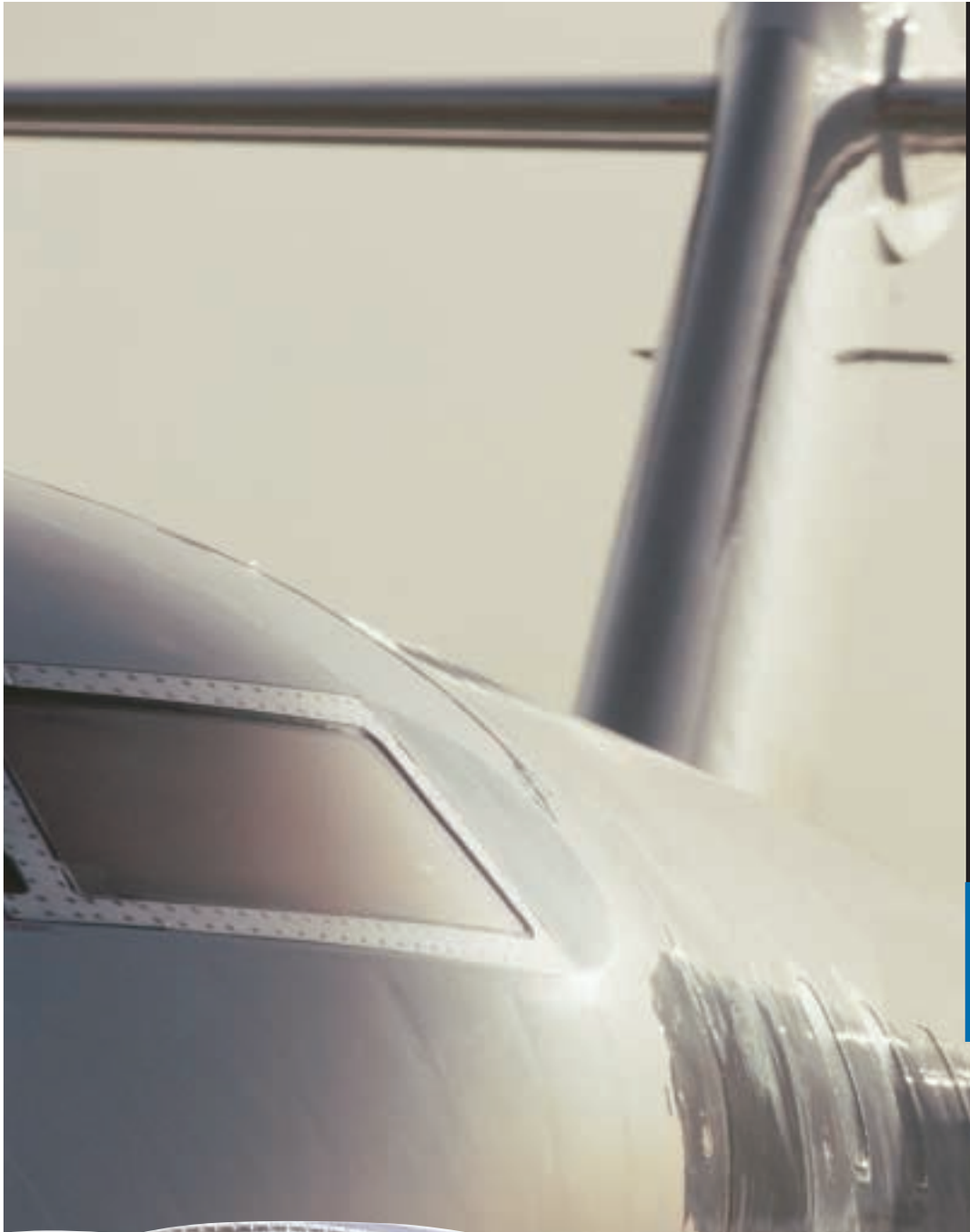


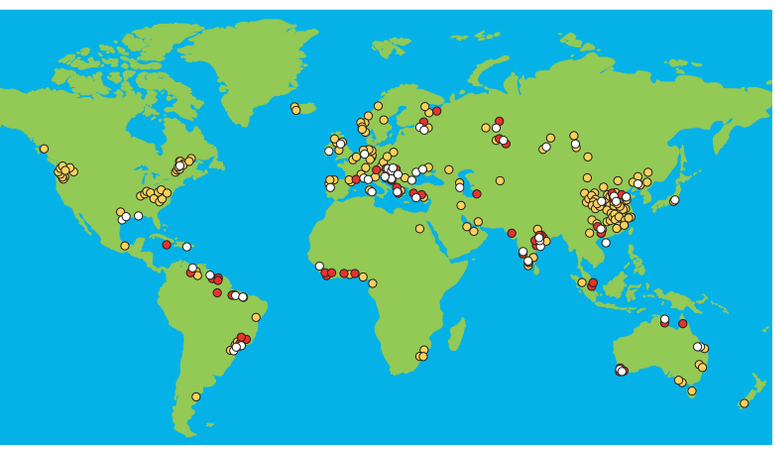
International Aluminium Institute

Sustainability Update 2004

Aluminium for Future Generations

ALUMINIUM FOR FUTURE GENERATIONS SUSTAINABILITY UPDATE 2004

The overall objective of the International Aluminium Institute's (IAI) *Aluminium for Future Generations* Sustainable Development Programme, conducted in partnership with the regional and national aluminium associations, is for the Aluminium Industry to be in a position to continue its global growth, while minimising its environmental footprint.



Global distribution of bauxite mines (red), alumina refineries (white) and aluminium smelters (yellow)

Launched in 2003, the Programme is a voluntary global undertaking by the Members of the IAI, twenty six CEOs whose companies represent over 75% of the world's aluminium production. In the words of the IAI Chairman and CEO of Alcan, Travis Engen, "the Programme unites IAI Member Companies in their shared commitment towards sustainable development across the three pillars of environmental footprint, economic growth and social progress". The Programme comprises eight *Voluntary Objectives* and twenty two *Performance Indicators,* designed to encourage a continual improvement in performance by the Industry. To assist Member Companies to achieve these Voluntary Objectives the IAI has available a team of consultants made up of leading technical experts from the Industry. They provide advice and training on good practice from around the world.

This Update includes reports on the progress recorded in the first IAI *Global Annual Sustainability Survey,* undertaken in 2004. For further information, see the *world-aluminium.org* website.

PROGRESS ON THE IAI VOLUNTARY OBJECTIVES

VOLUNTARY OBJECTIVE 1

An 80% reduction in Perflurocarbon (PFC) Greenhouse Gas emissions for the Industry as a whole per tonne of aluminium produced by 2010 versus 1990

PFC specific emissions (per tonne of aluminium produced) were reduced by 73% from 1990-2003. This represents a reduction equivalent to around 3 tonnes of CO_2 per tonne of aluminium produced since 1990.

VOLUNTARY OBJECTIVE 2

A minimum 33% reduction in fluoride emissions for the Industry as a whole per tonne of aluminium produced by 2010 versus 1990

Fluoride specific emissions to the atmosphere have been reduced by 38% over the period 1990-2003. The Voluntary Objective is scheduled for review in the light of these results.

VOLUNTARY OBJECTIVE 3

A 10% reduction in smelting energy usage for the Industry as a whole per tonne of aluminium produced by 2010 versus 1990

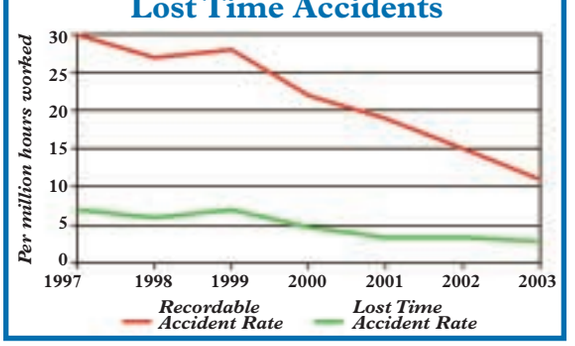
The average electric energy used for electrolysis has been cut by 6% since 1990.

VOLUNTARY OBJECTIVE 4

A 50% reduction in the "Lost Time Accident Rate' and 'Recordable Accident Rate' for the Industry as a whole by 2010 versus 2000

The 'Recordable Accident Rate' at IAI Member Company plants (mines, refineries and smelters) has been cut by 50% over the period 2000-2003. The 'Lost Time Accident Rate' has been reduced by 40% over the same period. The Voluntary Objective is scheduled for review in the light of these results.

Global Total Recordable and Lost Time Accidents

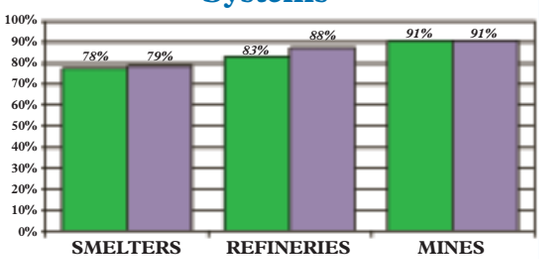


VOLUNTARY OBJECTIVE 5

Implementation of Management Systems for Environment (including ISO 14000 or equivalent certification) and for Health and Safety in 95% of Member Company plants by 2010

Environment, Health and Safety Management Systems are in place at the majority of IAI Member Company plants – 78% of aluminium smelters, 83% of alumina refineries and 91% of bauxite mines have such formal and documented systems, while ISO 14000 or equivalent certification has been obtained at an equally high number of facilities.

Plants with EHS Management Systems



VOLUNTARY OBJECTIVE 6

Implementation of an Employee Exposure Assessment and Medical Surveillance Programme in 95% of Member Company plants by 2010

Employee exposure assessment and medical surveillance programmes are in place at 85% of IAI Member Company plants (mines, refineries and smelters). A detailed industry-wide definition of the criteria required to meet this Voluntary Objective has been developed and shared between IAI Member Companies. This protocol document would provide the basis for the development of exposure assessment and medical surveillance programmes at those plants which do not already have such systems in place.

VOLUNTARY OBJECTIVE 7

The Industry will monitor annually aluminium shipments for use in transport to track aluminium's contribution through lightweighting to a reduction in Greenhouse Gas (GHG) emissions from road, rail and sea transport

Aluminium shipments to the automotive and light truck industry increased by 5.5% between 2002 and 2003.

VOLUNTARY OBJECTIVE 8

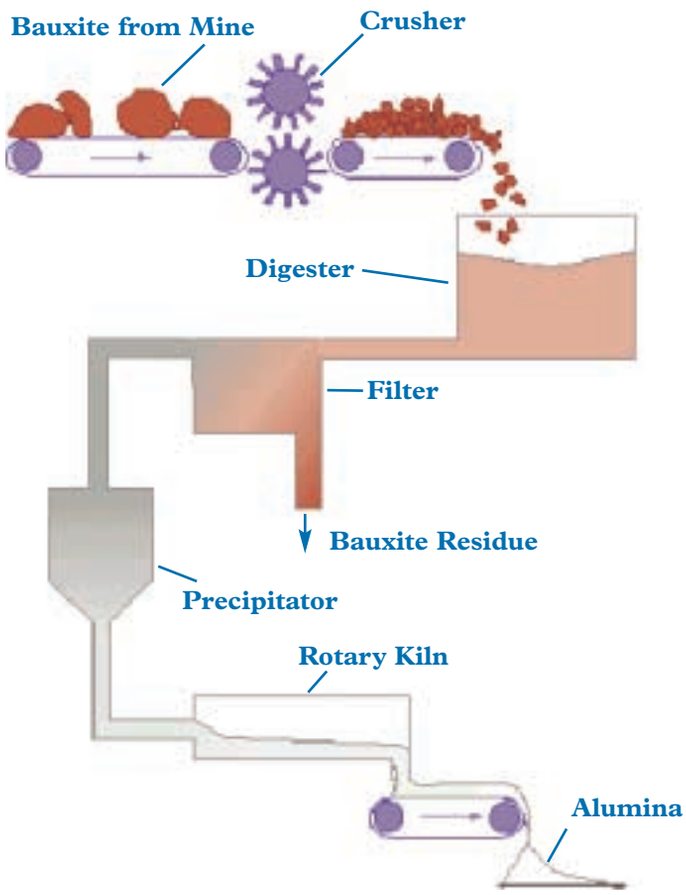
The Industry will monitor its recycling performance globally and use the data to establish a Voluntary Objective. The Industry will develop a global action programme in support of the Voluntary Objectives, thereby encouraging a significant increase in the volume of aluminium metal from used products

IAI Member Companies, which represent 25% of the world's production of recycled aluminium, increased their output by 4% in the period 2000-2003. In Europe, the production of aluminium metal from used products has been growing by an average of 4% annually over the past twenty two years.

THIRD BAUXITE MINE REHABILITATION SURVEY

The IAI's *Third Bauxite Mine Rehabilitation Survey* was conducted in 2003 and collected data from twenty three operations representing 70% (99 million tonnes) of global bauxite production. Aluminium production involves a modest use of mined resources as compared to some other materials:

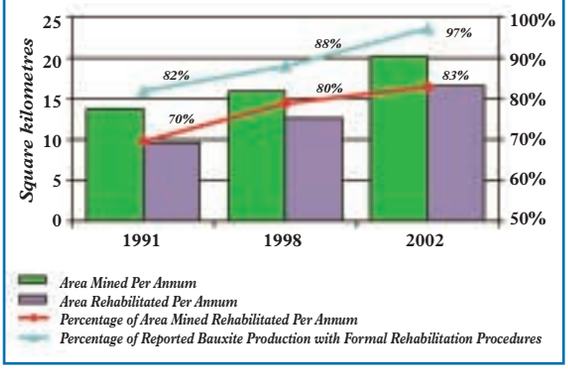
Bauxite → Alumina → Aluminium



- **2-3 tonnes of bauxite required to produce 1 tonne of alumina**
- **2 tonnes of alumina required to produce 1 tonne of aluminium metal**

The bauxite mining industry has the potential to be sustainable over the long term, as the known reserves of high quality bauxite are sufficient to provide over three hundred years' supply. The mean expected lifespan of bauxite mining operations from commissioning to closure is sixty four years. While the total annual area mined by reporting operations was 20 km^2 in 2002, a growth of 25% since 1998, the area rehabilitated per year has increased by 33% and amounted to 16 km^2 in 2002.

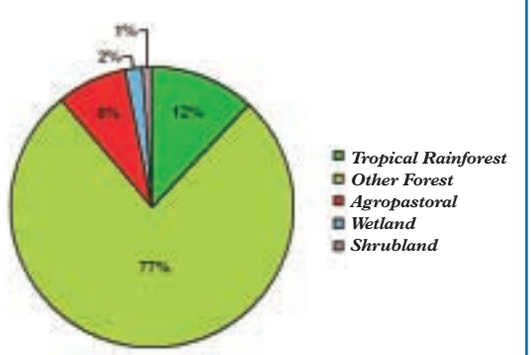
Mine Rehabilitation Performance



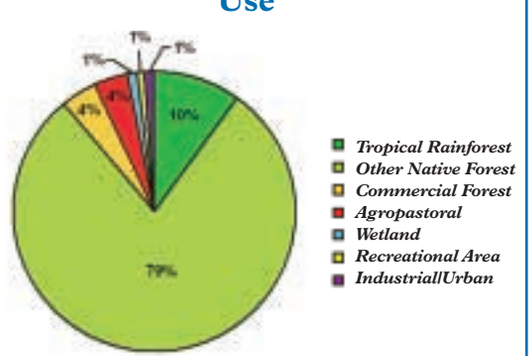
Operations representing 97% of the total reported production have formal written rehabilitation procedures as compared with 88% in 1998 and 82% in 1991. The average value of bauxite mined per square kilometre is US$ 114 Million.

The total area likely to be mined over the life spans of all the operations surveyed is 1,472 km^2 – a substantial area, but small compared to land used for other purposes. For example 4,700 km^2 of land was cleared in 1999 in Australia alone, mostly for agriculture and urban development. The areas disturbed by mining are mostly rehabilitated to the original land use.

Pre-mining Vegetation



Post-mining Rehabilitated Land Use



As well as foregoing bauxite resources in certain areas, a number of other measures have been undertaken by mine locations to protect biodiversity. For example, many mines (representing 92% of reported production) retain the original topsoil as a seed source and growing medium. Native plant species are widely used for rehabilitation at mines representing 74% of reported bauxite production.

The benefits to local communities, regions and countries from bauxite mining and land rehabilitation include the provision of well paid employment (99% pay wages above national average) and support for the development of local industries and infrastructure. There are consultation arrangements with community leaders and formal procedures in place to deal with complaints from neighbouring communities at operations representing the majority 86% of reported production. A number of operators acknowledge the special relationship between indigenous people and the land by using traditional ecological knowledge extensively in their environmental programmes. An IAI *Bauxite and Alumina Task Force* has been set up to spread bauxite mining and alumina refining good practices throughout the global industry.

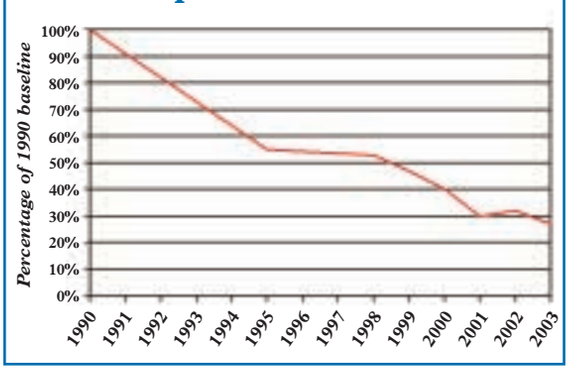
GREENHOUSE GASES

The reduction of the Aluminium Industry's Climate Change impact is fundamental to its sustainability. The Industry has identified three key responses to the challenges of Climate Change, focused on the entire lifecycle of aluminium products and their potential to address such challenges:

1. *Reducing perfluorocarbon emissions per tonne of primary metal produced through:*
   a. investment in modern technology;
   b. progress towards good operating practices.
2. *Maximising potential GHG savings through aluminium recycling;*
3. *Encouraging applications of aluminium, which reduce weight and GHG emissions in transport, a sector which is responsible for a third of GHG emissions globally.*

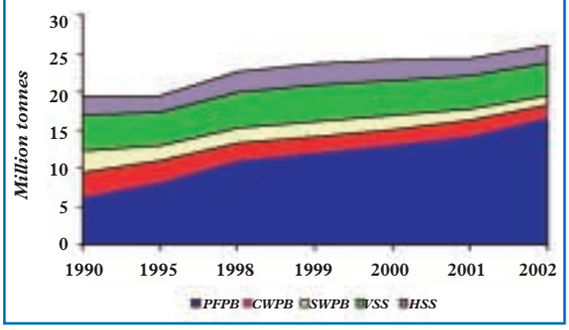
The most recent annual IAI Perfluorocarbon Survey showed a 73% overall reduction in PFCs per tonne of aluminium production since 1990.

Global Specific PFC Emissions



Much of this reduction is due to the phasing in of new Point Fed Prebake (PFPB) and Centre Work Prebake (CWPB) plants.

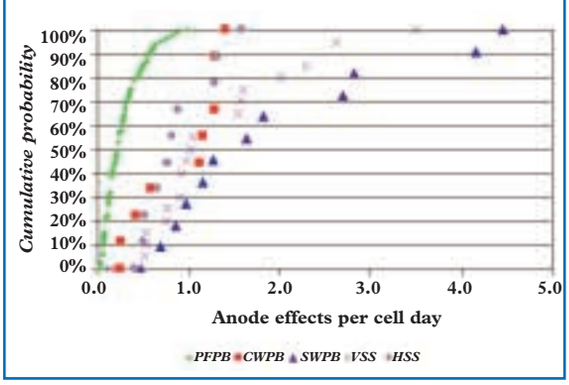
Global Primary Aluminium Production by Technology Type



As a result, older Horizontal Stud Søderberg (HSS), Vertical Stud Søderberg (VSS) and Side Work Prebake (SWPB) technologies represent an ever smaller proportion of global production.

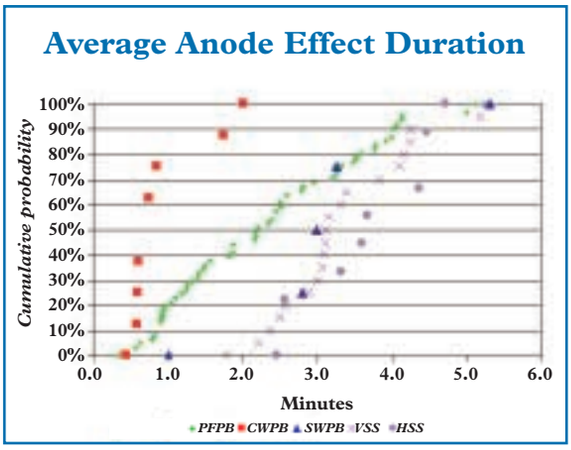
However, there is still scope for further improvement in operational practices given the wide variations in performance revealed by the benchmarking graphs in each of the different categories. The amount of PFCs produced in smelting is impacted by both the frequency and the duration of process upset conditions, known as anode effects, which result in the emission of PFC-containing gases.

Average Anode Effect Frequency



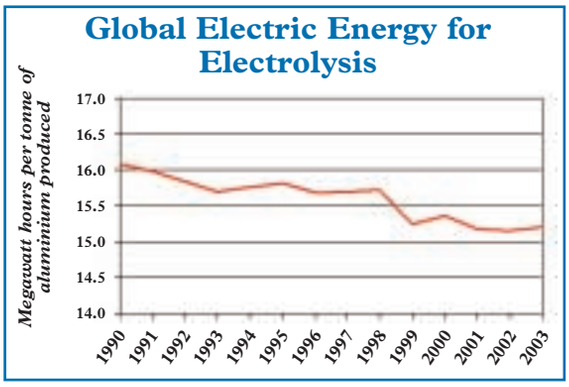
The above Anode Effect Frequency graph highlights not only the significant difference in performance between modern PFPB and other technologies, but also the wide spread of performance within all the technology categories. There is also a wide variation in performance in terms of Anode Effect Duration, where the reaction time to kill an anode effect again varies significantly.

Average Anode Effect Duration



The challenge is to bring all these individual curves in line with the best performance levels for each technology type. The IAI is seeking to identify differences in operating practices within technologies, which might account for the wide gap between the best and poorest performing plants.

Global Electric Energy for Electrolysis

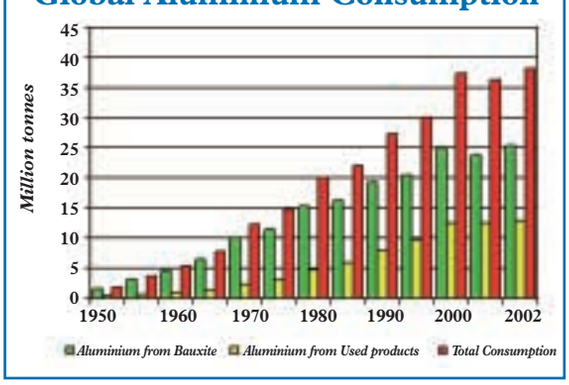


As well as reducing specific emissions of PFCs, by 73% per tonne of aluminium produced, progress towards good practice and investment in modern technology has also contributed to a 6% drop in smelting energy use since 1990.

RECYCLING

Aluminium recycling benefits present and future generations by conserving energy and other natural resources. It saves up to 95% of the energy required for the production of primary aluminium from bauxite and avoids corresponding emissions, including Greenhouse Gases. Aluminium can be recycled over and over again without loss of properties. The high value of aluminium is a key incentive and major economic impetus for recycling. Global aluminium recycling rates are high, approximately 90% for transport and construction applications and around 60% for beverage cans. Industry continues to recycle, without subsidy, all the aluminium it can collect from used products and fabrication processes. However, with the help of appropriate authorities, local communities and society as a whole, the amount of aluminium collected could be increased further.

Global Aluminium Consumption

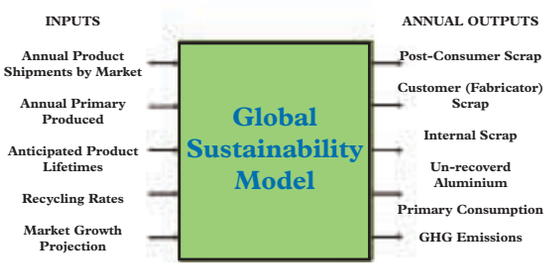


The growing markets for aluminium are supplied by both primary and recycled metal sources. The ratio of global recycled metal tonnage to total industry product shipments has increased from 17% in 1960 to 33% in 2000 and is projected to increase to around 40% by 2020.

IAI SUSTAINABILITY MODEL

The IAI's *Global Aluminium Recycling Committee* collected global recycling data for the first time in 2002 and found that there were some important regions where no data has been collected and that little data is available on the amount of metal being lost annually to landfill. It was therefore decided to complement data collection by developing a *Microsoft Excel* based ***Sustainability Model***. The following is a simplified illustration of the way in which the Model functions, with data inputs and annual outputs.

IAI Sustainability Model - A Simplification

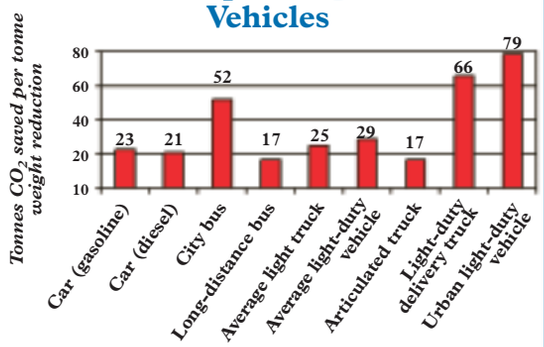


The input data covers such factors as product net shipments by geographical region and by market segment (e.g. transport, construction, packaging, aerospace etc.); product lifetimes; global recycling rates by market segment and market growth rate projections. These inputs provide an overall mass flow picture and estimates of global recycling totals. The incomplete recycling data collected by the IAI and national/regional aluminium associations gives a figure of 10.1 million tonnes of metal recycled in 2001, while the Model estimates the total at 12 million tonnes. The Model helps to identify applications where aluminium is not yet being recycled to its full potential. The Committee is investigating ways in which to promote better recovery for these applications in order to maximise recycling potential and thus minimise energy use and Greenhouse Gas emissions.

TRANSPORT LIGHTWEIGHTING

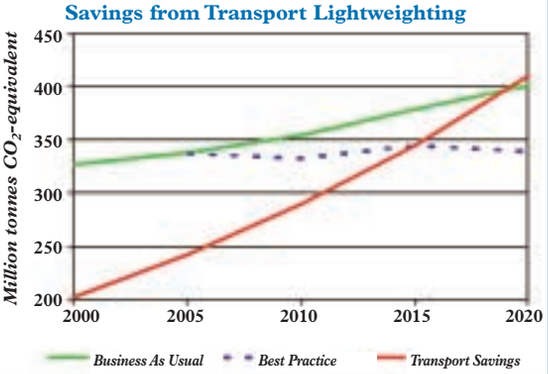
The unique properties and performance of aluminium allow for its use in innovative products, which have the potential to address the Climate Change challenge further. The Aluminium Industry is encouraging applications of aluminium in transport, to reduce vehicle weight and consequently to reduce Greenhouse Gas emissions from the transport sector, the fastest growing source of emissions. The IAI's lifecycle analyses have demonstrated that every additional kilogram of aluminium used to replace heavier materials in passenger cars results in savings of 20 kg of CO_2 emissions over the lifetime of the average vehicle. The largest emissions and reduction potential is linked to the operation of the vehicle and not to its construction (i.e. materials and assembly).

Lifetime CO_2 Savings for Road Vehicles



Aluminium shipments to the automotive and light truck industry increased by 5.5% between 2002 and 2003. Such shipment data is input to the Sustainability Model along with recycling and PFC data to produce projections of the potential impact of the Aluminium Industry on global Greenhouse Gas emissions across the entire lifecycle of its products. The following graph shows that, with the Industry meeting its 80% per tonne PFC reduction objective, total emissions would still increase due to growth in production. However, by bringing all primary and recycling operations up to today's best practices, the Industry has the potential to stabilise global emissions from aluminium production and flatten the curve. When both best practices and Greenhouse Gas savings from transport applications are factored in, there is the possibility for the Industry to become 'climate neutral' (i.e. for Greenhouse Gas savings from use of aluminium to outweigh emissions from its production) by 2020.

GHG Emissions from Aluminium Industry Against Savings from Transport Lightweighting



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INTERNATIONAL ALUMINIUM INSTITUTE
New Zealand House, Haymarket, London SW1Y 4TE
Tel: +44 (0) 20 7930 0528 Fax: +44 (0) 20 7321 0183
Email: iai@world-aluminium.org Website: www.world-aluminium.org