

Recycling of Prepainted Aluminium

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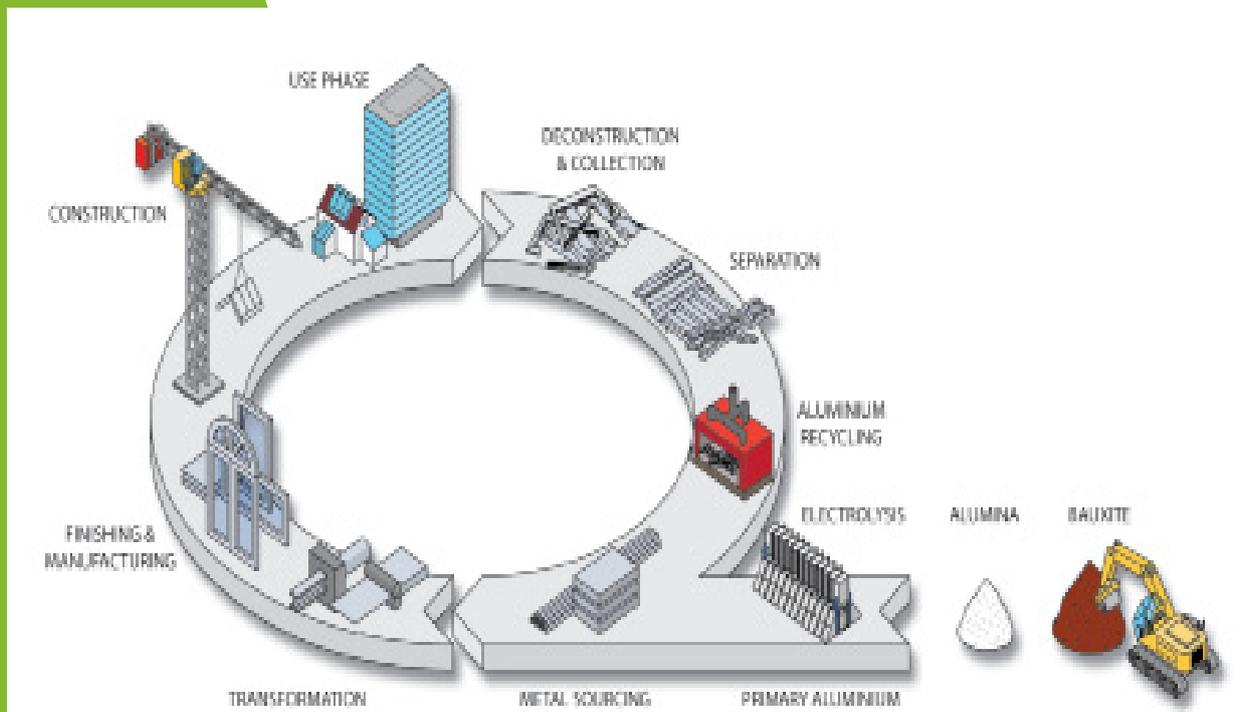
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1.

Introduction

Aluminium can be recycled forever: it can be melted down and reformed without losing any quality, and the process can be repeated over and over again.

The aluminium life cycle involves many stages, from the extraction of bauxite (the ore from which aluminium metal is obtained) to the primary manufacture of rolled or cast products through the use phase to recycling and re-smelting.



Source: European Aluminium Association (EAA)

Figure 1. The life cycle of aluminium in construction

The recycling of aluminium from many end-use applications is a well-established industrial process within Europe. Dedicated supply chains feed over 220 recycling centres focused on collecting aluminium scrap and providing the material to aluminium manufacturers. This infrastructure makes Europe the global leader in the recycling of aluminium; over 10mt of aluminium is recycled annually. Despite the widespread recycling of aluminium, there is insufficient scrap to meet the demand for aluminium products.

The recycling of aluminium is driven by:

- The high intrinsic value of aluminium makes the recycling process economically attractive.
- The fact that aluminium and its alloys can be melted and recast repeatedly without any loss of metal quality.
- Savings of 95% of the energy needed to produce the same weight of aluminium through primary smelting.

- The environmental benefits of avoiding the extraction and processing of four tonnes of bauxite for every tonne of recycled aluminium.

The recycling of aluminium saves raw materials, reduces energy consumption, lowers environmental emissions and avoids using landfill for disposal of waste materials. It is so successful that 75% of the aluminium ever produced is still in use today.

Prepainted aluminium is an integral part of this recycling industry with the material collected from its end-use applications, such as construction and transport, and processed through the recycling centres.

2.

What is Scrap Aluminium?

There are two different types of scrap aluminium:

1. Pre-consumer or “new” scrap – this is surplus material that arises during the manufacture of the prepainted aluminium product e.g. sheet edge trim. This material is collected by the coil coater and recycled directly back into sheet aluminium. Its recycling rate is 100% as it is of known quality..

2. Post-consumer or “old scrap” – this is the material that is recovered when an aluminium article e.g. beverage can, window frame has been processed, used and collected for recycling. The prepainted aluminium that enters this waste stream is usually mixed with aluminium from other uses. This mixed scrap is typically refined and converted into aluminium castings.

This document focuses on the recycling of post-consumer prepainted aluminium.

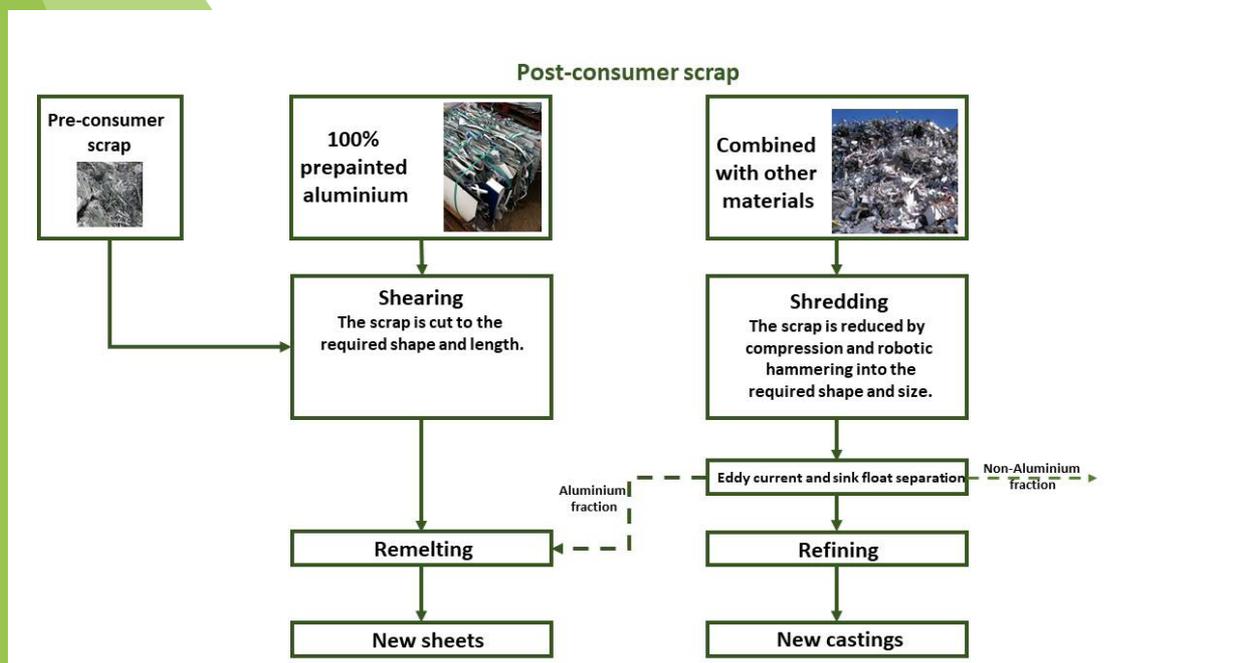


Figure 2. Recycling routes for prepainted aluminium [2]

3.

The Recycling Process for Prepainted Aluminium

The aluminium recycling centres utilise heavy equipment such as shredders in conjunction with magnetic separators and sink-and-float installations to separate the aluminium from other materials such as steel and plastics.



Shredder

The aluminium can then be melted either by remelters or refiners.

Remelters mainly process sorted wrought alloy scrap in dry hearth furnaces to produce extrusion billets or rolling slabs.

Refiners melt all kinds of scrap, including mixed alloys and soiled scrap in rotary furnaces, which melt and refine aluminium scrap under a salt layer. Refiners mainly produce casting alloys for foundries.

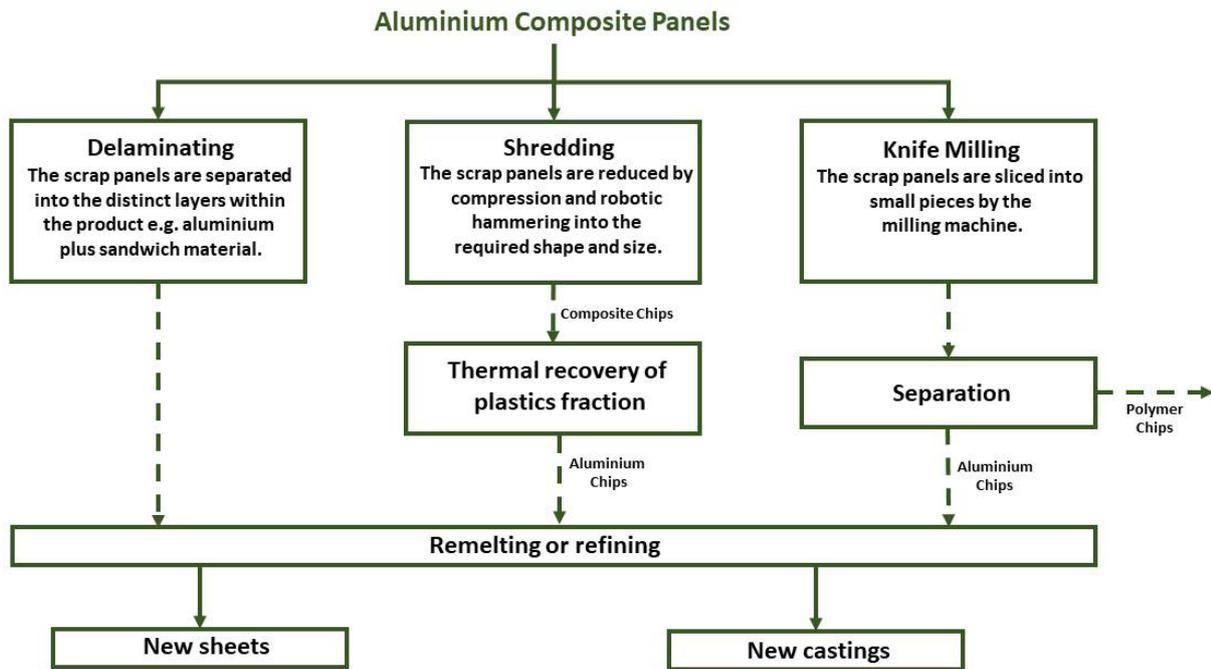


Figure 3. Recycling routes of aluminium composite panels [2]

A growing number of remelters are now able to process coated and polymer-containing scrap with no or limited preparation processes. They use a two-chamber furnace. Finishes to the aluminium (e.g. coating) are burnt away in the first chamber, and gas emissions are collected in efficient fume capture equipment.

The largest end-use application for prepainted aluminium is the construction market. Aluminium composite panels are the most difficult construction products to recycle and there are three different routes that can be used for this material.

4.

How much Prepainted Aluminium is recycled

The amount of prepainted aluminium that is recycled depends on the end-use application because of the different service lifetimes in each application and the ease of collection of the product. For example, aluminium packaging cans have a very short life time, have a diverse range of uses and collection is highly dependent on consumer behaviour.

In contrast, a prepainted aluminium clad building usually has a service life in excess of 40 years and during the building demolition, the aluminium components of the building can be easily collected and entered into the recycling waste streams.

It is estimated that around 80% of post-consumer aluminium scrap is recycled in Europe. The main method for recycling mineral wool composite panels is fragmentation via the shredder route. The mineral wool panels contain no blowing agents so they can safely be handled through the fragmentation route. The steel is recycled effectively, and the mineral wool sent to landfill along with the other shredder waste.

The methods and costs of recycling and disposal for built-up and composite cladding systems vary significantly. However, in each case, the main aim is to recycle as much as possible, which requires effective separation of the steel components from the remainder of the system.

5.

Construction Market

The construction market accounts for 30% of the end-use market for aluminium in Europe. However, the construction market consumes ~75% of prepainted aluminium production; it is, therefore, the key market in terms of recycling. The ability to recycle aluminium building products is also becoming more important as more building owners decide to deconstruct rather than demolish older buildings. Building owners are now much more deliberate about how they take down a building in order to extract as much recyclable material as possible. By doing so, they not only retain the scrap value of the aluminium but also eliminate the environmental impact and cost of dumping it in a landfill.

There can be a wide range of aluminium products in a building – from the window frames to the door handles to the cladding. The larger the product, the easier it is to separate within the waste stream and the easier it is to recycle. This leads to higher recycling rates in commercial and industrial buildings than in residential buildings.

A detailed study by the Delft University of Technology established that between 92 and 98% of all aluminium used in buildings is recycled [3]. The range is due to differences in building type and geography. The report highlights that buildings that use large panels, such as prepainted aluminium, will have recycling rates at the higher end of the range i.e. above 95%.

6.

Transport Market

The transport or mobility market is the largest end-use market for aluminium accounting for almost 40% of demand. Recycling of aluminium from this end-use market is well-established with rates of recycling in excess of 95%.

Although the transport market only accounts for around 10% of prepainted aluminium consumption, the recycling rates for the products in this sector is also above 95%.

7.

Appliance Market

The waste streams in this market are governed by the Electrical and Electronic Waste Directive (WEED) and the appliance industry has established appropriate take-back schemes to ensure the proper management of the collected waste.

Although a relatively small market for both aluminium and prepainted aluminium, it is highly visible to the consumer. The appliance industry has studied the materials flow and recycling rates in this very diverse market and have concluded that 40% of all aluminium entering the market is recycled [4].

8.

Conclusion

Prepainted aluminium is recycled through a well-established and effective network of recycling centres in Europe. The recycling process is driven by a range of environmental and economic factors and leads to significant amounts of prepainted aluminium being recycled each year.

Whilst the recycling rates vary depending on the end-use application, the average end-of-life recycling rate for prepainted aluminium is 92% which equates to over 250,000 tonnes of material being recycled each year.

9.

Sources

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3. Collection of Aluminium from Buildings in Europe. Delft University of Technology <https://european-aluminium.eu/media/1628/collection-of-aluminium-from-buildings-in-europe.pdf>
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ECCA

Objectives:

- Increasing the awareness of prepainted metal through promoting its environmental, cost, quality and design benefits.
- Stimulating market, application, product and process development
- Setting quality performance standards and developing test methods
- Granting of Quality and Sustainability Labels for prepainted metal on the basis of the technical and sustainability requirements defined in the ECCA Premium® Label manual and based on independent third party control
- Creating an industry network and forum for the development and exchange of ideas
- Representation of the Industry in its contacts with Public Officials, Public Authorities, other Trade Associations and Professional Bodies.

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