

# New steel Again

Recycle to take care of the environment.



BRAZIL  
**STEEL** INSTITUTE





# Introduction

Nowadays, one of the main concerns related to the environment is how to give the best destination for the products that we use it on a daily basis after the end of its useful life.

In the case of made products of steel, we have a big reward. Steel is a 100% recyclable material and can be recycled infinite times without losing quality.



**In this way, steel recycling is essential for us to build a more sustainable future together. But for that to happen, everyone must do their part.**

After all, the recycling cycle can start for you, at home, through the correct disposal of the material.

In this booklet, you will explore steel and its applications, learn about the path of this material to its recycling, understand how this process relates to the concept of circular economy and, above all, discover how you can collaborate. The purpose of this publication is to raise awareness about the importance of steel recycling for environmental conservation and invite everyone to participate. **Enjoy the reading!**

# Learning about steel

An illustration of a hand holding a magnifying glass over the text 'Learning about steel'. The hand is orange and green, and the magnifying glass is dark blue. The background is a dark teal color with a light blue pattern of small diamonds.

To understand the process of steel recycling, first you need to know this material closely.

**In this section we will introduce you: the composition of steel, its properties, the way it is produced and the different classifications of this material.**

## What is steel?

Steel is a metal alloy consisting mainly of iron (Fe) and carbon (C).

This alloy has a wider application than iron itself and can be used to produce several types of alloys that we will see later.

Its main properties are malleability, durability, elasticity, good thermal conductivity, and resistance.

# How is steel made?



The steelmaking process can be divided into an initial preparation and four steps: load preparation, reduction, refining and rolling

## 1. Preparing the Load

Iron ore is agglomerated using lime and coke fines, resulting in a product called sinter. And coal is processed and turned into coke.

## 3. Refining

Then oxygen or electric melt shops are used to transform liquid or solid pig iron and iron and steel scrap into liquid steel.

During this stage, part of the carbon contained in the pig iron is withdrawn along with impurities. Most of the liquid steel is solidified in continuous casting equipment to produce semi-finished products, ingots and blocks.

## 2. Reduction

After preparation, these raw materials are loaded into the blast furnace.

At this point, oxygen heated to a temperature of 1000°C is blown in from the bottom of the blast furnace.

The coal, in contact with oxygen, produces heat that melts the metallic charge and starts begins the process of reduction the iron ore into a liquid liquid metal: pig iron. The pig iron is an alloy of iron and carbon with a very high carbon content.

## 4. Rolling

Semi-finished products, ingots and blocks are processed by equipment called rolling mills and transformed into a wide variety of steel products, whose names depend on their shape and/or chemical composition.



# Steel types

There are thousands of types of steel in the world. They differ from their chemical compositions, heat treatments, microstructures, shape, and surface finish.

To help you understand this classification, we can divide steel grades into three main categories: **carbon steels low-alloy steels and high-alloy steels.**

## Carbon Steels

This is the most produced type of steel and consists of **iron and carbon alloys with a total content of other chemical elements less than 2%.**

Carbon steels are generally grouped into: high-carbon, with a carbon content greater than 0.5%, medium-carbon, with a carbon content between 0.2% and 0.49% and lowcarbon with a content between 0.05% and 0.19%.

Some examples of its uses are: plates for vehicle bodies and white goods made of low carbon steel, structural steel used in civil construction made of medium carbon steel, and high-strength rails and wires made of high carbon steel.

## Low-alloy steels

Low-alloy steels are those that receive other elements such as chromium, nickel, manganese, molybdenum and vanadium in their chemical composition **in total contents less than 5% in order to improve their properties.**

Besides containing alloying elements in its chemical composition, these steels receive a processing made from special techniques that guarantee greater cleanliness in the final product.

Some examples of their use are parts with thick sections or large pieces.

## High-alloy steels

High-alloy steels also receive **other elements** in their chemical composition, **but in levels above 5%.**

About 20 alloying elements are used in their composition, besides carbon, are used to improve their properties. Some of these are: manganese, silicon, aluminum, nickel, chromium, cobalt molybdenum, vanadium, tungsten, niobium, titanium, lead, among others.

Examples of this type of material are: stainless steels, heat-resistant steel, tool steel and others used for specific purposes.





**Now that you know a little more about steel, let's show you some of the applications of this material, which is so essential for different sectors and for our daily lives.**

## **Steel in construction**

In civil construction, steel can be present in conventional works in reinforced concrete structures, mixed systems and steel construction systems. It can be used in foundations, beams, columns, roofs, mezzanines, slabs and more.

The steel construction system allows freedom in architectural design, greater usable area, flexibility, compatibility with other materials, shorter execution time, rationalization of materials and labor, load relief on foundations, quality assurance, greater organization on construction sites and construction precision.

## **Steel for Everyday Life**

Steel is present in the most diverse environments of our daily lives and often goes unnoticed.

It is used in the manufacture of stoves, refrigerators, pans and kitchen utensils, packaging and other appliances. Among the properties of steel that make it ideal for these uses are resistance to low and high temperatures, a surface that prevents the accumulation of residues, a chemical composition that prevents it from peeling, long durability, and low maintenance costs.

Besides these uses, it is also used in furniture, decoration items, and technological devices such as computers and cell phones.

## Steel in transport

Steel is widely used in the manufacture of various means of transport. Steel can be found in cars, trucks, buses, trains, subways, ships, bicycles and motorcycles. It transports the population, connects cities and carries loads, distributing wealth and spreading progress.

## Steel in energy sources

Steel is used in hydroelectric plants, wind turbines, solar panels, thermoelectric and nuclear, transmission towers, transformers, electrical cables, platforms, pipelines, equipment prospecting and extracting oil, as well as rigs, mats and buckets in coal mines. Therefore, this material is essential in the production and distribution of energy in the country.

## Steel in agriculture

The efficiency of the agricultural sector is directly related to steel consumption. The land is plowed, seeded and fenced using steel materials and equipment.

And at harvest time, with the reapers and harvesters as well as in silo storage and bulk carriers, steel too is present, allowing that food and supplies reach the shops.

Thus, steel contributes to the supply of markets and other establishments, contributing to people's health and well-being.



# Steel



Steel is the world's most recycled material, with about 630 million tons recycled annually.

Because it is 100% recyclable, it can be reprocessed and transformed into new products infinitely without any loss of quality.

**That is, the steel present in an old refrigerator can become a brand new car, a piece of surgical equipment or even a cell phone in the future.**

With this, we realize that steel recycling is extremely important for building a more sustainable world.

Now, let's better understand the trajectory of the product made from steel until the moment it is recycled, the essential role of scrap dealers, how this material is reprocessed and what are the main benefits of this process.

# Path from steel to recycling



**Purchase  
of a steel  
product**



**Use of  
the product  
until the end  
of its useful life**

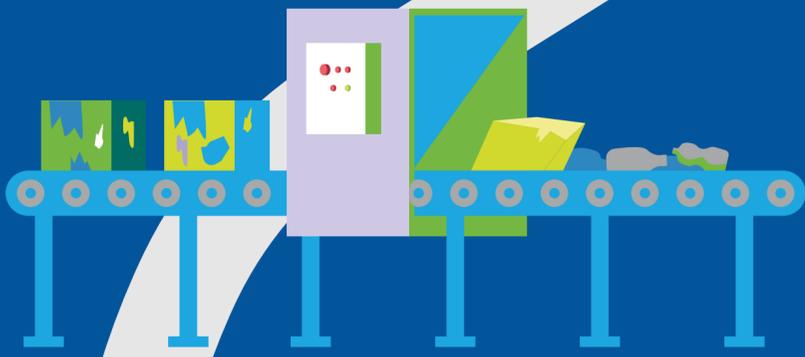


**Correct  
disposal and  
collection of  
scrap steel**



**Manual or  
electromagnetic  
separation  
of the scrap**

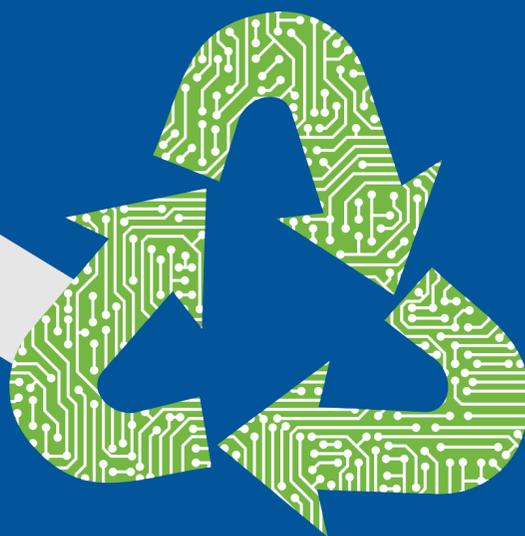
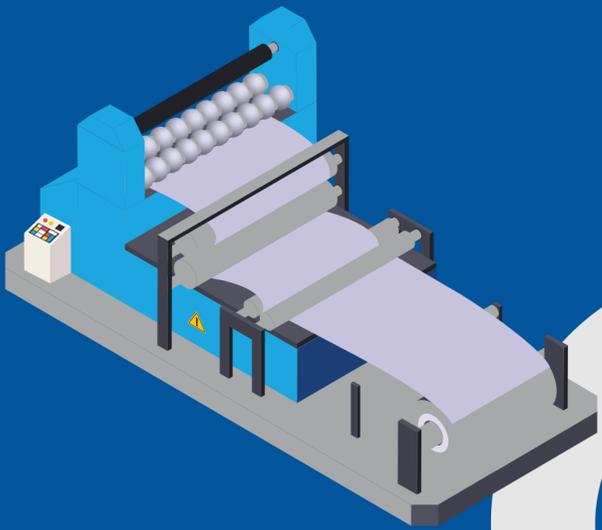




**Process  
cleaning and  
preparation  
of the scrap.**



**Sale and  
transportation  
of scrap to  
the steel  
industries.**



**Steel  
Recycling.**



# The Role of Scrap Dealers and cooperatives of waste pickers

To make its way to the steel mills where the recycling process takes place, steel relies on the action of very important workers: the scrap dealers and the collectors' cooperatives.

**They are involved in the stages of collection, separation, transportation, and sale of the steel scrap to the companies in the industrial sector.**

In this way, besides taking care of the environment, reducing the consumption of natural resources for steel production and ensuring that the steel is transformed into new products, the scrap dealers and the cooperatives of collectors also move the economy, generating jobs and income for many people.

# Process of **steel recycling**

The steel recycling process begins with selective collection and the correct forwarding of products made from this material.

After that, scraps need to be sorted manually or electromagnetically. And in some cases, scraps go through a cleaning process to remove unwanted materials.

Then, the scrap is pressed into bales in order to facilitate and optimize transport to the steel mills.

After arriving at the mills, the scrap is subjected to high temperatures inside the kilns, until it reaches its melting point at approximately 1300 °C, thus reaching its liquid state.

**Liquid steel can be molded into different shapes, giving origin of the most varied types of products to be marketed.**





# Benefits of **steel** **recycling**

Recycling steel from scrap reduces the consumption of non-renewable natural resources, such as water, for example.

In addition, it saves energy, avoids the need to occupy areas to dispose of obsolete products, and reduces greenhouse gas emissions into the atmosphere.

And finally, we must remember that recycling generates jobs and income for many people involved in this process, such as scrap dealers, for example.

**Everybody wins when  
steel is recycled!**



# Circular economy



**The recycling of steel is closely related to an increasingly important concept: the economy.**

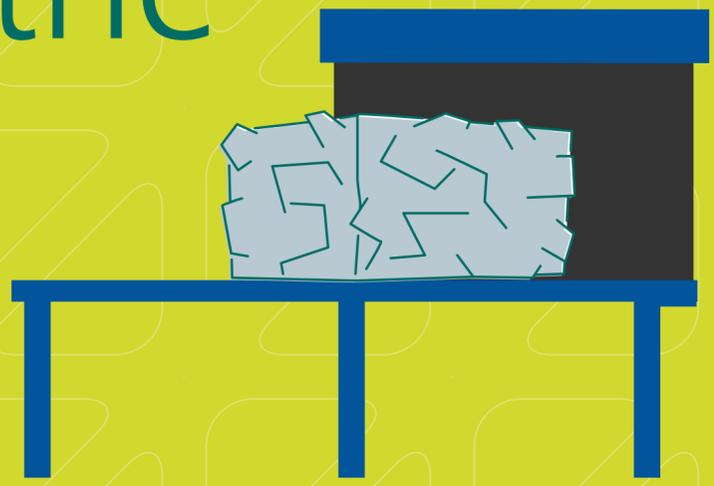
The circular economy is a new way of thinking about our future and how we relate to the planet. It seeks to promote economic development and the well-being people without the need to consume more and more natural resources.

To this end, it proposes that materials remain in as long as possible, through reuse or recycling.

In other words, old products are reused, gaining a new function, or are recycled and transformed into completely new products.



# Benefits of the **circular economy**



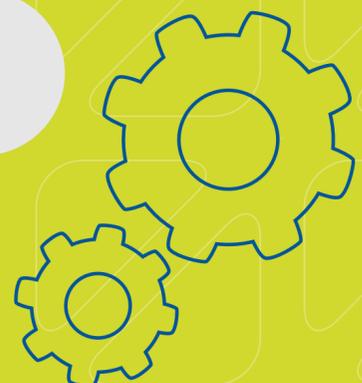
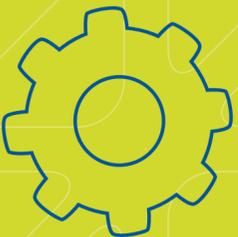
**Reducing the use of nonrenewable  
natural resources**

**Reduction of greenhouse  
gas emissions**

**Encouraging the production  
of easily recyclable materials**

**Stimulating recycling**

**Job creation**





## How can you help?

For steel recycling to bring all the benefits discussed, everyone needs to do their part.

Active participation in this sustainability cycle begins with the conscious consumption of steel products.

### **But after all, what is conscious consumption?**

The first step to understand this concept is to realize that everything we consume, whether a product or a service, has consequences for the environment, the economy and society as a whole. And, of course, steel products are also part of that.

In this way, conscious consumption encourages us to reflect on our consumption habits, pay attention to the real need for what we consume and the possible impacts this may cause.

There are some actions we can take to apply conscious consumption in everyday life, such as knowing the origin of the products we buy, choosing the manufacturer according to its socioenvironmental responsibility in production, making optimal use product so that it has a longer shelf life, and finally send the end-of-life product for recycling whenever possible.



# How to properly **dispose of steel products at the end of their useful life?**

The proper disposal of steel products at the end of their useful life starts at home, through the separation of products made from this material. In the case of small items, such as household items, for example, they can be separated and delivered to the selective collection service.

In the case of larger products, such as stoves, refrigerators, cars, among others, the ideal is for them to be sent to collection points for recyclables, junkyards, collector cooperatives or directly to scrap dealers, who will carry out all the processes of preparation and put these materials on the path of recycling.

**See how simple it is to help? Now that you know all this, do your part and collaborate with steel recycling!**



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