

Closed-loop recycling of steel products

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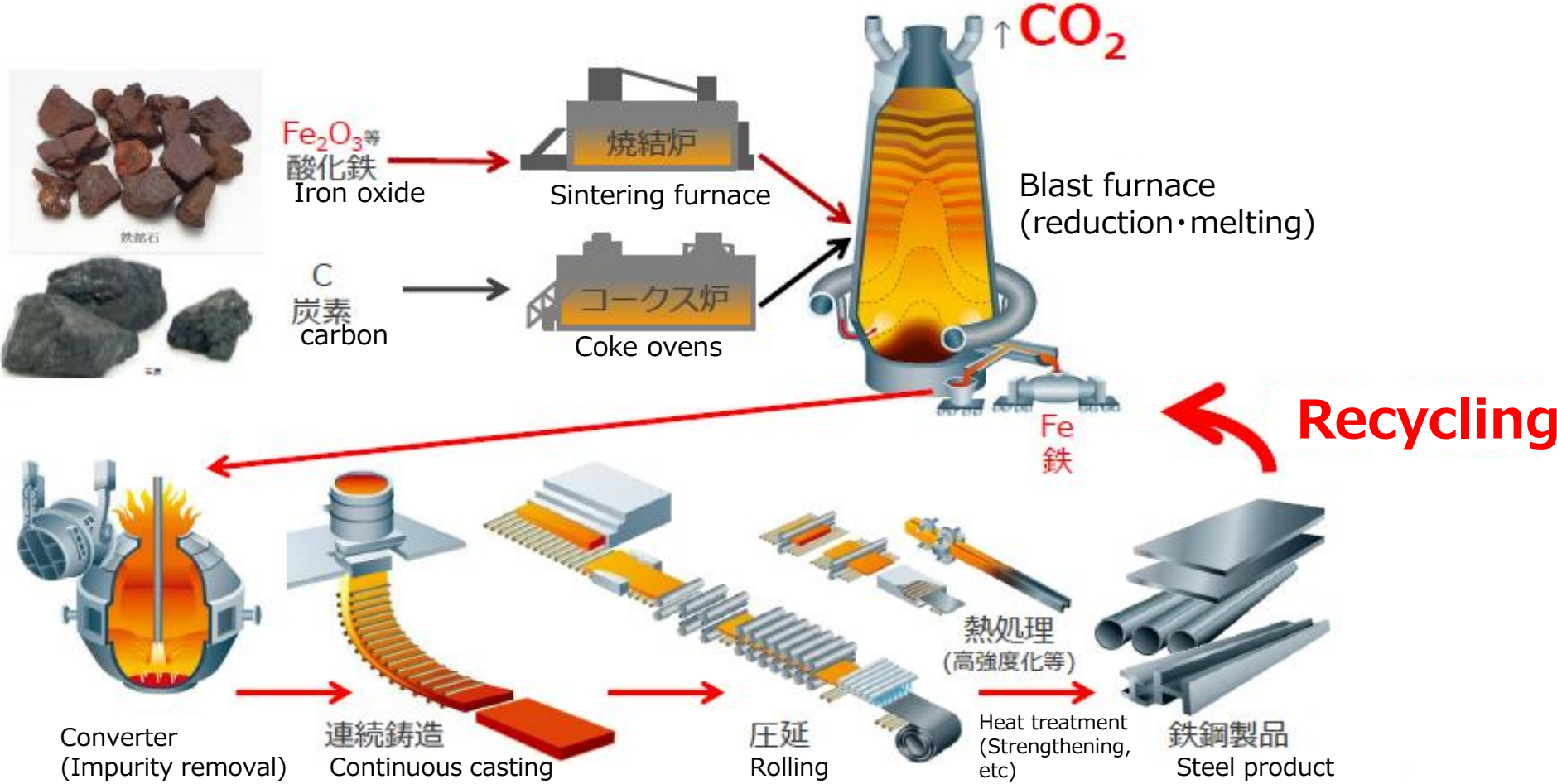
2022年10月31日

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Steel Production Process

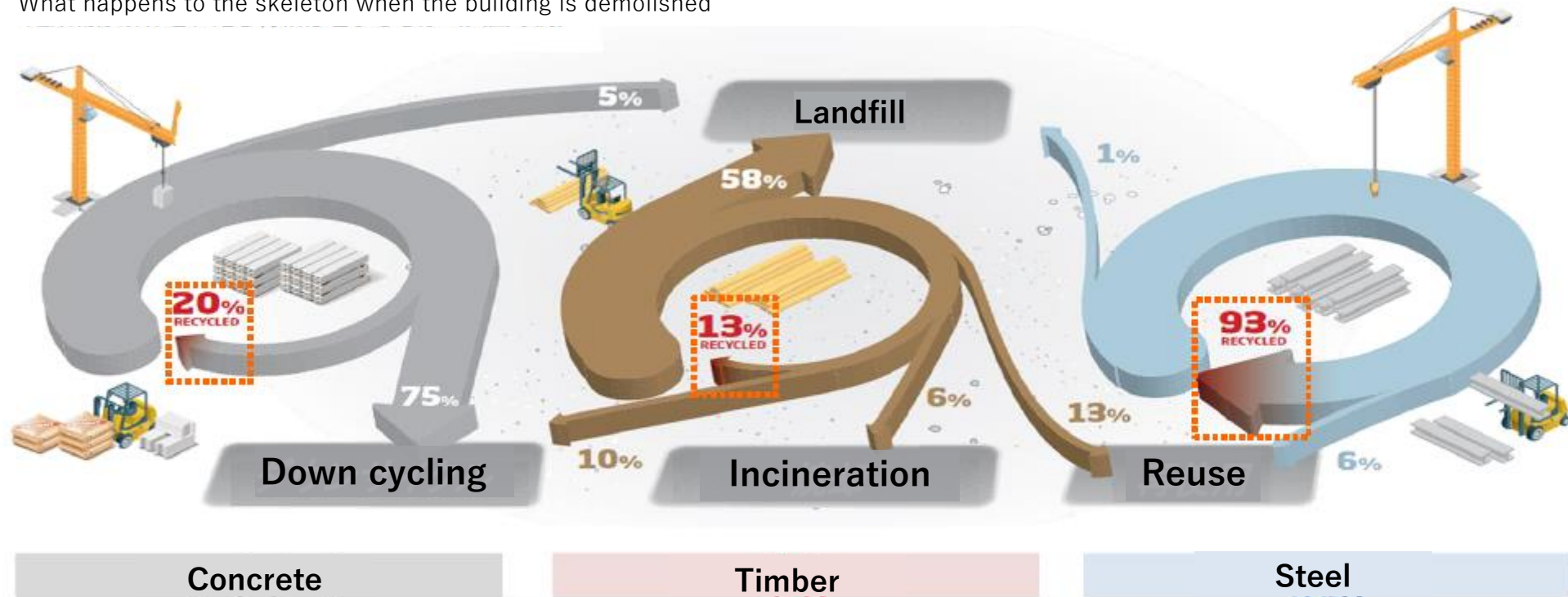
Steel is made by reducing iron ore (iron oxide) with carbon.



Almost all steel products are recycled

In construction materials, steel is mostly recycled.

What happens to the skeleton when the building is demolished



SteelConstruction.info, https://www.steelconstruction.info/File:B_Fig10_2013.png#filelinks

What are the requirements for autonomous, sustainable recycling?

Steel meets all these requirements.

1. Easy sorting

- Automated
- Magnetic

2. Lower environmental impact

- Lower environmental impact
- Scrap metal recycled simply by melting

3. Valuable

- High economic value, worldwide recovery system based on market economy.

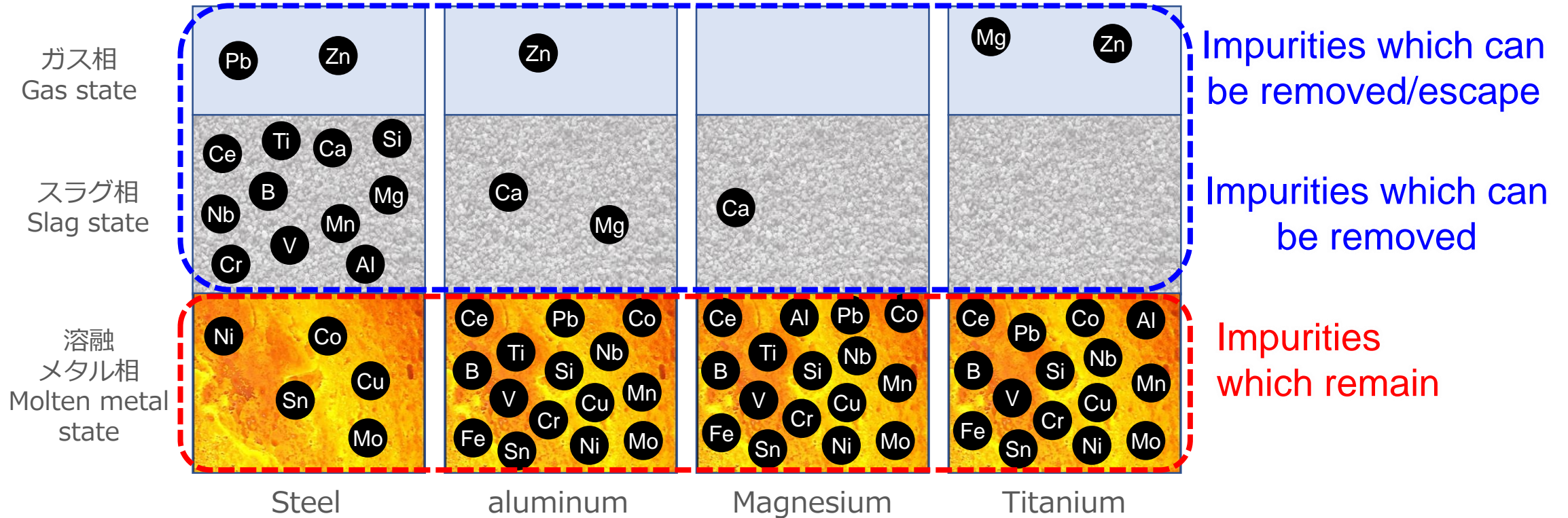
4. Easy removal of impurities

- Refined during recycling
- Steel has low alloy additions to begin with and many impurities can be easily removed by oxidation refining.

Steel is easy to remove impurities.

Most impurities can be removed by oxygen blowing, as they are more easily oxidised than iron.

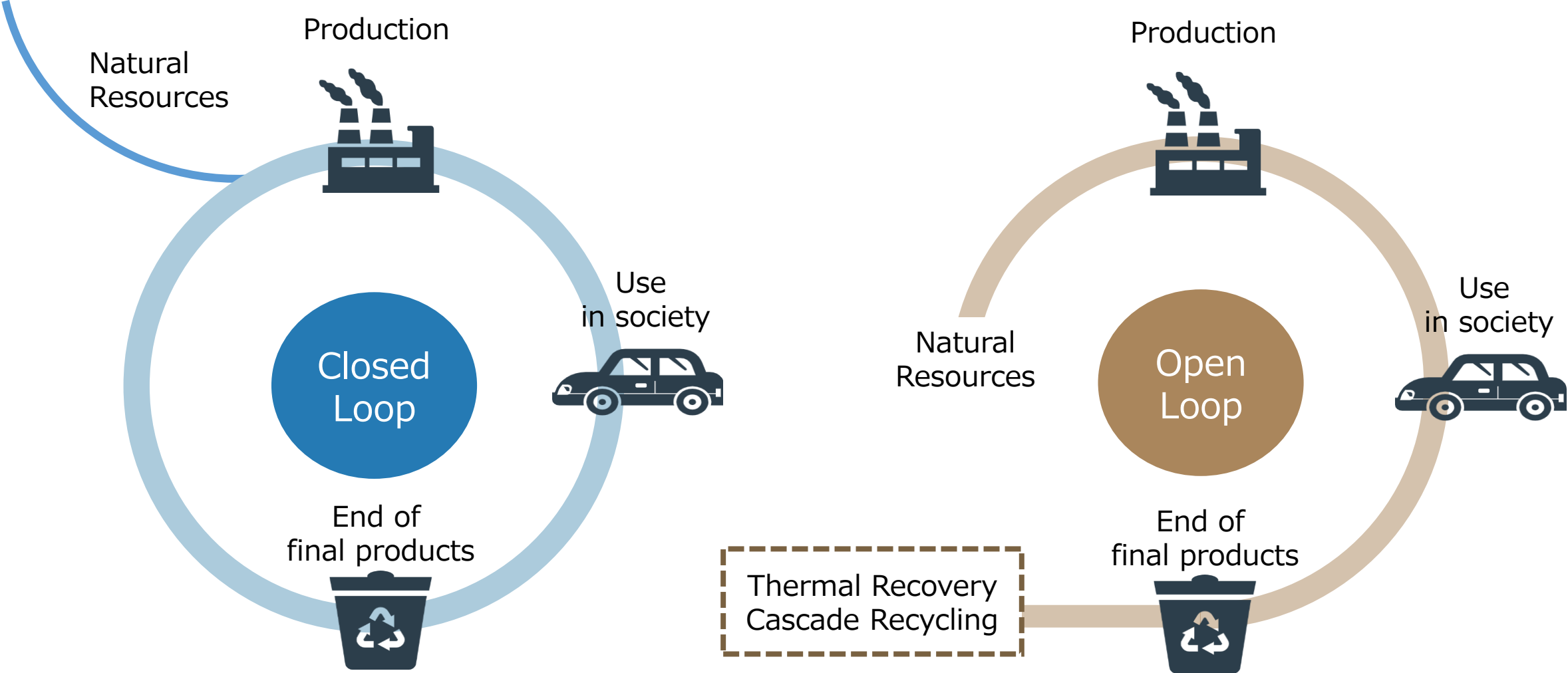
平木岳人也: 第23回廃棄物資源循環学会研究発表会 (2012) 23_269を改変



Most of the impurities that cannot be removed can be removed by magnetic sorting in advance.

Type of recycling

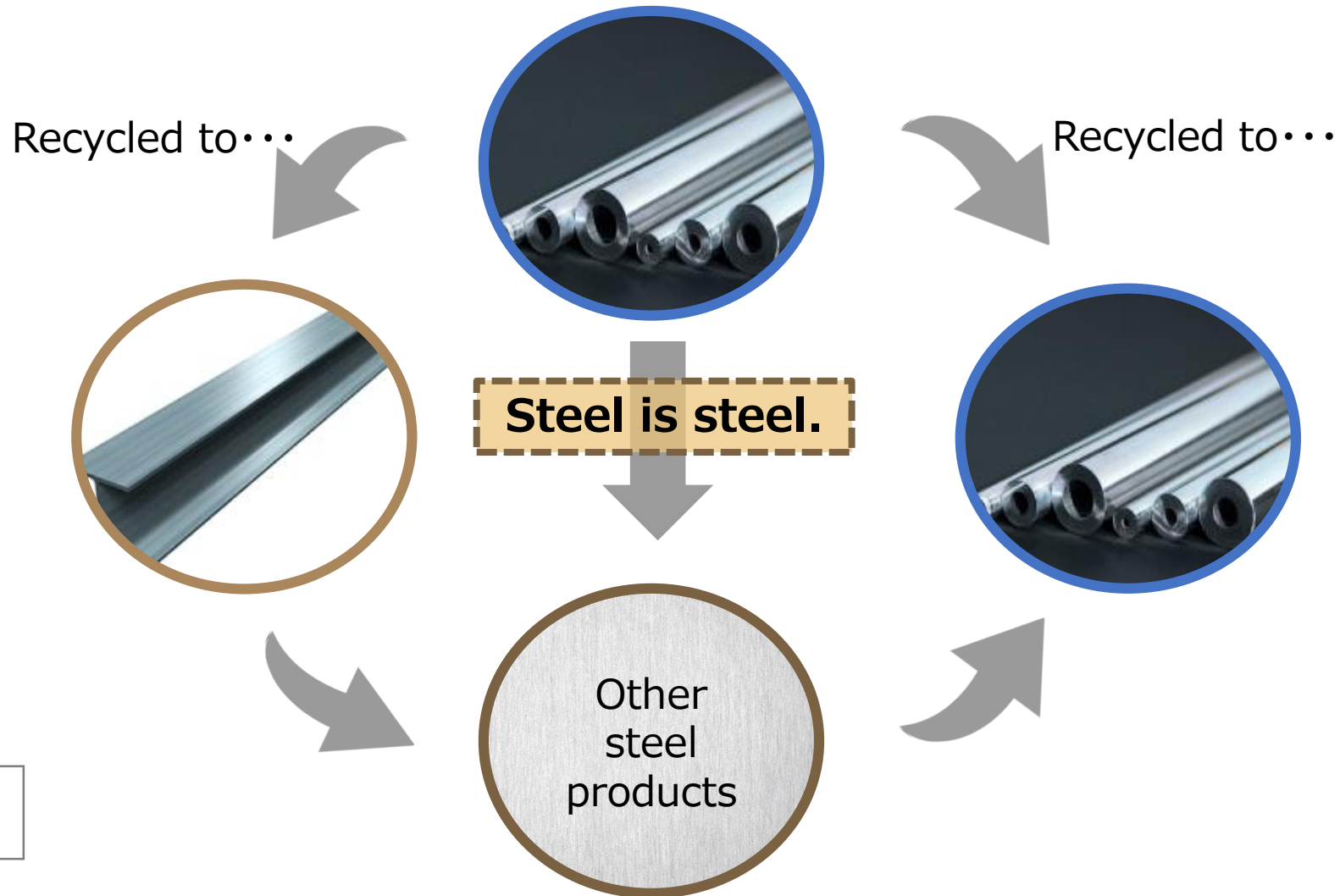
Recycling: CLOSED LOOP and OPEN LOOP



参考 : ISO14044

Is this Open loop Recycling ?

Steel products can be recycled into the same product or into different products.



Circulation of steel resources

The life cycle of steel material is endless and circulating in a closed manner

worldsteel, World Steel in Figures 2022

worldsteel, Steel Statistical Yearbook 2021

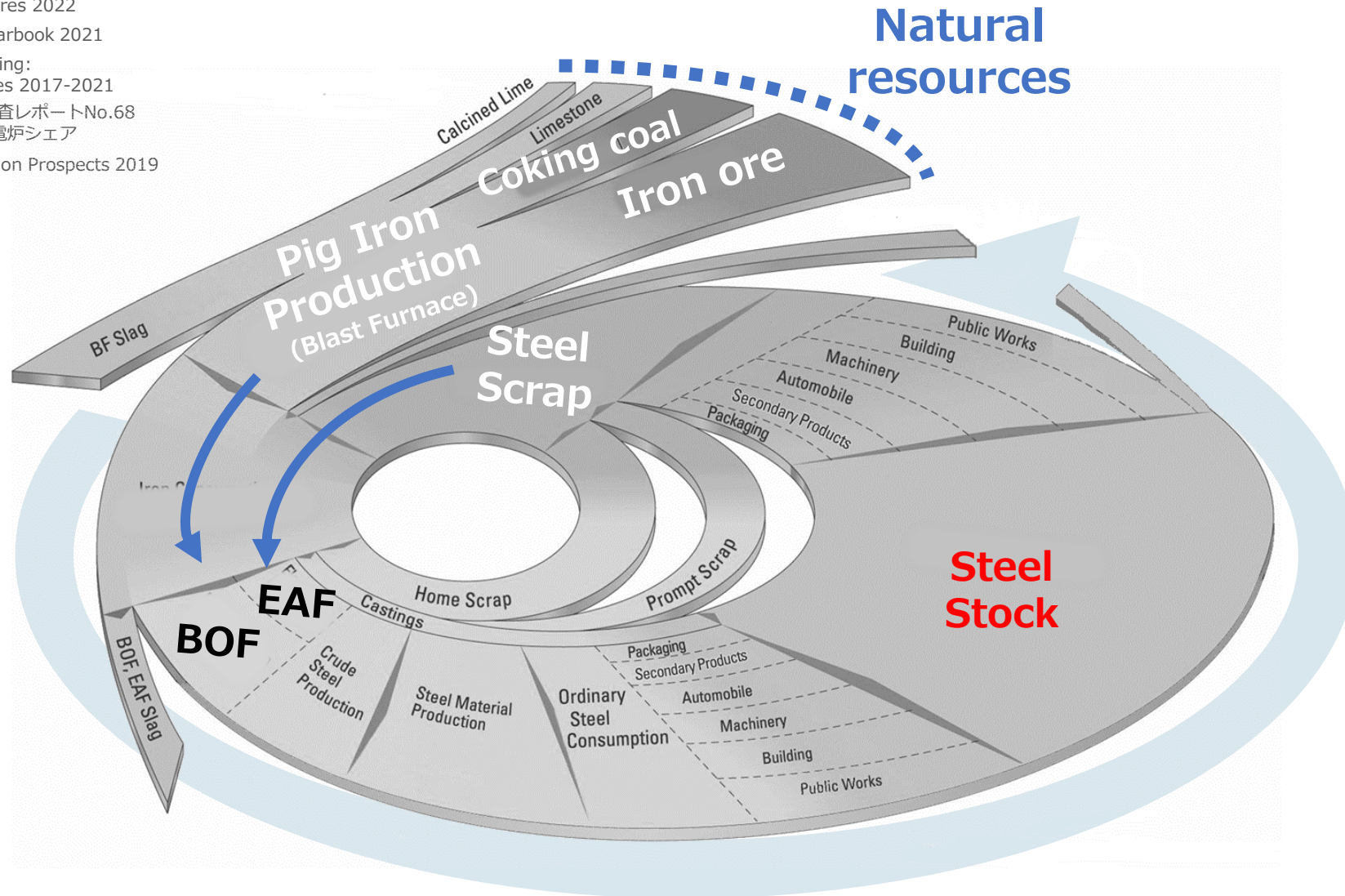
Bureau of International Recycling:

World Steel Recycling in Figures 2017-2021

鉄リサイクル・リサーチ, 調査レポートNo.68

21年末の世界鉄鋼蓄積量推計と電炉シェア

United Nations, World Population Prospects 2019



Closed loop and Open loops in the ISO 14044 standard.

Can to can recycling of aluminium is closed loop (both in terms of product and recycling) .

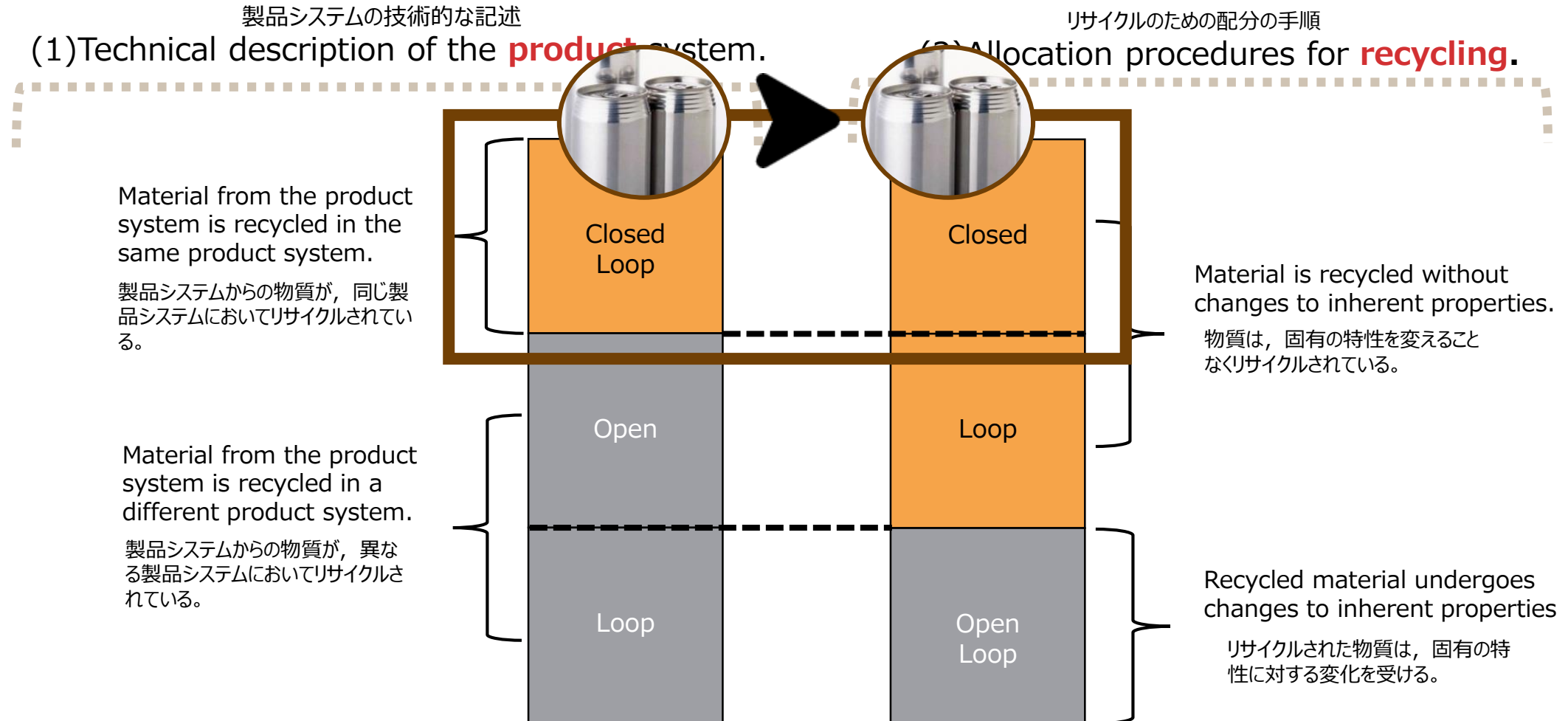
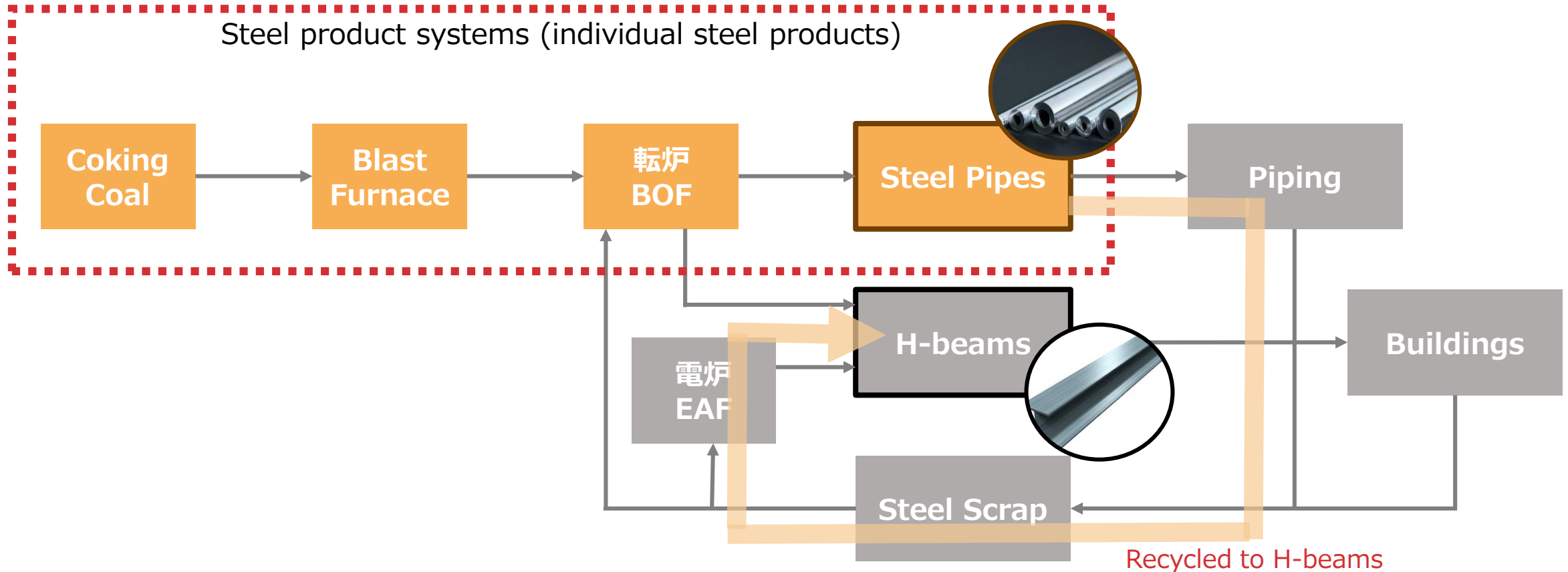


Figure-Distinction between a technical description of a product system and allocation procedures for recycling

Steel product systems (individual steel products)

In terms of product system, steel pipes become different product(H-beams).



Closed loop and Open loops in the ISO 14044 standard.

Pipe to H-beam can still be considered as closed-loop recycling.

製品システムの技術的な記述

(1) Technical description of the **product** system.

リサイクルのための配分の手順

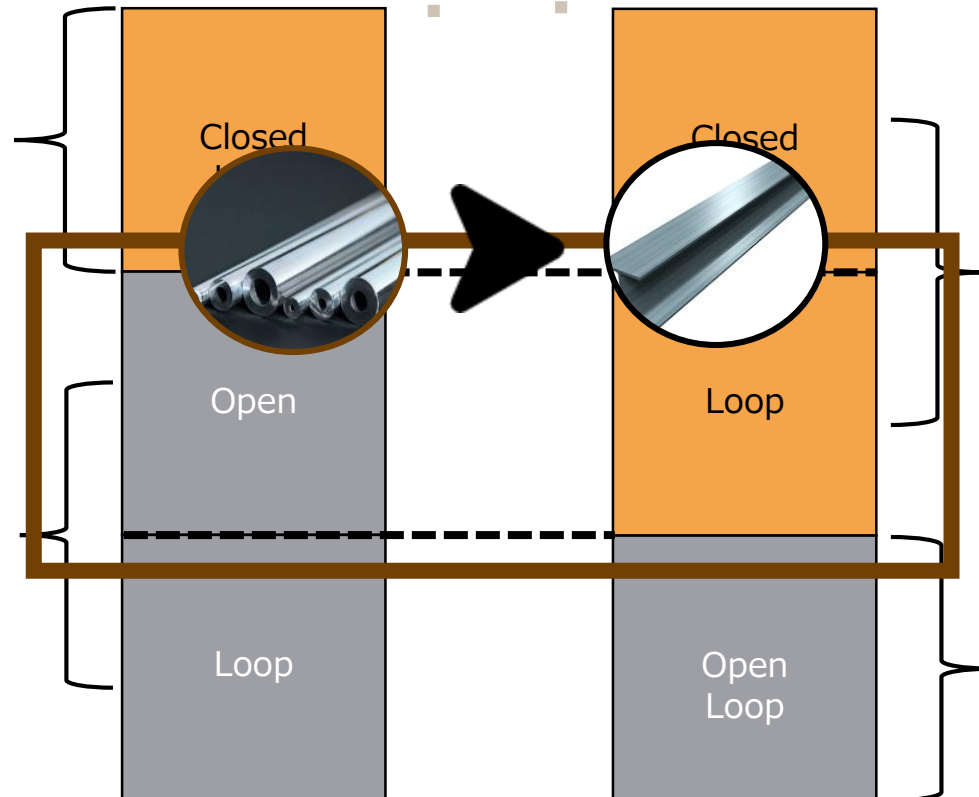
(2) Allocation procedures for **recycling**.

Material from the product system is recycled in the same product system.

製品システムからの物質が、同じ製品システムにおいてリサイクルされている。

Material from the product system is recycled in a different product system.

製品システムからの物質が、異なる製品システムにおいてリサイクルされている。



Material is recycled without changes to inherent properties.

物質は、固有の特性を変えずにリサイクルされている。

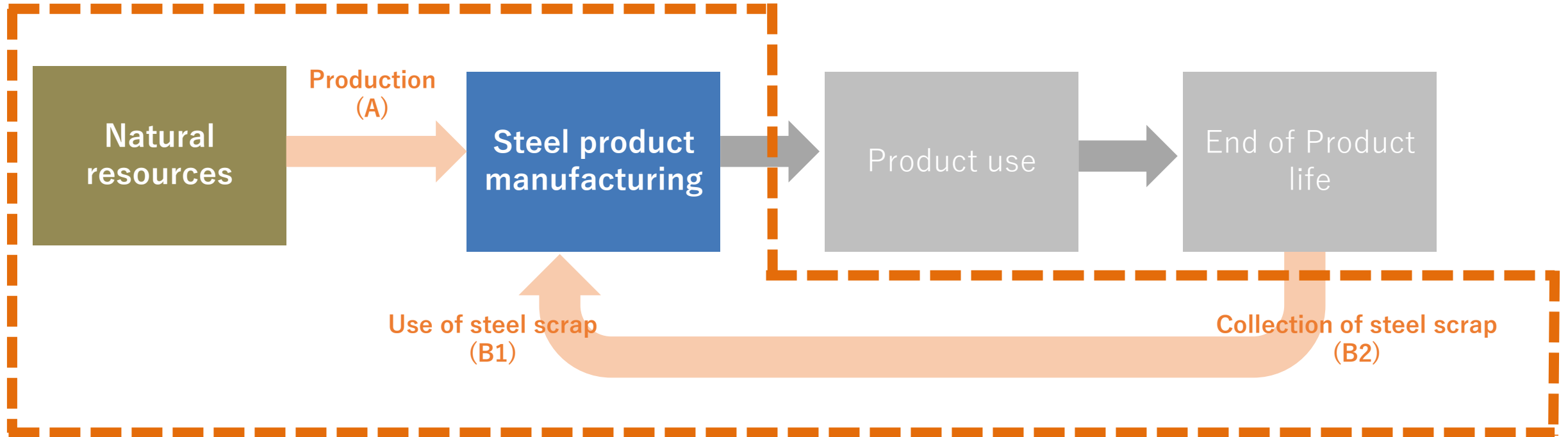
Recycled material undergoes changes to inherent properties

リサイクルされた物質は、固有の特性に対する変化を受ける。

Figure-Distinction between a technical description of a product system and allocation procedures for recycling

ISO20915 Life cycle inventory calculation methodology for steel products

ISO20915 is considered closed loop recycling.



Japan Iron and Steel Federation 'Publication of ISO 20915'

<https://www.jisf.or.jp/news/topics/181128.html>