

# RECYCLING ALUMINIUM

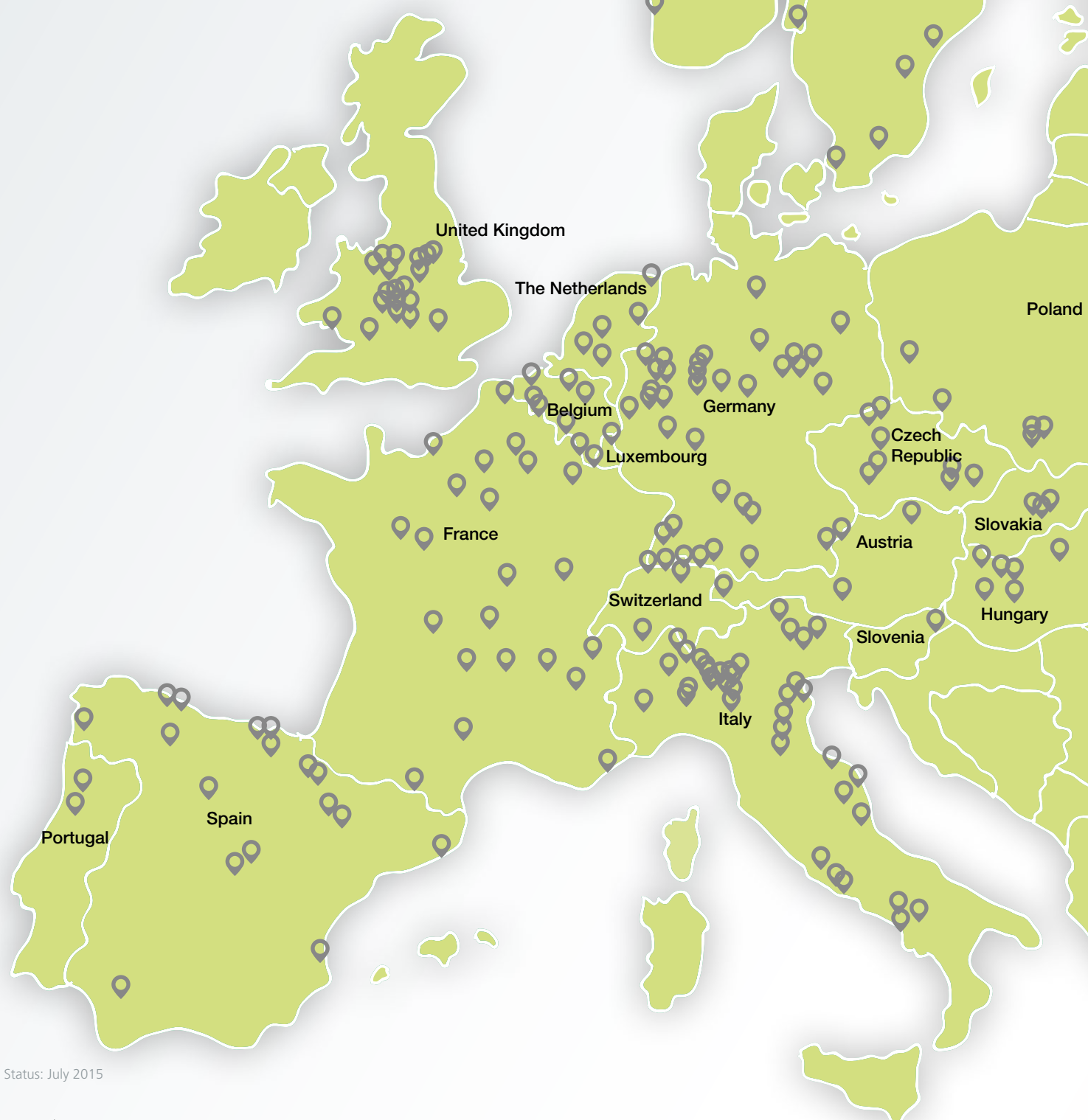
A PATHWAY TO A SUSTAINABLE ECONOMY



EUROPEAN ALUMINIUM

# ALUMINIUM RECYCLING PLANTS

IN EUROPE



Status: July 2015



Number of recycling  
**plants**  
in Europe



Many of which are small  
and medium-sized  
enterprises (SMEs)  
and family owned  
businesses.

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# INTRODUCTION

**Aluminium recycling is part of Europe's wider Aluminium industry, a sector of the economy that generates almost €40 billion revenue a year and directly or indirectly employs more than one million people. Aluminium's many properties place it at the heart of Europe's ambition to build a circular economy.**

Products made from aluminium are everywhere. In our homes, you will find this miracle metal in window frames, cooking utensils and embedded in electronics. For architects and engineers, aluminium is a material of choice when constructing buildings and bridges. Renewable energy relies on it for solar panels, wind turbines and cables. Aluminium keeps our food fresh and our medicines safe. And when we travel, we depend on it in our cars, aircraft and trains.

Aluminium has many attributes. It is light, flexible and very versatile. But there's one quality that is particularly valuable.

Aluminium is infinitely recyclable. It remains essentially unchanged no matter how many times it is processed and used. Therefore, it can be considered as a material with permanent characteristics, one that is not consumed, but used over and over again, without the loss of its essential properties.

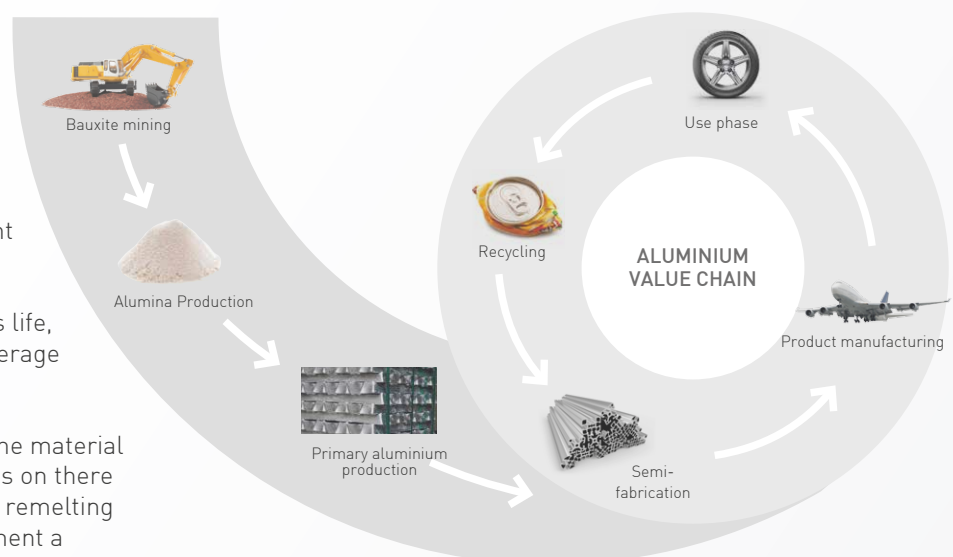
And, as the energy required for aluminium's primary manufacture is locked inside the metal, only a fraction, just 5%, of that original power is needed to drive the recycling process. It is as if the energy is 'banked' for the future. In addition, an equal amount of greenhouse gas equivalents is saved each time an aluminium product is recycled at the end of its life, regardless of whether it was a beverage can, a car or part of a building.

But not everything is as bright as the material itself. Aluminium recycling depends on there being enough aluminium scrap for remelting and refining. So we need to implement a series of activities to generate more scrap

and optimise its availability for European businesses, for example by improving the collection and treatment of used aluminium.

We live in a world of volatile energy prices. There is concern over energy security and dependency. Support for increased accessibility of aluminium scrap, Europe's "energy bank", promises tangible benefits for the EU's climate, energy and resource-efficiency ambitions.

The goal is to build on Europe's reputation as a recycling community and deliver a sustainable business whose contribution to our large, diverse and circular economy will stretch far into the future.



# KEY FACTS & FIGURES

## ALUMINIUM RECYCLING IN EUROPE



**75%** of all aluminium ever produced is still in use thanks to its durability and recycling properties



Recycling saves

**95%**

of the energy needed for primary production

## Employees



Direct

**6,000**



Indirect

**25,000**



Status: 2014



Revenue generated in 2014

**€8,6 billion**

# Recycling production in 2014

## 10,5 million tonnes



Total recycled aluminium  
is equivalent to

**63,000**  
passenger  
planes

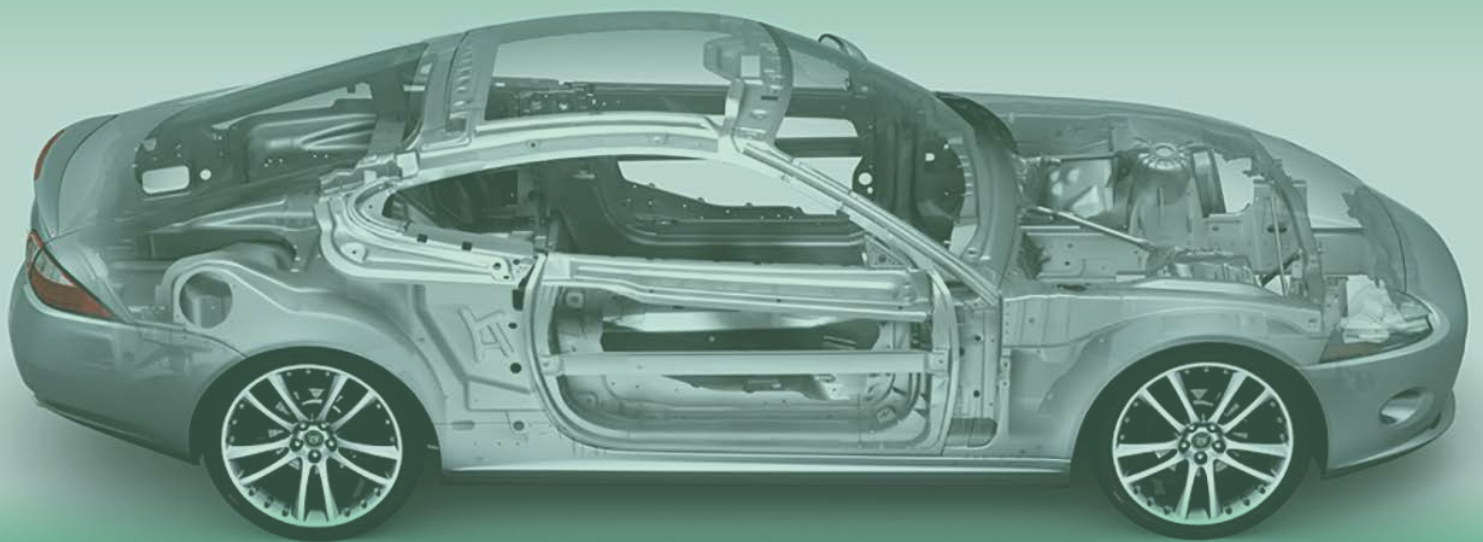


Aluminium recycling  
**saves greenhouse gases**  
equivalent to a passenger  
plane making

**46,000**  
round-the-world trips

# ALUMINIUM

THE RECYCLING PHENOMENON



## BUILDING THE CIRCULAR ECONOMY OF THE FUTURE

Aluminium is vital for Europe. It is a solution to many societal and economic challenges that Europe faces as it seeks to build a more sustainable and resource-efficient economy. Aluminium is infinitely recyclable because its essential properties remain unchanged even after multiple recycling loops. And the low levels of energy required for recycling compared with its initial manufacture make it an “energy bank”.

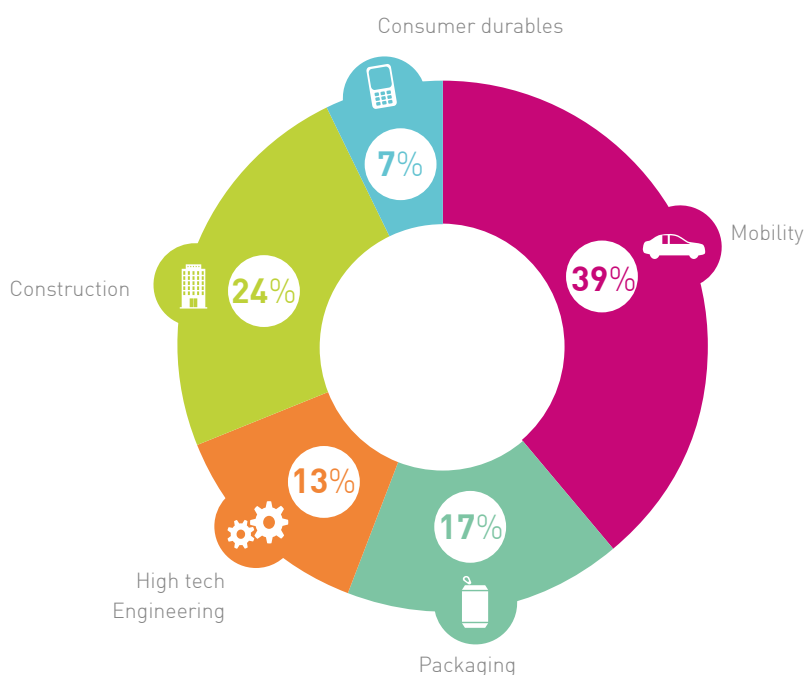
Aluminium has many different applications. In transport it reduces the carbon footprint of cars and trucks (an average of 140kg are in every new car). Aluminium components make buildings more energy-efficient and aluminium packaging keeps food and drinks fresh. When these products reach the end of their life cycle, be it after sixty days (in the case of beverage cans) or after several decades (as with buildings), the material can be easily

recycled and give life to a new product. Because of those qualities, 75% of all the aluminium ever produced is still in use today.

Europe is already the world’s greatest per capita recycler. Over half of all the aluminium currently produced in the European Union originates from recycled aluminium put on the market by refiners and remelters – and that trend is on the increase. But more can be done to build the circular economy of the future.

The goal for Europe must be to increase the recycled-to-new ratio wherever it can. This requires innovation in the collection and sorting of used aluminium so that every last piece of metal is recovered. It also means ensuring that valuable aluminium scrap remains available for European recyclers and serves as a perpetual resource for Europe’s business community.

### Main end-uses for aluminium products in Europe



## A TRULY EUROPEAN BUSINESS

One of the most important characteristics of the sector is the entrepreneurial nature of the businesses within it. It is rightly assumed that economic growth is driven by ambitious and imaginative SMEs and family-owned businesses building their companies and employing increasing numbers of people.

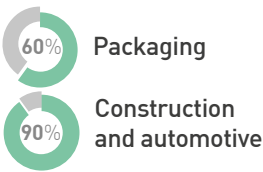
These engines of prosperity make up the majority of aluminium recyclers. It takes place right across Europe, frequently in companies which are the heart-beat of their local communities. It is this spirit of a passionate

commitment to sustainable commercial operations that is one of the distinguishing features of the industry.

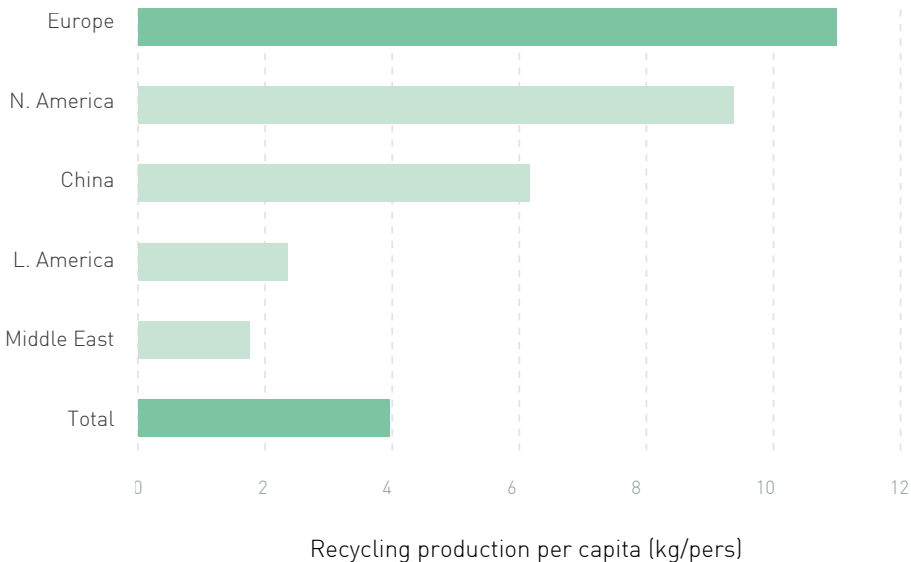
Europe's recycling rates are impressive. 90% of the aluminium used in the construction and automotive sectors, and about 60% of that used in packaging is recycled. Despite such a strong record, the amount of aluminium collected and sorted needs to be increased. Growing demand for scrap makes it challenging for the European industry to access this valuable raw material.

### The Aluminium Effect

In Europe aluminium enjoys high recycling rates:



### Europe is number 1 in recycling



Source: European Aluminium statistics 2013 data

## THE RECYCLING PROCESS

A bird's-eye view of the aluminium recycling sector looks something like this:



\* Input: municipal plants, incineration, voluntary schemes, consumers.

\*\*Input: plants producing aluminium and its alloys, fabrication of semi-fabricated (mill) products and end-products.

This picture reveals a community of interdependent businesses that have carved out technical specialisations throughout the recycling value chain.

From the skimmings resulting from primary production all the way through to products at the end of their life, specialist skills and dedicated

operations optimise Europe's yield of recycled aluminium. Refiners and remelters are producing new material for manufacturers and finishers such as foundries, rolling mills and extruders.

It is helpful to identify the key stages of the process, so let's start at the beginning of the recycling process.



## COLLECTION OF SCRAP

While the term 'scrap' might imply something of little value, to aluminium recyclers it means the exact opposite. It represents the vital raw material of their thriving and growing industry. The scrap value of used aluminium is normally high enough to compensate for the investments made in modern waste collection and sorting equipment.

Scrap comes from two different sources. First there is the metal harvested either during the primary aluminium production or at any of the processes leading to final fabrication. Then there is the scrap recovered from products containing aluminium that have reached the end of their service life.

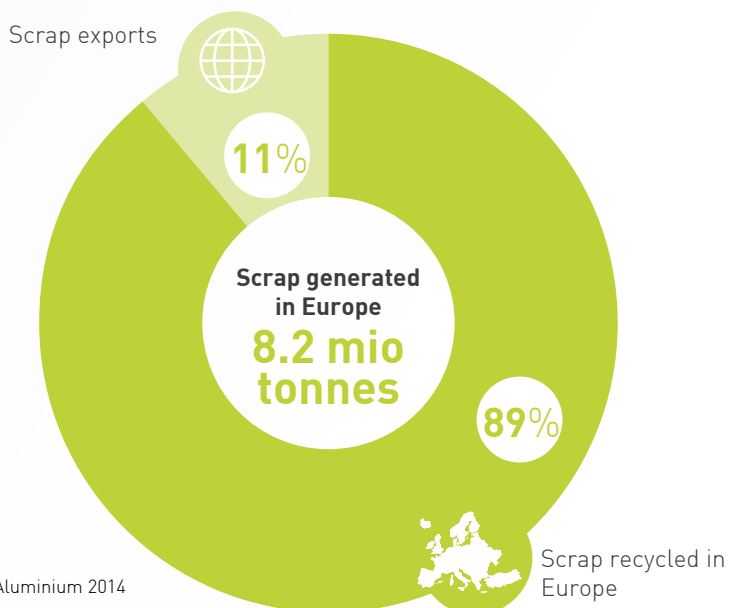
## Where European aluminium scrap is recycled

A snapshot of the destiny of scrap shows that the vast majority is consumed by the European recycling industry:

### The Aluminium Effect

Born to recycle

➔ Aluminium can be recycled endlessly **without a loss in quality**



Source: European Aluminium 2014 statistic data



While this is an encouraging picture, things become more challenging once products are either discarded or come to the end of their life-cycle. This aspect of the yield depends very much on initial product design concepts which embed recycling principles for end-of-life. But it also relies on initiatives to collect aluminium for recycling. This means citizens, industry, municipal and national authorities all participating in efficient and innovative collection systems.

For example, local schemes to collect used beverage cans play an important role. By releasing the high scrap value of aluminium, they can generate substantial income for municipalities, waste management companies and even individual collectors. In fact, based on its population, Europe is the world's greatest per capita recycler.

### ***What is the difference between post-consumer and pre-consumer scrap?***

*Post-consumer scrap is what we commonly associate with used aluminium, such as beverage cans, old cars or a broken window frame. This type of scrap has to be collected and sorted before it can be recycled.*

*Pre-consumer scrap arises during the manufacturing process. It can be the end of a rolled product or clippings that were produced in a factory. This type of scrap returns directly to the recycling plant where it is remelted.*

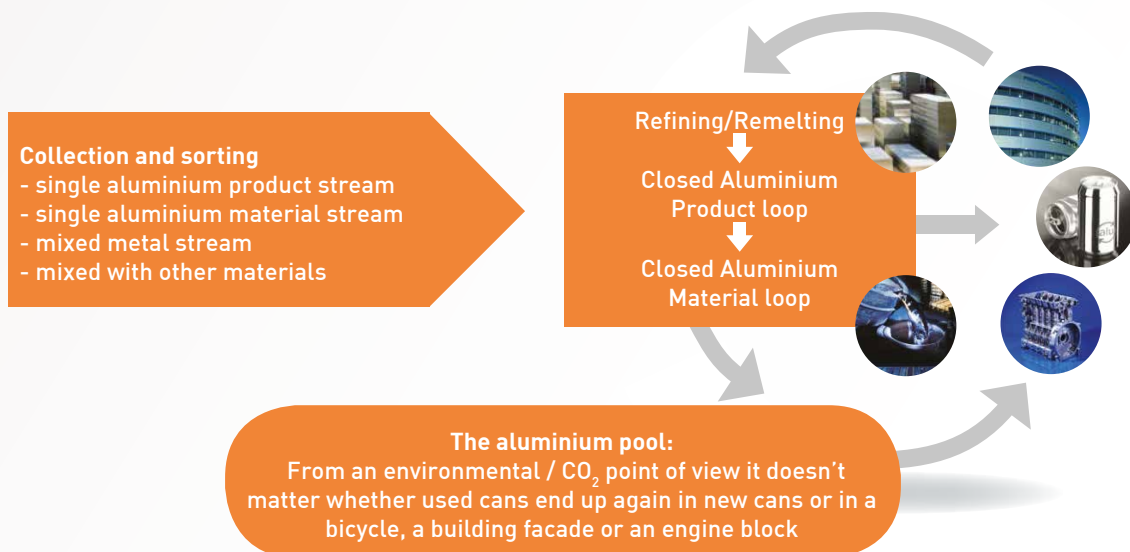


## SORTING AND TREATMENT

Once scrap has been collected, the process of preparing it for recycling can begin. Scrap is treated according to its origin or previous use. This is a highly technical part of the process. The versatility of aluminium means a vast array of different applications, each with its own physical properties and alloys that demand specific treatment. Whether a window, the engine block of a car or an electrical component, they all need to be processed into their various constituent parts so that the aluminium elements can be separated.

Aluminium preserves its core properties through infinite cycles of use. It can be recycled ready for fabrication either into the same product as before without any loss of quality ('closed aluminium product loop') or into something completely different. The European recycling industry consists of closed loop recycling for certain products such as the beverage can.

### Recycling Loop

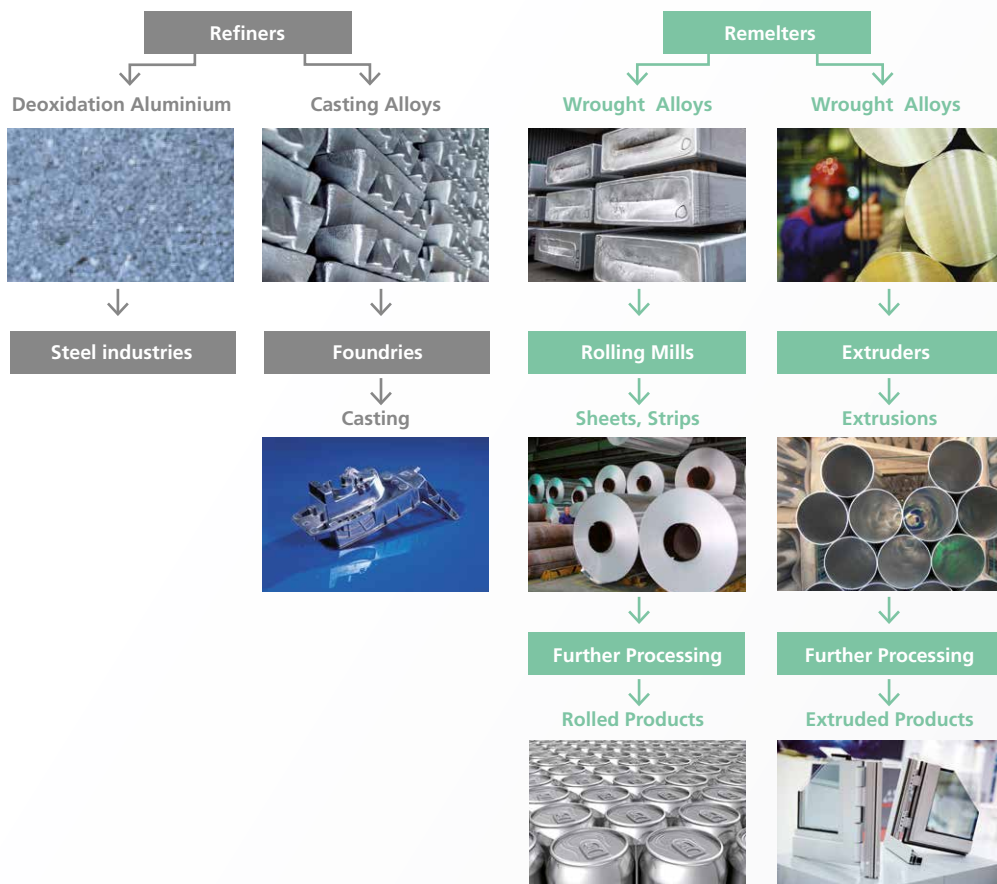




## REMELTING AND REFINING

Once treatment is complete, the recovered aluminium has to be recycled by being remelted or refined. Refiners produce casting alloys and remelters generate wrought alloys for sheets, strips and extrusions.

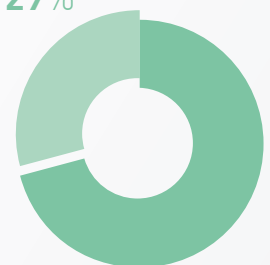
This results in new raw material for a wide variety of applications. For example, refined aluminium can be found in cast engine blocks, while remelted aluminium will be used for products like car bodies or beverage cans.



Recycling capacities  
in Europe in 2014:

**12,3 mio  
tonnes**

Refiners  
**29%**



**71%**  
Remelters

BUILDING A

# SUSTAINABLE FUTURE



## SECURING THE PROSPERITY OF A KEY EUROPEAN INDUSTRY



Recycling is key to sustainable economic development. And with its infinite recyclability and strong recycling infrastructure, aluminium is a critical component of the European circular economy.

But much still needs to be done. Aluminium recyclers across Europe seek productive relationships across the Union to drive innovations that foster the progress of the whole sector.

### The need to increase scrap availability

Europe's recycling industry is the world leader. With lucrative export markets available to businesses that collect and treat scrap, this leadership is under pressure.

The picture is clear: there is a clear trend in growing exports, and with it a pressing need to safeguard scrap availability within Europe. This will further liberate the potential for more recycling as well as help foster a European circular economy which retains as much of its precious resources as possible.

If the industry had access to all the aluminium scrap in the EU, recycled aluminium within Europe could be 21% higher than current levels.

When scrap is exported from Europe, the energy locked within the material is exported as well. At a time when energy security is of concern, the aluminium recycling industry's efficient use of power should not be overlooked.

**Scrap exports have on average increased by 15% annually since 2004**

The EU lost **943 ktonnes** of aluminium scrap to other regions in 2014



**The energy contained in this scrap is close to:**

**20% of the energy consumption of Denmark**



**Total energy consumption of Luxembourg or Latvia**



**Half the energy consumption of Slovenia or Lithuania**



Sources: European Aluminium, European Environmental Agency



European Aluminium is confident that there are a number of ways to influence the destiny of this important industrial sector in a positive and beneficial way for the whole value chain. We have to make sure that aluminium stays in a recycling loop and so remains available to our communities, contributing to a more resource-efficient and circular economy.

**An important facet to making this happen is to promote a gradual phasing-out of end-use recyclable goods being discarded in landfill. At the same time, there must be further restrictions on dumping the remaining waste fractions. Waste should always be pre-treated before it is sent for landfill.**

This requires a dynamic EU-wide waste policy that is ambitious in its targets, rigorous in its enforcement and entrepreneurial in its support for recyclability in a broad eco-design culture.

Aluminium creates the opportunity for multiple and infinite recycling. All that we preserve will remain in service forever, a real incentive to do the best we can.

And we must never lose sight of the environmental value of aluminium being an “energy bank”. It stores energy, because recycling needs up to 95% less energy than what is needed for primary production.

### Working together for a sustainable future

Sustainability has always been a deeply ingrained concept within the European aluminium industry. As aluminium is a key enabler of Europe’s transition to a low-carbon and resource-efficient economy, in 2015 the European industry has developed a roadmap of how this ambition can become a reality.

Despite the increase of post-use scrap collection, there has been little corresponding uplift in European production of recycled aluminium. Although estimates run at a healthy 3-4% growth a year in production of recycled aluminium, scrap exports are increasing at a higher rate, some 15% on average since 2004.

The logical conclusion is that scrap exports – whether legal or not – are hampering further growth by preventing us from reaching higher levels of recycling in Europe.

High rates of end-of-life recycling stimulate the increase of used aluminium products. With its permanent properties, the collected and separated material remains available as a resource for future generations.

About half of all the aluminium produced in Europe comes from recycled metal. The more we recycle, the less raw aluminium we need to import.



**Innovation in the collection and treatment of scrap demands continuous technological and process improvement so that the industry is as productive and efficient as possible.**

Research and development, being both expensive and complex, is beyond the reach of many smaller businesses in the sector, a fact made more acute by the competitive marketplace and tight margins.

**Effective partnerships supported by the EU's financial assistance open the pathway to ever more effective techniques that ensure as much quality scrap as possible is utilised in increasingly cost- and energy-efficient ways.**

And the higher the quality of scrap, the more robust are the pricing structure and the speedier the return on investment.

This virtuous circle requires co-operation, especially at the EU level. Building bridges and connections across the multiple interests that make up the future of aluminium is the way forward.

***“The more we recycle, the less raw aluminium we need to import.”***

### ***The end-of-life recycling rate as the right metric in life-cycle assessment***

*The upper limit of what is recycled today is governed by what was produced in the past. The rapid growth in the use of metals over many years and the fact that some metallic products have a service life of decades means that there is an actual shortage of metal scrap. As there is insufficient recycled material to satisfy the growing demand, virgin material has to be introduced into the supply chain.*

*So, despite the high collection and recycling rates of metal products at the end of their life, the average recycled content in metal supply is still relatively low.*

*Hence, it is critical to use the end-of-life recycling rate of a product as the key indicator for assessing the environmental benefits resulting from recycling in the context of life-cycle assessments (LCA). Using solely the recycled content indicator is too restrictive and inadequate.*

*The key is to improve access to secondary raw materials that will boost competitiveness and help the EU achieve its 2020 sustainability targets. The availability of scrap for use by Europe's industry should be among the highest priorities of legislators*



### International perspectives

In order for Europe to remain the world's best recycler, we have to do better. But Europe operates in a global context so we need to maintain an international perspective to strategic planning.

Not all of our international competitors operate under the same environmental, health and safety standards as we do in Europe. It is imperative that all those in the worldwide aluminium industry work to equivalent standards.

**The EU should investigate the most effective ways to secure a global level playing field from an environmental perspective, ensuring that exported scrap is treated under equivalent environmental, health and safety conditions.**

### Strengthening enforcement

We also need to get better at combating illegal exports.

**This can be achieved by strengthening the efforts of EU Member States and improving co-operation with regard to improving enforcement and control of the waste exports regime. This would certainly be enhanced by an internationally-agreed set of definitions and an improved approach to the collection of data.**

Taken together, measures like these will help ensure that aluminium recycling remains a shining example of a sustainable industry.

# CONCLUSION

The aluminium industry has been a star of the European economy for over 125 years. And within its broad spectrum of activities, recycling has carved out a pivotal and indispensable role.

Driven by a range of large, small and medium-sized companies, many of them family-owned, it is one of the engines of Europe's prosperity and offers a compelling vision of a circular economy where production and infinite recycling create a virtuous circle of mutual support and reliance.

Aluminium's unique ability to be recycled an infinite number of times presents a definitive example of sustainability. For as long as there is a viable supply of scrap, the industry is constantly able to produce the raw material for key industries such as automotive and aerospace, construction and high-tech engineering, consumer durables and packaging.

And aluminium is an energy bank, locking in energy during primary production so that only 5% of that original consumption is required to power the recycling operation.

With the collective will of business, government and regulators to value and cultivate a vital part of the European economy, this example of Europe's great heritage of responsible entrepreneurialism can thrive long into the future.

# GLOSSARY

<b>Casting alloys:</b>	aluminium alloys used for the production of casting where the final product shape is generated by pouring molten metal into a mould.
<b>Deoxidation aluminium:</b>	aluminium consisting of alloys with a high concentration of metallic aluminium (usually exceeding 95%) used to remove free oxygen from liquid steel.
<b>European scrap intake:</b>	intake of scrap ( <i>pre-</i> and <i>post-consumer scrap</i> ) into the recycling industry (i.e. <i>refining</i> or <i>remelting facilities</i> ) in EU28 and EFTA.
<b>Foundry:</b>	the main customers of <i>refiners</i> , they produce a wide variety of <i>casting alloys</i> which are mostly used in the transport sector.
<b>Post-consumer scrap:</b>	scrap arising from the disposal of post-consumer products (ex-cans, cars etc) after they have been used.
<b>Pre-consumer scrap:</b>	scrap arising from the production of aluminium and its alloys, and from the fabrication of semi-fabricated (mill) products and end-products.
<b>Production (“Secondary ingot production”):</b>	is the total production of the recycling plants (i.e. <i>refiners</i> and <i>remelters</i> ) including the production from <i>run-around scrap</i> . <i>N.B: In 2014, the recycling industry produced about 10.5 Mio tonnes of products (including run around scrap from remelters)</i>
<b>Recycled aluminium:</b>	refers to the <i>refining</i> production + external scrap intake from <i>remelters</i> (i.e. without <i>run-around scrap</i> but including production from tolled or purchased scrap).
<b>Refiner:</b>	producer of casting alloys and <i>deoxidation aluminium</i> from scrap ( <i>pre-</i> and <i>post-consumer scrap</i> ). Refiners are able to add alloying elements and remove certain unwanted elements after the melting process.
<b>Remelter:</b>	producer of <i>wrought alloys</i> in the form of extrusion billets, rolling slabs or remelt ingots mainly from <i>pre-consumer scrap</i> .
<b>Run-around scrap:</b>	scrap that is recycled in the same plant, company or integrated company group where it has been generated.
<b>Skimmings:</b>	compound containing metallic aluminium and oxides, which are scraped off the surface before the metal is cast.
<b>Wrought alloys:</b>	aluminium alloys used for wrought products, typically semi-fabricated items in the form of rolled sheets, foil or extruded profiles.

## THE RECYCLING MEMBERS OF EUROPEAN ALUMINIUM\*

- ABB\*\*
- Alcoa
- Aluminio la estrella
- Alusigma
- Amag
- Assan Alüminyum
- BAGR Berliner Aluminiumwerk GmbH
- Befesa
- Coreal
- Constellium
- Daiki Aluminium Industry\*\*
- Elval S.A.
- EPALME S.A.
- Gränges
- Hammerer Aluminium Industries GmbH
- Hydro
- Idalsa S.L.
- Igora\*\*
- Impexmetal S.A.
- Intals S.p.A.
- Novelis
- Polst

- Raffineria Metalli Capra S.p.A
- Real Alloy
- Refinerías Díaz S.A. - Redisa
- Raffmetal S.p.A
- R.V.A.
- Sacal - Società Alluminio Carisio
- Sapa AB
- Scepter
- ScholzAlu
- Società Alluminio Veneto S.p.A
- Stena Aluminium AB
- Trimet Aluminium SE

### European and National Associations

- Asociación Española de Refinadores de Aluminio (ASERAL)
- Associazione Italiana Raffinatori Alluminio (ASSIRAL)
- Association française de l'aluminium (AFA)
- Aluminium Association of Greece
- Austrian Economic Chamber
- Gesamtverband der Aluminiumindustrie e.V. (GDA)
- Svenskt Aluminium

\* Status 2015

\*\* Associated Member



## ABOUT EUROPEAN ALUMINIUM

European Aluminium, founded in 1981, is the voice of the aluminium industry in Europe. We engage with European decision makers to create a sustainable business climate for the aluminium industry in Europe and promote aluminium as an innovative and sustainable material for the future of Europe. Through environmental and technical expertise, economic and statistical analysis, scientific research, education and sharing of best practices, public affairs and communication activities, European Aluminium promotes the use of aluminium as a permanent material that is part of the solution to achieving sustainable goals, while maintaining and improving the image of the industry, of the material and of its applications among their stakeholders. The association is based in Brussels and represents about 70 companies and national associations all across Europe. Its members are operating more than 600 plants in 30 European countries.

### Contact details

European Aluminium  
Avenue de Broqueville 12  
1150 Brussels, Belgium  
Phone +32 2 775 63 63  
[communications@european-aluminium.eu](mailto:communications@european-aluminium.eu)  
[www.european-aluminium.eu](http://www.european-aluminium.eu)