

## Greenpac Mill: The Fiber of Niagara's Circular Economy

Today, much of the world economy operates in a linear fashion—we extract resources from the earth, manufacture and produce materials, distribute them to customers who use them, and then discard the materials and their byproducts. And then the process repeats.

But different nations have, to varying degrees, been able to return some materials back to the economy through reuse and recycling.

For example, countries like Germany, Austria and the Netherlands are successfully recycling 60 percent of their municipal solid waste. Countries like the United States and Canada, however, still have some way to go. Even when U.S. and Canadian companies recycle well, the outcomes aren't always spectacular, sometimes resulting in lower quality products—a process colloquially called “downcycling.”

In contrast, a circular economy aims to fix this problem, keeping materials at their highest value possible by utilizing sustainable solutions to fit them into the supply chain where they can be fully recycled into new, high-quality products, or their components can be used as inputs for other processes that support some function of manufacturing, fuel creation or energy generation.

A significant example of a circular economy in action today can be found in Niagara Falls, New York and its success is the direct result of several companies' partnerships with Reworld™.

Here, companies from a variety of industries work with Reworld™ to reduce their waste generation and turn what waste is unavoidable into new

products, low-carbon fuels and carbon-negative energy. And there's a lot of waste to work with.

Managing several thousand tons of it per day, Reworld™ is able to significantly reduce these partners' carbon footprints and supply ample resources to their manufacturing processes.

“Another thing to note is that we're able to secure a predictable price for exporting steam and other resources that is potentially higher than what we would get for a wholesale price on the market—something very attractive to our stakeholders,” said Dave Burke, manager of export steam sales at Reworld™.

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“From the customer’s perspective, they’re likely going to get a reduced price on their energy and be able to capitalize on the added benefits of avoiding landfill disposal and the risk that comes with it while furthering their environmental—and financial—goals. What’s more, is that by providing turnkey steam, electricity and alternative fuel solutions to our customers, it eliminates their reliance on fossil-fueled boilers and kilns. Ultimately, this allows them to focus on their core businesses without ever having to choose between performance and sustainability. It’s a real competitive advantage.”

## Following the Inputs and Outputs

So, where does the circular process in Niagara start? It all begins at Greenpac Mill, with the many bales of waste paper that have been collected from local businesses and the surrounding community.

Considered the most advanced and largest facility of its kind in North America, Greenpac Mill manufactures a lightweight linerboard made with 100 percent recycled fibers and has an annual production capacity of more than 540,000 tons.

One of the qualities that makes their product stand out, is that their linerboard is produced with significantly less water and less fiber than similar strength paper, making Greenpac’s product one of the strongest fully-recycled linerboard around.

But not every bit of paper sent to Greenpac Mill can be used. Nearly all recycling processes generate waste, and paper recycling is no exception.

In addition to the short fibers, clays and other fillers that give some paper materials an inability to be properly recycled, there are also a number of external variables that contribute to a bale being deemed contaminated. These variables are often plastics, metals, glass and other non-paper materials finding their way into the mix.

But the amount of contamination depends on the source of the recovered material and its grade. Some bales from single stream curbside recycling programs can have up to 40 percent non-paper contamination, resulting in a good deal of “unsalvageable” materials being left to manage.

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So what becomes of it? It goes to Reworld™ where it is reimaged into a different kind of resource.

## Closing the Loop on Circularity

One way Reworld™ creates value from Greenpac Mill's unrecyclable waste is by turning it into a new product—a popular one being agricultural bedding.

Waste from cardboard paper mills serve as an excellent input for agricultural bedding manufacturing, as the supply is consistent, reliable, and takes to the processing extremely well.

It's a procedure that involves superheating paper fibers in a 7 million BTU triple pass drying system; injecting them with a special liming agent; and further refining them to eliminate bacteria and moisture—a process that also prevents their future buildup. The result is a 100% biodegradable fiber bedding that's wholly superior to its more traditionally made peers.

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This alternative engineered fuel is made by running “unsalvageable” waste—such as thin film plastics, packaging scrap, waxy cardboard and a variety of other materials (a number of which are common contaminants in cardboard paper bales)—through a series of sophisticated shredder and metal recovery systems.

During this process, metals are extracted for other recycling channels while the remaining materials are customized to fit the boiler input needs of different customers, including cement and lime kilns, power plants, and conveniently, paper mills.

A final key value creation solution for unsalvageable materials is renewable energy recovery through composting, anaerobic digestion, or one of the most prominent technologies at Reworld™ thermomechanical treatment facilities, waste-to-energy processing.

When materials undergo this type of processing, they get metered onto a state-of-the-art grate system to be readied for combustion. During the combustion process, water in steel boiler tubes is heated up and converted into renewable, high-temperature steam

that gets sent back to the Niagara community as electricity for more than 15,000 homes per year.

Additionally, this technology synergizes with ReCredit, another key Reworld™ solution. This service line generates renewable energy credits (RECs) that can help businesses to further offset their carbon footprints. In fact, credits derived from this solution are 10 times more impactful than those derived from solar or wind sources due to the methane that is avoided from diverting waste from landfill disposal.

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## Perpetual Value Creation

What's especially interesting in this relationship, is that regardless of whether waste materials are transmuted into bedding, fuel, or energy, their lifecycles don't end there—they find their way back to market in some form after that use, creating a circular economy.

- Animal bedding can once again be made into bedding or be used as a feed to alternative engineered fuels or waste-to-energy processing.

- Alternative engineered fuels can satisfy systems in Greenpac Mill and its neighboring businesses.
- Steam and electricity generated during waste-to-energy conversion becomes an input too. In the case of Niagara, steam is sent from Reworld™ through a direct line to Greenpac Mill: where it is used for drying paper in the manufacturing process. Steam is also sent to the adjacent Praxair, Goodyear, Niacet and Norampac sites, for use in their operations.

In these various ways, “waste” becomes inputs for products and energy, which are then used as inputs for other processes at Greenpac and the surrounding region. More manufacturing is fueled, which in turn creates more waste that can once again be used as an input to more products and energy in a closed-loop cycle.

Through this partnership, Greenpac Mill annually diverts more than 12,000 tons of greenhouse gases from entering the environment—an equivalent comparable to removing 2.5 thousand cars from the roads for an entire year.

But helping create a circular economy within their part of Niagara has not only made them a local sustainability leader, it has also optimized their efficiency, improved their bottom line, and given them a powerful story on what can be achieved when great goals are met with even greater support.



**Reworld™**  
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**Reimagine waste into a resource.**  
Talk to us today.