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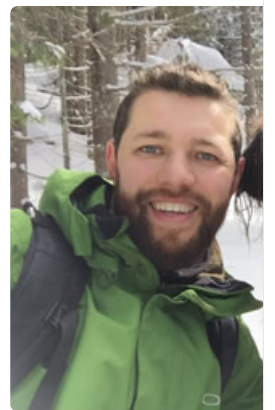
How is Paper Recycled: The Recycling Process



GREENTUMBLE

RECYCLING — SEPTEMBER 4, 2018

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Each year, over 400 million metric tons of paper and cardboard is produced globally, with over half of production originating from China, the United States, and Japan [1]. In 2016, Americans alone consumed 70 million metric tons of paper a year, or approximately 514 pounds per person [2].

The United Kingdom's maximum consumption rate of nearly 13 million metric tons was reached in year 2000 and has steadily decreased to a rate of 9.1 million metric tons or 305 pounds per person in 2015 [3].

Most of this paper can be recycled, which is the process of reprocessing waste paper for reuse.

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Waste papers are gathered from:

paper mill scraps


discarded paper waste after consumer use
– for example: old newspapers,
magazines, white printer paper, cardboard,
and packaging papers

Paper is one of the most easily recycled materials, however, paper eventually reaches a point where it can no longer be recycled due to the progressive shortening of fibers each time it is recycled [4].

Each metric ton (1,000 kilograms) of recycled paper can save approximately:

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19 trees that can absorb 127 kilograms of carbon dioxide from the atmosphere each year

1,500 liters of oil

2.68 cubic meters of landfill space

4,400 kilowatts of energy

29,000 liters of water

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Recycling in America has plenty of room for improvement, with only 63 percent of produced paper being recovered in 2013 [6], and 67 percent of paper in 2015 [7]. Assuming the rest of the world has similar paper recovery rates, approximately 150 million metric tons of paper and cardboard is deposited in landfills or incinerated each year.

Recycling a single run of the Sunday New York Times would save approximately 75,000 trees [5], enough to absorb 1 million pounds of carbon dioxide each year!

If the world can achieve nearly a 100 percent paper recovery and recycling rate, approximately 2.5 billion trees would be saved this year!

Quick Navigation for How Is Paper Recycled

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Paper recycling process: Step by step

Whether you recycle your own paper or recycle paper on an industrial scale, the process is essentially the same. However, steps may be added or omitted in some cases, depending on the quality of the recovered paper, with thin lightweight newspaper requiring fewer steps than thick cardboard boxes [8].

Additional steps can also be added to remove a greater number of contaminants in paper such as bisphenol A, phthalates, phenols, mineral oils, polychlorinated biphenyls (PCBs) and toxic metals [9].

Step 1: Collection

The process of recycling paper begins with individual users (homes, businesses, universities, industrial manufacturers) that collect and store paper waste in bins.

Recyclers and paper merchants collect this paper and combine it together in a large recycling container.

Step 2: Sorting and transportation



After collection, the paper is measured and graded for quality. Waste paper with similar qualities are combined since they have similar amounts of fiber which can be extracted from the pulp. The paper is then hauled to paper mill recycling facilities [10].

Upon arrival at the recycling facility, the quantity and quality (cleanliness and type) of the paper is measured and a purchase contract is issued to the recycler. These measurements of paper quality are also used to determine whether the type of waste paper is accepted or rejected; some recyclers accept mixed grades of recovered paper, while others only accept preferred quality of waste paper grades [10].



Once accepted by the recycling facility, the recovered paper is then further sorted based on its surface treatment and structure. For instance, very thin lightweight paper such as newspapers are sorted separately from thick paper materials such as paper folders. This sorting is important because different grades of paper material are



produced based on the materials being recovered [10].

Step 3: Shredding and pulping

After sorting, the paper is then shredded to break down the material into small bits. After the material is finely shredded, a large amount of water is added along with other chemicals such as hydrogen peroxide, sodium hydroxide, and sodium silicate to break down and separate the fibers of the paper.

The resultant slurry solution, known as pulp, has an oatmeal consistency and is the raw material used to make paper. This process of transforming the recovered paper materials to pulp is known as pulping.

The pulp is then passed through a series of screens, and a centrifuge-like process to remove larger contaminants such as paper clips, staples, tape, and plastic films that were included in the recovered paper.

Step 4: Floatation tank / de-inking

After removing larger contaminants, pulp is added to a flotation tank where chemicals and air



bubbles remove dyes and inks to enhance the purity and whiteness of the product.

Hydrogen peroxide, and other whitening agents may be added to further enhance the whiteness if a white color is desired as the product. This step continually bleaches the pulp until it is ready for the final processing stage.

Dyes are sometimes added to create colored products, and in some cases a small amount of blue and black dye are added to create a bright white printing paper [11]. Brown paper pulp, such as paper pulp used to make paper towels, is not bleached.

The pulp, which is now 99 percent water and one percent fiber at this stage, may be combined with pulp made from new materials to enhance its properties, and is then pumped over onto a paper machine [12].

Step 5: Drying / finishing for reuse

The pulp is then passed over rollers that press out excess water, or a vibrating machine to create a product made of 50 percent water and 50 percent fiber. The pulp can be used alone or additional virgin wood fiber can be added to the pulp to give the paper extra strength or smoothness.



If coated paper is desired for smooth printing, a coating mixture may be applied to the paper near the end of the paper-making process or after the process is completed.

Next, the sheets pass through steam heated rollers, at temperatures as high as 130 degrees Fahrenheit to form long rolls of continuous sheets of flattened paper. A single roll of this paper can be as wide as 30 feet and weigh up to 27 metric tons [12].



At this stage, coatings such as potato starch are sometimes added to the paper to keep ink from spreading like it does when writing on tissue paper. The ends of the roll are then trimmed and recycled to make new pulp [11].

The resulting paper roll is then shortened into smaller sections and sent to various manufacturers that use paper to make their product, such as newspaper printing, wrapping paper, printing paper, and blown-in cellulose insulation.



The whole recycling process for newspaper takes about 7 days, and studies suggest that paper can be recycled approximately 7 times before losing its integrity.

Unfortunately, there is a limit to how much recovered paper can be recycled. During the paper recycling process, the individual paper fibers are shortened more and more each time they are recycled, and generally have a maximum limit of 7 times that they can be recycled. Such “end of the line” paper products include products like cardboard egg cartons that can no longer be recycled.

The best way to dispose of these products in an environmentally-friendly way is to compost them.



Where and how to recycle paper?

The availability of recycling programs varies across the United States [6], and across the world. Most communities and offices in the United States accept at least some grades of paper at curbside pickup.

If you are unfamiliar with your local recycling programs, don't hesitate to ask your neighbors.



Most curbside recycling programs pick up recyclables once a week; check with your local program to determine the appropriate day to take your recyclables to the curbside to prevent unintentional disposal in landfills.

Even though recycling programs are largely available throughout the United States, paper makes up approximately 25 – 33 percent of our annual garbage output [12,13].

What Paper Can Be Recycled?

Almost all paper types can be recycled, including magazines, corrugated cardboard, printer paper, packaging papers, newspaper, cardboard dairy and juice cartons, unsolicited direct mail, phone books, and more [8].

As a general rule, if you can tear the paper, it's probably accepted at your curbside pickup program.

It is very important to check with your recycling company to determine which types of paper products can be recycled and which ones cannot.

For instance, **used paper towels and paper plates cannot be recycled** because they contain food particles. However, in most cases, such paper products **can be composted in your backyard or**



composted by your local waste management company or municipality.

Below are a few tips to increase the recyclability of recovered paper:

Recycling of certain types of paper, such as paper lined with plastic found in frozen food boxes, and milk and juice cartons are limited in some areas.

Remove sensitive information using a black marker instead of shredding paper. Shredding paper reduces the fiber length, thus reducing the number of times it can be recycled.

Break down cardboard boxes to save room in your recycling bin.

Avoid getting paper wet, as it reduces the paper quality. It's sensible to rinse and air dry all plastic and glass containers before putting them in the recycling bin but prevent wetting the paper. Wait until morning to put the recycling bin at the curbside if rain is possible [13].



How to recycle paper at home?

Recycling paper is not only for paper mills; you can also recycle paper at home by following a few simple steps.

Here's what you'll need:



Waste paper (never use glossy paper like magazines)

Water

Blender

Old picture frame

Screen or mesh (secure firmly to the picture frame)

Cloth or sponge

13" x 9" pan

Wildflower or vegetable seeds for decoration (optional)

First, affix the screen or mesh to an old picture frame using nails, staples, or glue to make a paper mold.

Then follow the below steps:

Tear paper into small pieces and add to a blender with warm water. Blend the mixture until the pulp is a smooth consistency.

Set the picture frame mold into a 13" x 9" pan, then pour the pulp into the pan. Make sure the mold is well-covered, then pull the mold up. Seeds and wildflowers can be added at this stage – cover the seeds with a little more pulp to embed fully in the paper.

Using a towel or sponge, press out the excess water and let the paper dry for a day or two. The pulp can dry directly on the



screen or flip the mold over and let it dry on another surface [14].

Optional: After use, place the paper on a loosened soil surface and cover with a thin layer of soil. Sprinkle with water to keep the area damp, and watch your seeds take off!



Examples of recycled paper products

Recycled paper products are used in our everyday lives, and you may not even be aware that you are using it. In fact, an estimated 200 million tons of paper and cardboard are produced annually from recycled paper sources. That's a lot of recovered paper that can be made into new products!

The most common examples of products made from recycled paper are white printing paper, toilet paper and tissues, paper towels and napkins, greeting cards, cardboard, and magazine and newspapers [15].





Creative retailers are also selling other items that have not traditionally been made from recycled paper. For instance, [Ten Thousand Villages](#) sell flower vases, picture frames, clocks, and other crafts made from recycled paper [16].



In the United States alone, approximately 1 billion trees worth of paper is discarded each year [5].

Currently, the total amount of wood and paper that is thrown away each year is enough to heat 50,000,000 homes for 20 years.

If we wish to preserve the natural environment for our children and grandchildren, each of us need to take a stance against needless waste and commit to recycling the paper that we do use.

Will you make a commitment to reduce, reuse, and recycle paper in your homes and offices today?

Further reading: [Why Is Recycling Important?](#)



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