



PRO CARTON
PACKAGING FOR
A BETTER WORLD



CARTON &
BOARD MAKING

RECYCLING



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THE IMPORTANCE OF RECYCLING

WHAT IS MEANT BY “RECYCLING”?

Recycling occurs when a product having completed its original function is reprocessed to convert it into useful new material. The European rate for recycling cartonboard and fibre packaging is 84.2%, (Cepi 2018).

The target for the carton industry is to use all waste from recycling to produce new packaging material. Pro Carton’s latest study, (Technical University Graz, 2021) shows you can recycle fibres in excess of 25 times without weakening the mechanical strength of the fibre material. This is the ideal base for a circular business model, creating new packaging again and again through recycling.

When folding cartons are discarded after use they become part of the packaging recycling process. They can be recycled by reprocessing whereby the fibres are separated. The recovered fibre is then used to make cartonboard or another paper or board product. Alternatively, they can be composted, a process known as “organic recycling”. Fibre material is too valuable for incineration. The industry targets to maximise collection and sorting of fibre material to recycle for new packaging material production. Every carton collected helps towards improving the recycling rate.

For recycling to take place, the fibre packaging must be collected and sent to a mill. Ideally, the collected fibre based material should be kept separate from other recycling materials. This will secure the best quality output at the end of the process.

Production losses that arise during manufacture are relatively easy to recover, such as trimmed packaging fibre in cartonboard mills and from carton manufacturers. However, the bulk of cartonboard, along with all paper and board products, is ultimately dispersed throughout society and therefore an infrastructure is required for its recovery. It may be segregated in the home, or other point of disposal, and either collected or taken to a collection location.

Consumers in Europe trust the recycling infrastructure that exists for fibre based materials. They understand the value of collection and separation of fibre based materials. This is the reason that board and paper achieve an 84.2% recycling rate, significantly higher than any other packaging material.



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HOW IMPORTANT IS RECYCLING IN THE PAPER AND BOARD INDUSTRY?

Recovered fibre, including fibre from recovered paper and board packaging, contributes nearly 53% of the total fibre used in the paper and board industry worldwide. In Europe nearly 49 million tonnes of recovered fibre was used in the paper & cartonboard industry, (Two Sides 2019).

Closed-loop recycling is a process where waste for recycling, or resources (as it is known) is collected, recycled and then used again to make the same product.

Used packaging including folding cartons and corrugated board, is not therefore the only source of fibre for recycling in Europe. Other major sources include news print and magazines, office stationery and general paper waste from printers.

Rates for the recovery and recycling of packaging in Europe, including that from paper and board based packaging, are set by the European Commission, as required by the Directive on Packaging and Packaging Waste, 94/62/EC. The paper and board industries are closely aligned in order to meet and beat the ambitious targets.



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IS ALL RECOVERED FIBRE OF EQUAL QUALITY?

The quality of recovered fibre depends on a number of factors:

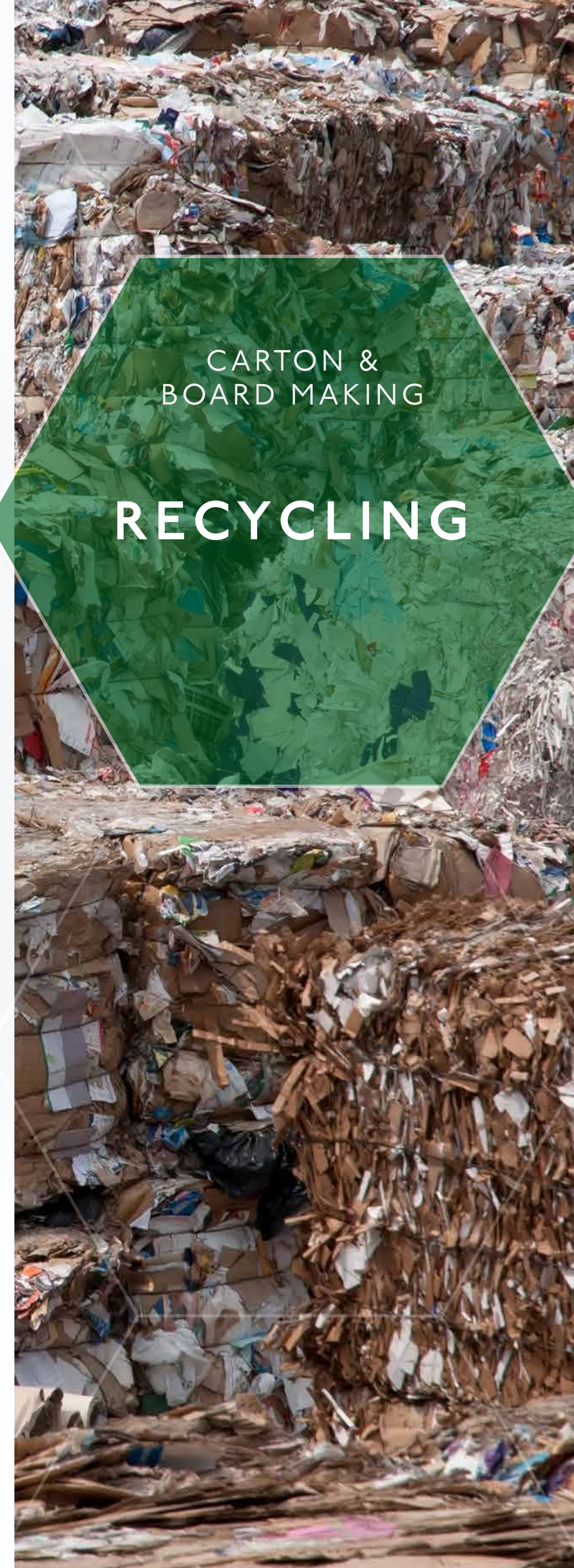
- Whether they are long or short fibres.
- How they were separated from the original wood.
- Whether they were bleached.
- To what extent they are associated with other materials such as coatings, ink, plastics, wet strength resins and adhesives.

Fibre quality therefore depends on the initial separation and treatment, how it was made into paper or board and, finally, how those products were used.

The quality of fibre ranges from virgin pulp substitute (unprinted white trimmings), office waste, newsprint, brown (unbleached) packaging to mixed papers and boards. The grade or type of waste and market demand determines the price.

Recovered paper and board is therefore graded. A list of defined grades has been agreed between Cepi and BIR. (Bureau of International Recycling).

The widely accepted grade list across Europe is BS EN643 which defines 5 groups of paper for recycling subdivided into over 90 separate grades. A number of these relate to cartonboard noting differing composition and presentation.



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CAN THE FIBRES BE RECYCLED INDEFINITELY?

In technical terms the number of times a fibre can be recycled depends on the original virgin fibre, its initial processing and use, and the uses of the resulting paper or board products. As previously stated, studies have proved that recycled fibres remain stronger than previously known. After 25 recycling loops the fibre quality does not show significant signs of impact and therefore can be recycled maintaining a reasonable strength more than 25 times.

In practice, the number of times a fibre is likely to be recycled depends on what it was used for and the probability of its recovery (collection) for recycling. The collection rate today defines the biggest single limitation in recycling followed by the quality of separation during the collection process. Fibre based materials should be collected separately from other recycling materials (plastics, wood, metals) and household waste.

As the demand increases for more sustainable products, many customers are eager to use recycled paper and cartonboard which play a key role in creating the circular economy. Virgin fibre is part of the same sustainable production chain, playing an equally important role in closing the loop. A steady source of virgin fibre is necessary to maintain the paper recycling and manufacturing process.

Some products by nature of their use, remove themselves from the paper and recycling process altogether. Examples include the baseboard for plasterboard, archived printed material, book covers, graphic board, cigarette paper, tissues and some food cartons.



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WHAT IS DE-INKING?

It is a process whereby ink is removed from printed paper and board prior to reprocessing.

Recovered paper and board is dispersed in water and the resulting fibres are treated with surfactants which extract the ink particles. The fibre is separated from the ink particles by a cascading, flotation process based on the difference in density between the two materials. Finally, a mild bleaching treatment may be included to increase the brightness of the pulp.

The major uses of de-inked fibre are in the manufacture of tissues, newsprint and stationery products. It is not widely used in cartonboard manufacture and containerboard mills do not de-ink.

WHAT IS “ORGANIC RECYCLING”?

Organic recycling occurs when organic material in waste is broken down by micro-organisms to produce a soil conditioner, or mulch, which can be used in agriculture and horticulture. Cartonboard is ideal for composting because cellulose fibre is biodegradable. This means that it can be broken down into natural substances by bacteria using microbial enzymes, thereby producing carbon dioxide, water and compost (humus).

WHAT DOES HOUSEHOLD WASTE CONSIST OF?

23% Garden waste

Grass, cuttings, leaves, hedge clippings and soil

18% Paper and cardboard

Boxes, drinks, cartons, paper bags, newspapers, magazines and mail

17% Kitchen waste

Vegetable peelings, leftover food

9% General household sweepings

Dust, fluff and cigarette ash

8% Plastic

Plastic drinks bottles, food containers and clingfilm

7% Glass

Bottles and jars

5% Scrap metal

Old electrical equipment, batteries

5% Wood

Old furniture, fencing, DIY offcuts

3% Textiles

Old clothes and rags

3% Metal

Tin cans and aluminium foil

2% Nappies

Source: WRAP (The Waste and Action Source Programme)

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COMPOSTING CARTONS

To maximise the circular use of fibre resources, consumers should always be encouraged to prioritise the recycling of cartonboard in a paper mill, which preserves the fibre in the paper loop, rather than composting it. However, in certain rare and exceptional circumstances, where cartons cannot be recycled as fibre, due to technical issues or contamination, they may be composted.

Compost can be made from raw materials high in carbon, such as cartonboard, combined with a material containing nitrogen. For waste managers and local authorities this will provide an alternative process to recover part of the packaging waste stream.

The first stage is the source segregation of cartonboard at the household. Paper and cartonboard are collected, often with other dry recyclable materials, separately from other waste materials. The materials collected together can then be sorted at a Materials Recycling Facility (MRF) before onward transfer to the recycler. After the components that are suitable for recycling are sorted and sent for reprocessing, any residual material comprising of cartonboard and paper can be composted.

An organic waste, such as sewage sludge, provides a source of nitrogen. The selection of the source is guided by what is most easily available from waste treatment facilities and waste from agriculture.

Pro Carton and ADAS Consulting, a company with wide experience of working in the environmental and agricultural sectors, co-operated in developing specific processing guidelines for the processing of cartonboard packaging and agricultural wastes.

This work showed that the waste sources must be combined in proportion to give an optimum carbon to nitrogen ratio of around 30:1.



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COMPOSTING CARTONS

For a typical cartonboard and sewage sludge mix this is 3 parts cartonboard to 4 parts sludge by weight. It is essential to laboratory test the feed stock for carbon, total nitrogen, dry matter and trace metals to achieve the right mix.

For the best results, the paper and cartonboard should be shredded before mixing with the other materials. Alternate layers of cartonboard and sludge should be built into a windrow (heaped row) 2.3m wide and 1.3m high. This allows good control of the environmental conditions such as temperature, moisture and air flow.

A wheeled loader or a compost turning machine is used to mix and turn the windrow. The windrow should be turned twice in the first week, by which time temperatures will have risen towards the target of 60°C. The windrow should then be turned weekly for up to 8 weeks. Following screening to remove any contraries such as plastics, the compost is ready for use as a soil improver.

The screened compost is visually attractive, being fine in texture, light brown in appearance and odourless. Its main application is as a soil improver for both large scale landscaping use and in the garden. It can be used as a replacement of peat-based materials in proprietary composts. It has been used as a soil improver for planting trees on a site in the National Forest in Central England.

WHAT ARE THE BENEFITS OF COMPOSTING POST CONSUMER CARTONBOARD PACKAGING?

- Diversion of used cartonboard packaging from landfill.
- Recovery and recycling of packaging material.
- Results in a beneficial soil improver.
- Provides a sustainable alternative to peat and proprietary composts.
- Diversion of used cartonboard from mass burn incineration.

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The European Pulp and Paper industry plays a major role in the circular economy.

Recycling waste paper, in the EU, provides 53% of the fibre requirements for the paper and board industry.

Cartonboard is based on cellulose fibre derived from wood (trees) and over 42% of European land is covered by forests.

In 2019, a total of 57.5 million tonnes of paper was collected and recycled in Europe.

In Europe, 82.4% of fibre material consumption was recycled in 2018 (Eurostat 2018), one of the most recycled materials.

THE DEFINITION OF SUSTAINABLE PACKAGING

The idea that goods and services should be produced in ways that do not use resources that cannot be replaced and that do not damage the environment.

The lifecycle of cartonboard is truly circular.

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Pro Carton would like to thank the following companies for contributing both information and images to support the creation of these Fact Files:



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