Aluminium Institute (IAI). Indices tracked will also be coordinated with the efforts under other project plans for PFC management, fluoride emissions management and recycling. Areas included will be bauxite mining, alumina production, and primary aluminium production and semi-fabricated aluminium. Aluminium production data will be used to determine indices of sustainability on a tonne of aluminium produced basis.

Objectives

To have data collected from each Partner, consistent with the industry memorandum of understanding, on a three-yearly basis, to monitor progress against an agreed sustainability benchmark to assist with the continued efficiency and environmental performance of the industry.

Performance Indicators

- A completed set of sustainability indices for each Partner to benchmark and monitor that comprehensively addresses aluminium sustainability performance for all relevant sectors of the industry.
- Relevant expertise is deployed to Partner countries to ensure accurate and consistent data collection.
- A tri-annual updating of sustainability indices by nation and for aluminium sectors including bauxite mining, alumina refining, primary aluminium production and aluminium semi-fabrication operations.

Milestones

2006–mid 2007	Adopt standard set of sustainability indices for measurement and benchmarking, consistent with current IAI sustainability activities.
	Agree to common reporting format.
	Identify and initiate training requirements for data collection for each Partner.
	Establish data collection systems and reporting processes within all Partner countries.
2008	All Partner countries to collect data in the IAI format and provide to an agreed international organization (to be determined) with expertise in data collection and analysis.

The data collection and analysis organization will analyze this data and provide aggregate to Partners, which will be used as the initial year benchmark data.

The data collection and analysis organization will analyze data and report outcomes based on the agreed sustainability indices.

2009 Report the first year variation of Partner country performance against sustainability indices.

Resources

The data collection and analysis organization to develop a database to accommodate variations for the sustainability indices.

The data collection and analysis organization to establish a reporting format for Partner use.

Consultant engaged to undertake training in Partner countries for the data collection and reporting process.

Participation

Australia, China and the United States.

ATF2–06–02—Management of PFC Emissions

Project

This project will enable all primary production facilities in Partner countries to identify and implement cost-effective, technically feasible opportunities to minimize perfluorocarbon (PFC) emissions generated during anode effects in the electrolytic cell. The IAI GHG protocol provides guidance on common measurement and calculation methodology.

In general, the magnitude of PFC emissions for a given level of production depends on the frequency and duration of anode effects. Cost-effective technologies and practices to reduce PFC emissions are currently available and can be implemented at smelters of all technology types. However, emissions can vary significantly from one aluminium smelter to the next, depending on cell technology and operating procedures.

This project will provide the relevant tools to develop PFC inventory and reporting regimes and to facilitate the development and adoption of smelter-specific PFC emission reduction strategies, which may include some or all of the following measures: improving alumina feeding; training monitoring staff on best practices to minimize the frequency and duration of anode effects; maintaining applicable controls over alumina properties; mechanical maintenance; and cell parameters.

Objectives

That all participating Partner countries report anode effect performance.

That all participating Partner countries reduce PFC emissions through the development and use of high quality PFC emissions data and by facilitating the adoption of systematic PFC emission management processes. Key components of PFC management include:

- Monitoring and inventory
 - Establish baseline estimates using IPCC default values or, when available, smelter-specific measurement data.
 - Establish monitoring and data collection system for anode effect frequency and duration.
 - Conduct direct PFC measurements to establish smelter-specific slope-coefficients to improve accuracy of emission estimates.
- Management systems
 - Set reduction targets.
 - Awareness of the process efficiency and climate benefits of reducing anode effects for managers and potline operators.
 - Awareness and analysis of technical options in emission reduction technical upgrades.
 - Anode effect prevention and response training for managers and potline operators.
- Process control systems

- Anode effect reduction algorithms/resistance monitoring.
- Cell technology upgrades
 - Point feed.
 - Prebake.

Performance Indicators

- All participating Partner countries are trained in the collection and reporting of the required data.
- All participating Partner countries collect and report on PFC emissions for the agreed quantity of smelters.
- Each Partner achieves the IAI median benchmark for PFC emission performance across smelter population for each technology type.
- Ongoing PFC emissions performance benchmarks to be reassessed based on global benchmark.

Milestones

- | | |
|------|---|
| 2007 | <p>Adopt standard facility-specific measurement method, e.g. EPA/IAI Smelter Measurement Protocol</p> <p>Agree to common reporting format for primary facilities, e.g. IAI Aluminium Sector Greenhouse Gas Protocol</p> <p>Identify and initiate training requirements for data collection and reporting</p> <p>Identify and initiate training requirements for smelter measurements</p> <p>Establish in-country data reporting processes</p> <p>Achieve anode effect data tracking and reporting at 25% of smelter facilities</p> <p>Estimate Partner country PFC emissions using IPCC method</p> <p>Develop compendium of currently available mechanisms to facilitate PFC emission reductions</p> <p>Host workshops and study visits to disseminate PFC emission reduction information</p> <p>Develop PFC direct measurement strategy to identify priority smelters for measurements including cost estimates, timeline etc.</p> |
| 2008 | <p>Complete preliminary benchmark assessment of Partners' facilities against global averages</p> <p>Achieve anode effect data reporting at 50% of all primary facilities</p> |

Partner countries identify mechanisms in existing smelter operations of different technology types that have facilitated PFC emissions reductions and host workshops and study visits to disseminate information

Identify financial mechanisms to implement strategies to enhance PFC emission reductions

Conduct additional training workshops as needed

Complete facility specific PFC measurements at 10% of primary facilities

2009 Complete facility specific PFC measurements at 20% of primary facilities

Undertake supplementary data collection training in Partner countries if required

2010 Complete baseline smelter measurements at 40% of primary facilities

Resources

Financial and in-kind resources will be necessary for training and management awareness, measurements, translation, etc. and be sourced from Partner contributions.

An international organization (to be determined) with expertise in data collection and analysis will collate and analyze data.

Provide relevant training in conjunction with a consultant and technical experts for the measuring of the PFC data through Partner funds.

IT upgrades necessary to collect anode effect process and other relevant data to be through Partner funding.

Resources necessary for any technical upgrades, major/minor retrofits, etc. will be achieved through commercial markets and implemented on a case-by-case basis.

Demonstration smelter operations will be provided at the cost of the smelter operator. Participation of Partner countries in the workshops and information sharing will be at the cost of each Partner.

Investment in minor and major technology upgrades, e.g. anode effect prediction software packages—commercial markets.

Tools/mechanisms for information dissemination, prioritization and recommendations for implementation of appropriate technologies and practices—Partnership resources.

Participation

The United States, Australia and China.

ATF-06-03—Management of Bauxite Residue (Red Mud)

Project

Worldwide, alumina (Al_2O_3) is produced from bauxite using the Bayer process. After digestion, bauxite residue (also known as red mud), is separated, washed and disposed of. Bauxite residue is highly alkaline in nature and contains oxides and salts of six major oxides of Fe, Al, Ti, Si, Na, Ca, and a variety of minor trace elements. Typically it contains in the region of 15 to 20 different mineral phases.

Around 1.5–2.5 tonnes of red mud is generated per tonne of alumina produced, depending on the bauxite source and alumina extraction efficiencies. The main environmental risks associated with bauxite residue are related to high pH and alkalinity, and minor and trace amounts of heavy metals and radionuclides.

A wide variety of potential uses has been suggested for the residue, and significant research has been done in a number of areas. Despite this, to date there are no economically viable and environmentally acceptable solutions for effective utilization of the high-residue volumes that have developed. Consequently, most of the bauxite residue produced is stored on land for future rehabilitation or use. Current best practice is to contain the material within specially constructed landfill sites, called red mud ponds/stacks or bauxite residue disposal areas (BRDAs). The intention is that, after exhausting the storage capacities, the landfill sites are either used for industrial or civil purposes or re-afforested to ensure merging with the surrounding eco-system.

The key focus areas of this project are to develop technically and economically sound options for:

- The productive utilization of bauxite residue in various end-uses including those application specific to the steel and cement industries (including the extraction of oxides and trace metals).
- Better stabilizing the residue (mechanical stability and chemical inertness).
- Utilizing minimum land for storage and ensuring faster rehabilitation of landfill sites.

Objectives

To develop technology and practices for the alternative use of bauxite residues that will reduce the reliance of stockpiling and storage.

Maximize the potential of bauxite residue for the steel and cement industries through the extraction of oxides and trace metals as viable substitutes to existing industrial inputs to production processes.

Performance indicators

By 2010, 50% of facilities will utilize 70% of red mud produced, in various end-uses that include industrial, construction and agricultural applications.

By 2010, 60% of facilities will reduce on-land storage of red mud by 40% through vertical stacking, post neutralization, mid-sea dumping etc.

By 2015, no facilities will be dumping bauxite residue into the sea.

By 2010, 30% of facilities will ensure that on-land storage areas containing leftover red mud will be closed and rehabilitated in the shortest possible time or the residue directed to beneficial use.

Milestones

2006–07 Undertake a detailed literature review of currently available technology and research.

Agree to a research priority list of those areas identified within the literature study that have the most promising outcomes.

Engage with the steel and cement industries to address any cross-sectoral applications and potential project partners for future trials.

2007–09 Undertake R&D activities on promising technologies and applications.

Pilot test the most promising options.

Identify financial mechanisms to implement strategies to enhance bauxite residue utilization.

2009–10 Implement on commercial scale at trial sites and exchange technology among member companies.

Develop an ongoing implementation plan and future benchmarks for future uptake of the technology and practices.

Resources

Information sharing on the existing methods related to the utilization of red mud among participating countries.

R&D to support basic research on priority areas identified. Resource to be provided by participating Partner countries

Consultancy to develop data collection pro formas and to collect, collate and analyze the information relating to characterization of bauxite residues and processability studies for meeting various end-uses. Resources to be provided by participating Partner countries.

Consultancy to further develop technology for faster rehabilitation of closed bauxite residue sites. Resources to be provided by participating Partner countries.

Facilities and infrastructure for conducting trials with treated bauxite residue in identified end uses. Resources to be provided by participating Partner countries. Government may allocate funds and extend research facilities for the same.

Review by experts on the environmental and safe use of the options developed for bauxite residue use, especially environmentally sensitive areas.

Presentations, workshops and site meetings hosted by participating companies and supported by industry experts (e.g. consultants, researchers) to disseminate aggregate data results and analysis of measures.

Project identification, development, financing and implementation by companies supported by internal and external resources (project and financing consultants, in-house staff).

Participation

Australia, China and India.

ATF-06-04—High Silica Bauxite Processing

Project

With the rapid development of the global alumina industry, bauxite consumption is growing and has reached more than 160 million tonnes per year. With such a high demand for bauxite alumina production is becoming more difficult due to the gradual global decline of high-grade bauxite resources.

There is a growing need to develop new processes and technologies for alumina production from low-grade bauxite with lower caustic and energy consumption in order to utilize available bauxite deposits.

Low-grade bauxite processing currently includes the application of sintering process, removing silica minerals from the bauxite by using either physical or chemical processes before the Bayer process etc. These technologies are limited by high capital costs, high energy consumption and have technological limitations.

This project focuses on developing technology for:

- Processing options—inhibiting either the dissolution of kaolin or the precipitation of desilica product (DSP), or forming an alternative DSP low in soda.
- Recovery of values from residues—reprocessing of residue or a concentrated DSP stream to recover soda, or produce a value added product to defray the cost of replacement soda.

Objectives

To develop new technologies and practices that are environmentally and economically viable for the processing of high silica bauxites to address the future demand for bauxite and the global decline of high grade bauxite resources.

Performance indicators

By 2010, participating countries will be able to process high silica bauxite for alumina production utilizing developed technologies. The ‘high silica bauxite’ means the ratio of alumina to silica in weight percentage in the bauxite is less than 8.

By 2015, 60% of participating alumina refinery facilities processing high silica bauxite operates in top 10% of the global benchmark performance for caustic soda and energy consumptions. The global benchmark would be:

- Determined from the industry surveys on the caustic and energy consumption in the refineries processing high silica bauxite all over the world.
- Related to the energy and caustic soda consumption per tonne of alumina production.

Milestones

2006–07 Determine bauxite sampling standards and chemical and mineralogical analysis standards of bauxite.

Define the bauxite grades and ‘high silica bauxite’.

Collect the typical high silica bauxite samples from different participating countries and carry out chemical and mineralogical analysis of the bauxite samples.

Survey the practical alumina production from high silica bauxite in Partner countries and collect the energy and caustic soda consumption data as the basis for comparison.

2007–09 Cooperate on the research and development of a new project among Partner countries on finding the new types of DSP with favorable chemical and mineral compositions and crystal structures and their suitable formation conditions, based on the study of the bauxite's mineral compositions and the behavior of impure minerals during bauxite digestion.

Develop an improved Bayer process to produce alumina from high silica bauxite in which the new types of DSP with lower ratio of alumina to silica (A/S) and lower ratio of caustic soda to silica (N/S) can be formed to reduce caustic and energy consumptions in Bayer process.

Select a suitable refinery for the case study of the project and implement the project in the refinery.

2009–10 Prepare, collate and disseminate project study results on implementation of projects by industry presentations/workshops and/or site visits to increase industry awareness of the opportunities to process high silica bauxite with low consumptions and cost.

Apply the project achievements and newly developed process in some participating countries and Partner refineries using high silica bauxite as raw material.

Collect the operation and consumption data in the alumina production facilities in Partner countries and compare to the original data collected at the project beginning.

Complete and summarize the project implementation.

2010–15 Ongoing collection of data and reporting.

Resources

Information sharing on the methods and new process related to high silica bauxite processing with the cost as low as possible among the participating countries and organized by the project task force management.

Project identification, development and implementation by the companies supported by internal and external resources (including experts, research and industrial facilities etc).

Presentations, workshops, site visits and operation training hosted by participating companies and supported by industry experts to show the study data and results.

Participation

Australia, India and China.

ATF-06-05—Fluoride Emissions Management

Project

Fluoride is part of the aluminium smelting process with alumina being dissolved in a bath of molten cryolite (sodium aluminium fluoride) to facilitate the electrolysis process. Fluoride emissions (as gases and particulates) remain of high environmental concern for the aluminium smelting sector.

Depending on the local conditions, fluorides could have a serious environmental impact on the local flora and fauna. Fluorides accumulate in vegetation and can cause damage to coniferous trees. They also accumulate in the teeth and bones of ruminants eating fluoride-contaminated forage. Plants with modern control systems to remove and recycle the fluorides do not generate local concerns. Optimum fume collection from the electrolytic cells, coupled with specific workplace-related training of employees, has led to further improvement.

The management of fluoride emissions is critical to ensure that environmental impacts are minimized or eliminated. This project will identify practical mechanisms to reduce fluoride emissions for existing smelter operations and disseminate information to enable implementation to achieve reductions in fluoride emissions.

Project objectives

To provide smelter operators with information on their operation's fluoride emissions performance as it relates to the global average.

To implement best practice and technology to reduce fluoride emissions across all primary aluminium smelters in the Partnership.

Performance indicators

All Partner countries are trained in the collection and reporting of the required data.

Each Partner achieves the IAI median benchmark for fluoride emission performance for each technology type.

Ongoing PFC emissions performance benchmarks to be reassessed based on global benchmarks.

Milestones

2006-07 An international organization (to be determined) with expertise in data collection and analysis to collect data and report current status of fluoride emissions for aluminium smelters from all Partner countries.

The international data collection organization to provide smelter-specific reporting which benchmarks against global average.

Concurrently, identify, collect and collate information on fluoride emissions reduction measures and opportunities that have been implemented by smelters in Partner countries and international experience.

2007–08 Disseminate the collated information to all Partner countries. The information dissemination process could be supplemented by industry presentations/workshops and/or site visits to increase industry awareness of current opportunities/best practice for reducing fluoride emissions.

2008–09 Establish an expert review team from Partner countries to review a small number of representative, less efficient facilities to identify potential opportunities for cost-effective and practical fluoride emissions improvements as the basis for preparation of case studies to be shared with all Partner countries/facilities.

Individual Partner countries/facilities (possibly with expert assistance from other Partner countries) to implement cost-effective fluoride emissions management measures. (Note, while Partner countries would work collaboratively to identify projects, decisions on implementation would continue to be the responsibility of individual companies and facilities.)

2009–10 Prepare, collate and disseminate case studies and lessons learned on implementation of projects.

Collect national-level data on the fluoride emissions of production facilities in Partner countries and compare to the original data collected at the commencement of the project.

Resources

An international organization (to be determined) with expertise in data collection and analysis to collect and analyze fluoride emission data.

Government agencies and industry associations (where these exist) distribute aggregated and benchmark data and information.

Expert review group for assessment of a small number of smelters, which would include the preparation of case studies to be shared with all Partner countries/facilities.

Presentations, workshops and site meetings hosted by participating companies and supported by industry experts (e.g. consultants, researchers) to disseminate aggregate data results and analysis of measures.

Project identification, development, financing and implementation by companies supported by internal and external resources (project and financing consultants, in-house staff)

Participation

Australia, China and the United States.

ATF-06-06—Aluminium Recycling

Project

This project will develop a mechanism for establishing baseline recycling rates for aluminium and an annual reporting mechanism to monitor recycling rate progress. Included will be recycling of aluminium for beverage cans (UBCs). Methods will be explored to establish usage ratios of recycled resources for long-life products, including building and construction. In addition, the project will develop a database of best practices for collection and recycling operations, including environmental and safety practices to enhance sustainable recycling operations.

Project Objectives

A completed database of benchmarked recycling rates for UBCs by nation.

Annual updating of recycling rates by nation and for aluminium sub-sectors including UBCs.

Establishment of methods to assess usage rates for long-life products including building and construction.

A comprehensive database of best practices for operating recycling facilities.

Project Performance Indicators

By 2010, participating countries would have established a baseline of UBC recycling rates.

By 2010, participating nations would have established an annual reporting mechanism to track UBC recycling performance of aluminium.

By 2010, the Aluminium Task Force would have developed a set of methods to assess usage rates for long-life products including building and construction.

By 2010, establish a database of best practices for recycling facility environmental and safety procedures to optimize aluminium recycling sustainability and worker/community protection.

Milestones

2007	Adopt standard recycling indices for aluminium UBCs.
	Agree to common reporting format.
2008	Initial year of recycling rate benchmarking performance.
	Establish in-country data reporting process.
	Identify and initiate training requirements.
	Establish data collection systems at 70% of recycling facilities.
	Establish methods for assessing usage rates of long-life products.
2009	Complete database of best practices for environmental and safety of recycling facilities.

Resources

Information sharing and workshops on methods and materials related to recycling rates and best practices.

Participation

The United States, Australia, Japan and China.

ATF-06-07—Linkages to Technology Providers

Project

The implementation of initiatives under the Aluminium Task Force relies on the application of technology, both new and existing, to enhance current performance, both commercial and environmental.

Many of the projects within the action plan are focused on using expertise in the Partnership to identify potential improvements in aluminium production processes. For implementation of improvements to occur it is imperative that there are linkages to technology providers.

A register of technology providers will be accessible by industry and could form an effective mechanism to provide operators with the access to resources necessary to implement change.

An open and transparent register (publicly available) will attract technology providers who may be seeking to offer their expertise across the Partnership and this may also provide operators with a selection of providers to ensure a competitive market environment.

Objectives

By mid 2007, technology providers register to be operating via the Internet with linkages to the national industry associations and governments involved in the task force.

Performance Indicators

The technology is fully operational by mid 2007.

Technology providers upload information on the register.

Milestones

By end of 2006 Develop a web page for the technology register.

 Develop and agree standard reporting information for the register.

By March 2007 Trial the technology register and circulate to task force members for comment.

By mid 2007 The technology register will be fully 'live' and ready to accept information.

Resources

Consultancy to develop database and web page interface.

Ongoing maintenance.

In-kind resources from government and national industry associations to link to the register and also promote it through newsletters, emails and other industry information.

Possible operating environment.

The technology register could be embedded in a web page related to the Partnership (to be determined).

Technology providers will be able to access the technology register through a password and username. This will ensure that only the technology provider (and the website administrator) can amend any of the details.

The technology provider will need to complete a range of compulsory information fields before the register will accept the information.

Once the information is complete it will be automatically uploaded and visible to anyone accessing the register.

There will be no scrutiny of the technology providers (reputation or quality of documentation) and therefore it will be up to the operator to ensure the credentials of the technology provider.

The register will be structured such that information will expire after a period of time (say every 6 to 12 months). At this time an email will be sent to the technology provider asking them to reaffirm the information or it will be removed from the register.

This will ensure minimal manual input and keep the register up to date.

Participation

Australia, the United States and China.