

Recycling of Prepainted Steel

SR-2020-nip-en

eccca
prepaintedmetal.eu



Table of contents

1.	Introduction	4
2.	What is Scrap Steel	6
3.	The Recycling Process for Prepainted Steel	7
4.	How much Prepainted Steel is recycled	10
5.	Construction Market	11
6.	Appliance Market	12
7.	Conclusion	13
8.	Sources	13

1.

Introduction

Steel is one of the most recyclable materials in the world; the industry has been operating steel scrap recycling on a large scale for more than 150 years.

The steel recycling infrastructure is very efficient, and all the collected steel is returned to the steel making processes for conversion into new steel products.

The steel life cycle involves many stages, from the extraction of iron ore and coal to the primary manufacture of steel products through the use and reuse phases to recycling.



Figure 1. The life cycle of steel

The recycling of steel is driven by:

- It's magnetic properties which enables it to be easily separated from other materials in the waste stream.
- It is a permanent material that can be infinitely recycled and is 100% recyclable without loss of quality.
- The ability to convert low value steel scrap into high value steels by using appropriate processing and metallurgy.
- Savings in raw materials and energy. Every tonne of recycled steel eliminates the environmental impact of extracting 1.4 tonnes of iron ore, 0.7 tonnes of coal, and 0.1 tonnes of limestone. The recycled steel also saves 70% of the energy and 40% of the water normally used in the production process as well as reducing air emissions by 86% and water pollution by 76%.

- Avoids the need for landfill sites as 1.28 tonnes of solid waste is avoided for every tonne of recycled steel.

The extensive recycling of steel means that all new steel products contain 37% recycled steel. However, despite the fact all available steel scrap is recycled, there is not enough scrap available to meet demand for new steel products.

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

2.

What is Scrap Steel?

There are two different types of scrap steel:

1. Pre-consumer or “new” scrap – this is surplus material that arises during the manufacture of the prepainted steel product e.g. sheet edge trim. This material is collected by the coil coater and recycled directly back into sheet steel. 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 the steel article e.g. beverage can, automobile has been manufactured, used and collected for recycling. The prepainted steel that enters this waste stream is usually mixed with steel from other uses. It is estimated that around 80% of post-consumer steel scrap is recycled in Europe.

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

3.

The Recycling Process for Prepainted Steel

The metal recycling centres utilise heavy equipment such as shredders in conjunction with magnetic separators to separate the steel from other materials such as aluminium and plastics. The shredders remove the organic coating from the steel and it is collected as part of the non-ferrous waste stream.

The collected steel scrap is then used to provide either:

- 30% of the charge needed for the basic oxygen steelmaking process or
- 100% of the charge for an electric arc steelmaking furnace.



Shredder



Magnetic Separator



Figure 2. Recycling routes for pre-painted steel

The largest end-use application for pre-painted steel is the construction market. The pre-painted steel is used as part of a “built-up” system involving mineral wool or supplied to the building site as a composite or “sandwich” panel containing a foam or mineral wool insulation layer.

The recycling of built-up systems is relatively straight forward. The two key elements to consider are the pre-finished steel outer and inner sheets and the mineral wool or glass fibre insulation. These two elements are readily separated during the demolition process so that the steel can be recycled without further processing. The positive value of the steel scrap more than offsets the costs of disposal of insulation, giving a marginally positive overall value to the operation.

The recycling of foam filled composite panels is slightly more complex since the components of the panel are adhesively bonded together. To achieve the optimum solution for disposal, the foam core and steel sheets need separation, but the presence of gases known as blowing agents in the core complicates this process. Panels manufactured before 2004 are likely to contain blowing agents which are known as Ozone Depleting Substances (ODS) and they are sent to refrigerator recycling plants. These plants capture the blowing agents during the separation of the panels into the steel and foam components. Panels manufactured after 2004 do not contain any ODS and are included in waste streams that are recycled via the usual shredding facilities [2].

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.

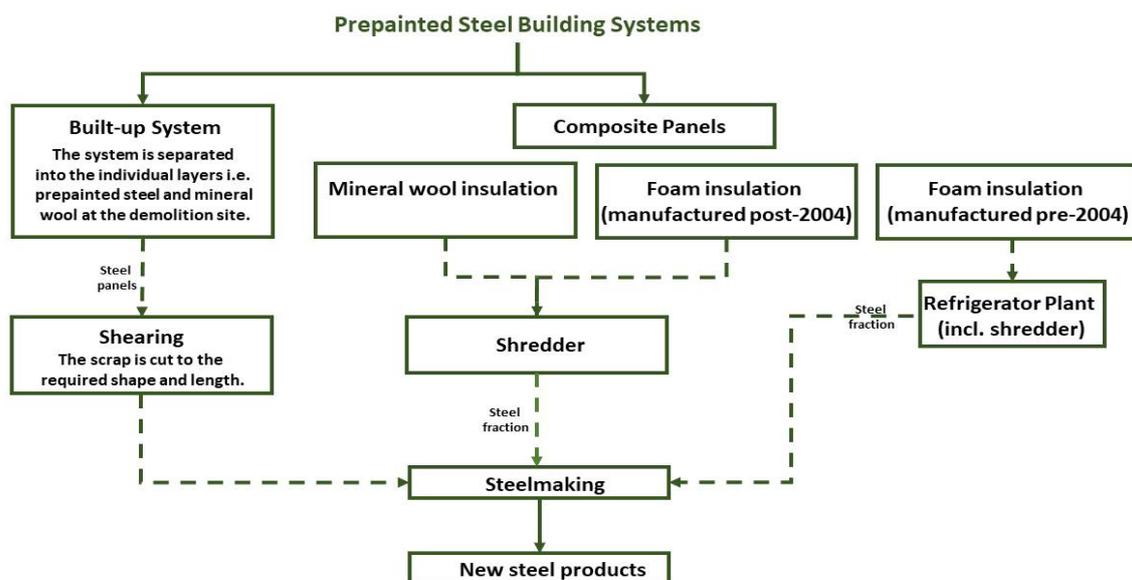


Figure 3. Recycling routes for prepainted steel building panels

4.

How much Prepainted Steel is recycled

The amount of prepainted steel 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, large domestic appliances have a service life of 7-10 years, are used in a diverse range of uses and collection and recycling are governed by the Electrical and Electronic Waste Directive (WEED). In contrast, a prepainted steel clad building usually has a service life in excess of 40 years.

When the building envelope comes to the end of its service life, there are several options available to the building owner, designed to either extend its life further or ensure it is disposed of safely and with minimum environmental impact.

5.

Construction Market

The construction market accounts for 50% of the end-use market for steel in Europe and consumes ~75% of prepainted steel production; it is, therefore, the key market in terms of recycling. The ability to reuse or recycle steel building products is also becoming more important as more building owners recognise the impact of the built environment on climate change.

The options available to a building owner include:

- Refurbishment – Refurbishing buildings offers a sustainable approach to achieving new facilities without the full cost of new build, effectively extending the useful life of the building and so minimising the impact of the resources used. Buildings using pre-finished steel cladding systems are ideally suited to refurbishment.

- Re-use – Where building materials are to be disposed of, re-use is generally the lowest impact option. With careful dismantling and removal, it is possible to re-use some of the materials used in the original construction. A European Commission life cycle assessment for steel construction estimates that 10% of the cladding sheets removed from buildings during the demolition process enter the re-use market [3].

- Recycling – Research has shown that 89% of prepainted steel is recycled with only 1% going to landfill.

The ease of removing and separating prepainted metal cladding from other building waste means facilitates these very high rates of recycling (89%) and reuse (10%) with only 1% going to landfill.

6.

Appliance Market

The appliance industry has established appropriate take-back schemes to ensure the proper management of the collected waste in order to comply with WEED. The appliance market is an important market for prepainted steel, accounting for approximately 10% of production.

It is at the forefront of innovation within the industry and 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 75% of all steel entering the market is recycled [4].

7.

Conclusion

Prepainted steel 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 steel being recycled each year.

Whilst the recycling rates vary depending on the end-use application, the average end of life recycling rate for prepainted steel is 85% with a further 8% being reused in building applications. This 85% equates to approximately 4.5 million tonnes of material being recycled each year.

8.

Sources

1. World Steel Association www.worldsteel.org
2. Insulated Panels – Identification and Disposal. Engineered Panels in Construction www.epic.uk.com
3. Life-cycle assessment for steel construction. European Commission <https://op.europa.eu/en/publication-detail/-/publication/25e4be8e-97c1-4e79-b37b-a51b7634ef7c/language-en>.
4. Material Flows of the Home Appliance Industry. European Committee of Domestic Equipment Manufacturers www.ceced.org

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.

Avenue de Tervueren, 273
1150 Brussels (Belgium)

Tel: +32 2 515 00 20
Fax: +32 2 511 43 61

www.prepaintedmetal.eu
info@prepaintedmetal.eu