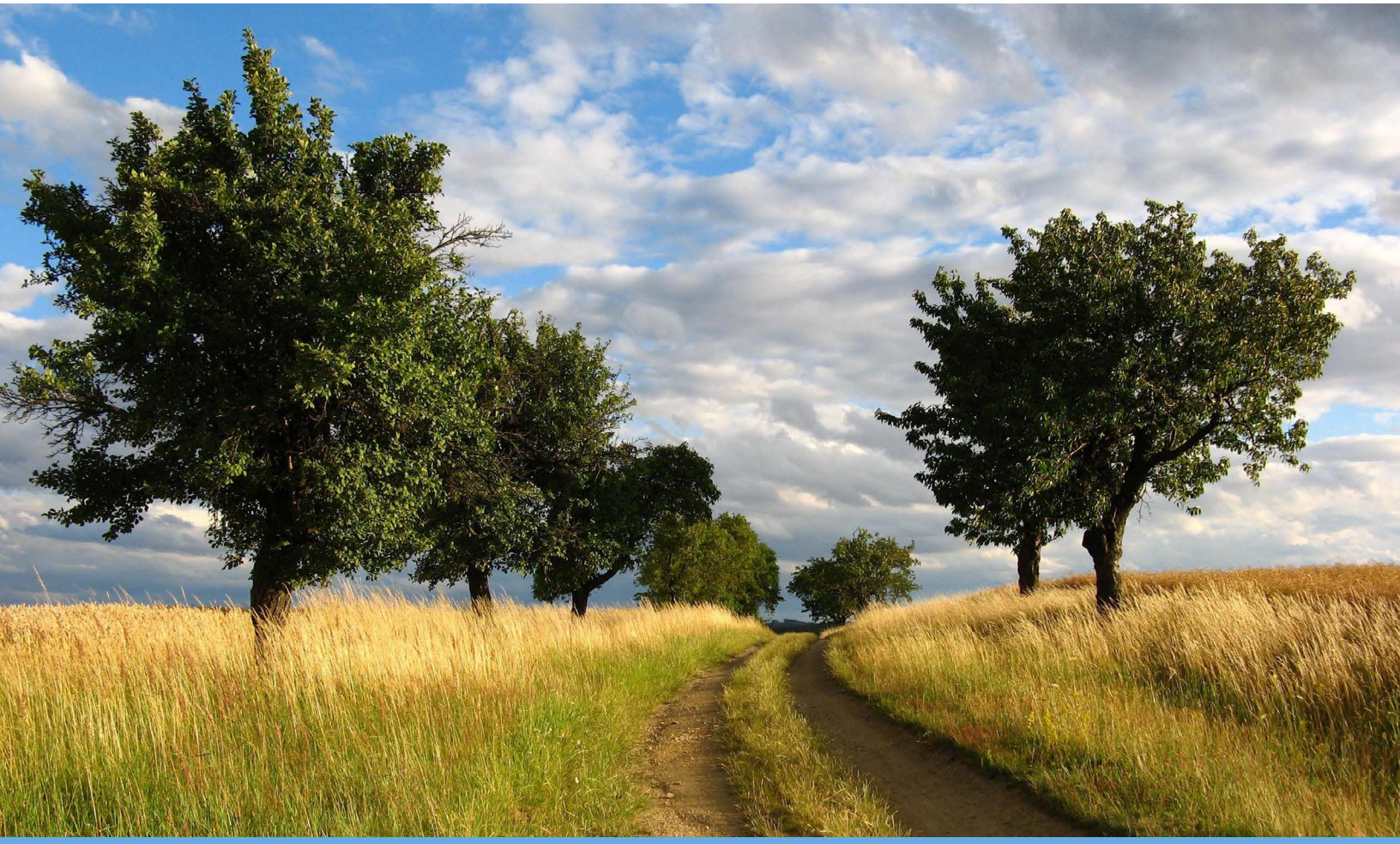
TAPECON®

CONFIDENCE THROUGH BETTER PRODUCT SOLUTIONS



MAKING A BETTER FUTURE

Sustainability Guide

Best practices for sustainable manufacturing, printing, and materials selection

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IN THIS GUIDE

For over 100 years, Tapecon has partnered with product teams to develop, scale, and deliver better products through responsive and reliable printing, converting, and advanced manufacturing.

GREENER MANUFACTURING FOR THE GREATER GOOD

As the effects of climate change impact communities around the globe, there's a growing understanding that environmental stewardship is a shared responsibility. Within manufacturing, sustainability has become a popular buzzword and strategic objective. But what does it mean, and what can companies do to achieve greater sustainability in their products and processes? In this guide, we'll cover best practices for materials selection, printing, and converting processes, and explain how companies can focus on the triple bottom line – profit, people, and the planet.

What is sustainable manufacturing?

Sustainable manufacturing, commonly called green manufacturing, is a broad concept revolving around minimizing the industry's environmental impact across the entire supply chain, conserving natural resources, and creating more environmentally sound products.

There are several ways that companies can implement sustainable practices, including:

- *Improving product design and material selection to reduce waste*
- *Enhancing the efficiency of manufacturing processes and operational procedures*
- *Promoting recycling, re-manufacturing, and refurbishment of products*
- *Reducing energy consumption, particularly unsustainable fossil fuels*
- *Working with vendors and manufacturing partners that share a commitment to sustainability*

Fast Facts

According to the EPA, American manufacturing accounts for nearly

23%

of global carbon emissions

The U.S. is also responsible for

2.2

million metric tons of plastic pollution ending up in the ocean

Globally, manufacturing uses about

1/3

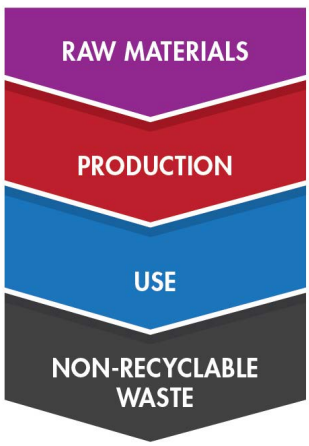
of the world's energy

WHERE MANUFACTURING FITS IN THE BIG PICTURE

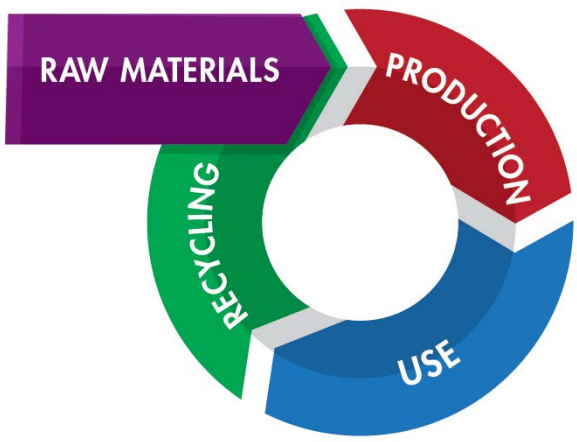
In 2015, the United Nations introduced the Sustainable Development Goals (SDGs), also known as the 17 Global Goals. These interconnected areas are intended to end poverty, fight inequity, and address climate change by 2030. By implanting sustainable practices, manufacturing can contribute to at least three of the 17 Global Goals. Good Health and Well-being, Decent Work and Economic Growth and Responsible Consumption and Product.

Shifting to a circular economy

To fully achieve sustainable manufacturing, we – as an industry and society – must first rethink how products are made and used. The traditional linear economy follows a take-make-and-dispose process. This model relies heavily on raw materials –and the majority of products are disposed of after use. However, in a circular economy, products are designed to promote as much reuse as possible. This make-use-return model continuously repurposes materials, resulting in less disposed waste.



Linear Economy



Circular Economy

Business objectives and benefits

Beyond being "the right thing to do," a growing number of manufacturers are embracing sustainability to fulfill their business needs and strategic objects.

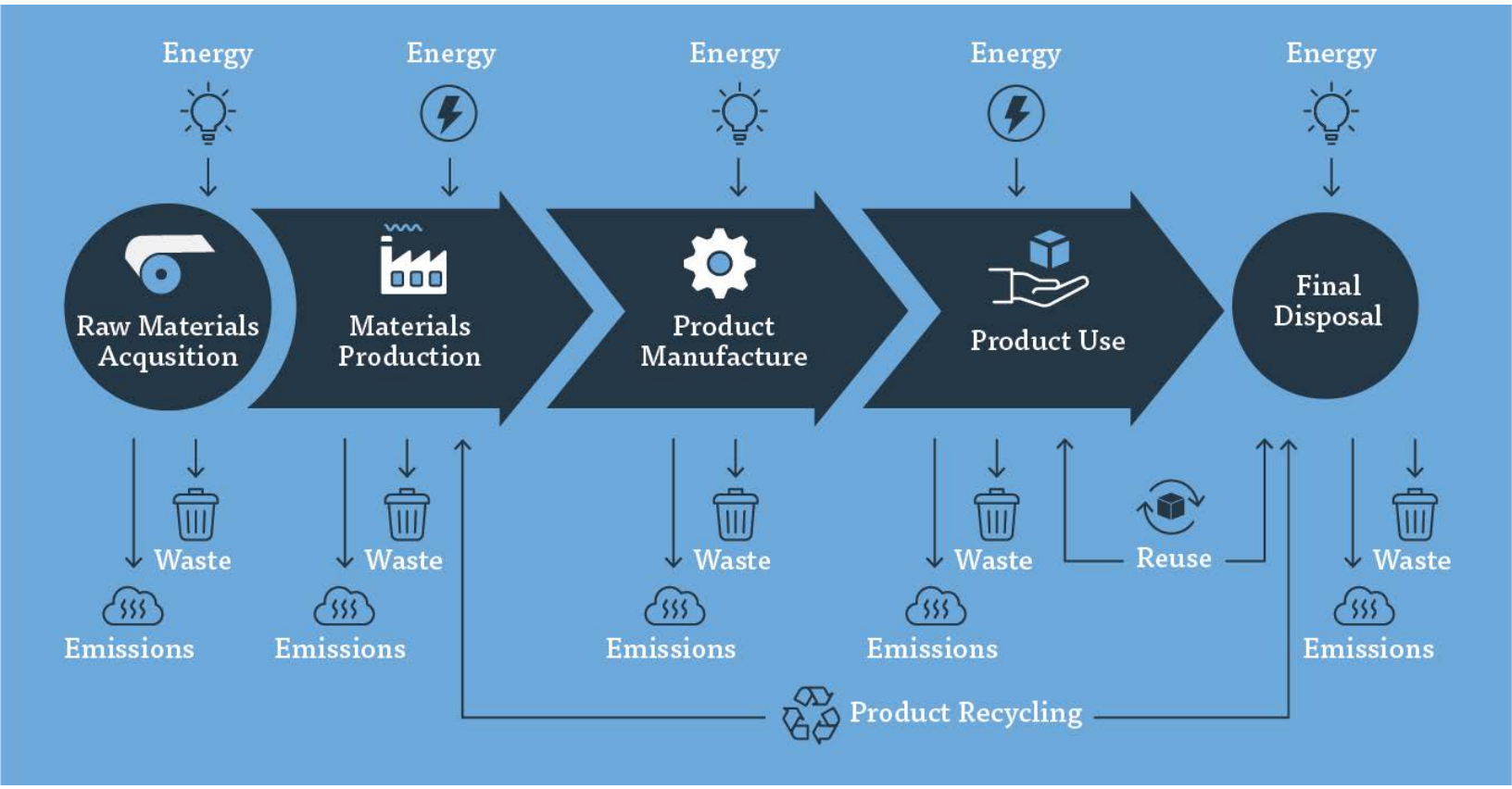
- *Meet consumer demand for environmentally friendly products*
- *Adhere to industry or regulatory requirements*
- *Align with values of retailer or distribution partners*
- *Reduce costs and increase operational efficiency*
- *Enhance branding, marketing, and public relations initiatives*
- *Position for long-term profitability and success*

LIFE CYCLE ASSESSMENT

One tool that can be valuable in developing a sustainability plan is the Life Cycle Assessment (LCA), which is a study of a product from the cradle to the grave. The analysis considers the actions and environmental impact of raw material extraction, manufacturing, distribution, the long-term use of the product, and how it can be recycled or disposed.

A holistic LCA study:

- *Challenges companies to consider the long-term impact of their products, including how consumers use them*
- *Provides quantitative measures to help designers and engineers to make more informed design decisions*
- *Encourages multiple stakeholders to work in collaboration*
- *Formalizes, coordinates, and integrates sustainability practices across the company, supply chain, and distribution partners*
- *Encourages strategic planning and implementation of innovation to improve outcomes*



BEST PRACTICES FOR MATERIALS SELECTION

Material selection and usage can play a significant role in the sustainability efforts of product designers, engineers, and manufacturers. Sustainable material considerations include reducing the amount of materials used in the product, incorporating more renewable, recyclable, compostable, or reusable materials, and optimizing processes to maximize material use and reduce waste.

Incorporate eco-friendly packaging

Packaging is often the first areas companies look to improve the sustainability of their products. Advancements in materials science and access to recycled content make eco-friendly packaging more feasible and cost-efficient. However, before new material is incorporated into your application, it should meet the following criteria:

- *Material of the new packaging should not compromise the product's quality, appearance, performance, or other aspects that customers expect*
- *New materials should be compatible with your manufacturing process*

Evaluate plastics for recyclability

By the latest estimates, the world produces over 418 million tons of plastic per year. Packaging represents the largest producer with 42% of primary plastic. While recycling has increased over the past few decades, only about 20% of plastic waste was recycled (source: OurWorldinData.org). For the majority of plastic that is discarded, it can take between 20 to 500 years for the material to decompose. To improve the sustainability of products and packaging, manufacturers should be aware of recyclability for each type of plastic. In general, multi-polymers make recycling more difficult. When possible, the use of PET, HDPE, or compostable plastics is the more sustainable option.

Plastic Number	1	2	3	4	5	6	7
Name	*PET Polyethylene terephthalate*	*HDPE High-density polyethylene*	*PVC (Polyvinyl chloride)*	*LDPE (Low-density polyethylene)*	*PP (Polypropylene)*	*PS (Polystyrene)*	*Other*
Recyclability	*Easy*	*Easy*	*Very difficult*	*Manageable*	*Manageable*	*Difficult*	*Very difficult*
Typical Applications	*Food and beverage bottles, liners*	*Food and consumer goods containers*	*Toys, furniture, pipes*	*Bags and packaging films*	*Food containers bottle caps, straws*	*Foam products and packaging*	*Products with blends of materials*

Incorporate more sustainable paper products

Paper is often considered more sustainable than plastic for product and packaging due to shorter decomposition time and higher recyclability.

A simple way to improve the sustainability of your product or packaging is by sourcing FSC® certified paper materials. The certification is overseen by the Forest Stewardship Council, which sets standards to prevent deforestation, protect water quality, restrict the use of highly hazardous materials, and more.

Paper packing products can also be made from non-traditional yet sustainable materials such as wheat, hemp, crop waste, and other non-wood pulps.

Consider other sustainable materials

In addition to paper, there are many other materials and solutions to improve the sustainability of your product or packaging.

- *Bioplastics – made from carbon-based or biodegradable materials*
- *Compostable materials*
- *Made from post-consumer waste*
- *Made from post-industrial waste*
- *Liner-less labels*
- *Green adhesives*
- *Engineered materials such as Dupont Tyvek® (Shown above)*

BEST PRACTICES FOR SUSTAINABLE PRINTING

Printing is often an overlooked area of sustainability initiatives. While not as visible or tangible as materials selection, optimizing printing methods and processes can help increase recycling and reduce waste, energy consumption, water contamination, and more.

Prioritizing deinking

As paper recycling becomes increasingly important, manufacturers and printers must be aware of deinkability and take the necessary steps to improve their paper products' recyclability.

Deinking is the process of separating and removing ink from printed graphics on paper products. The goal is to remove as much ink as possible in order to recycle the paper at a similar quality level as the original product. If a high level of deinking is not possible, then the paper may be recycled for lower-grade paper products.

A common way of determining the recyclability of paper products is by calculating the Deinkability Score. Created by the European Paper Recycling Council, the Deinkability Score is based on five parameters – luminosity, color, cleanliness, ink elimination, and filtrate darkening. The Deinkability Score is the summation of individual category scores; however, the product must meet a minimum threshold in each category to be suitable for deinking.

Score *(total points)*	Evaluation *of deinkability*
71-100	Good
51-70	Fair
0-50	Tolerable
< 0 *(failed to meet at least one threshold)*	Not suitable for deinking *(may be recycled without deinking)*

Fast Facts

Recycling one ton of paper can save an estimated 17 trees, 7,000 gallons of water, 380 gallons of oil, three cubic yards of landfill space and 4,000kW of energy

17 *Trees*

7K *Gallons of water*

380 *Gallons of oil*

3 *Cu. yards of landfill space*

4K *kW of energy*

Eliminate solvents and VOCs

Volatile organic compounds (VOCs) are proven to be harmful to both humans and the environment. Unfortunately, VOCs are also commonly found in solvent-based inks and cleaning solutions used in traditional printing operations. To reduce VOC emissions and comply with new regulations, printers can transition to water-based inks and adopt more environmentally friendly processes such as flexographic printing.

Improve ink management

Investing in an efficient ink and color management system – through high-quality presses and optimized processes – can reduce ink usage and waste. Improving ink efficiency can also result in shorter drying times, higher capacity and production speed, and higher image quality.

Switching to dry toner

Replacing chemical toner with dry toner for your industrial printing process has several environmental benefits:

- *Dry toner particles are mechanically altered (size and shape), whereas chemical toner particles are modified in a solution*
- *Printing with dry toner consumes less energy and water than chemical toner*
- *Dry toner can produce less waste*
- *Certain dry toner products have deinkability scores of 90 and above, guaranteeing recyclability of printed products on recyclable materials*
- *Dry toners for labeling and packaging products are approved and safe for food, toys, and clothing*

BEST PRACTICES FOR ADVANCED MANUFACTURING

Sustainable manufacturing is not a single step or "set it and forget it" process. Instead, it's a comprehensive set of principles that connect people and processes throughout the organization. The most successful sustainability strategies come from the top of the organization and require buy-in and consistent evaluation at all levels.

Improve processes and procedures to:

- *Reduce energy consumption*
- *Maximize material use and minimize waste*
- *Reduce emissions and pollution*
- *Improve chemical handling*

Enhance logistics and product shelf life to:

- *Reduce fuel usage for transport*
- *Minimize waste of food, pharmaceuticals, and other perishable goods*

Implement policies that:

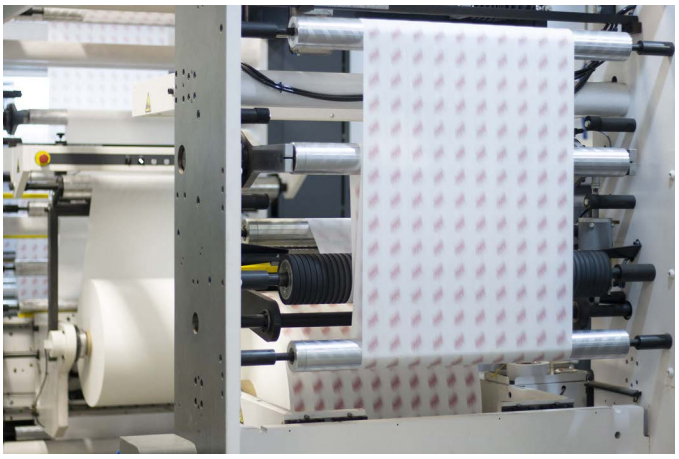
- *Prioritize employee health and wellbeing*
- *Make a positive community impact, environmentally and socially*

Minimize environmental impact by:

- *Conserving fossil fuel energy and exploring alternative energy options*
- *Reduce waste and water consumption*
- *Improve waste disposal and processing – recycling, reusing, composting, etc.*

TAPECON'S SUSTAINABILITY INITIATIVES

As a company with a long history of embracing innovation, Tapecon established a multi-faceted sustainability plan in 2015. We continually evolve and enhance the plan to further reduce our impact on the environment.



Facility and technology improvements

Tapecon installed new utility and production equipment that offer improved performance and energy efficiency, including:

- *Energy-efficient compressors, LED lighting, and motion sensors*
- *Facility-wide energy management system to improve the efficiency of our HVAC equipment*
- *New printing technology for efficient curing and drying of ink*
- *Recycling programs for paper, plastic, cardboard, e-waste, scrap metal, and pallets*

Reducing energy use

We've taken many steps to reduce the amount of energy it takes to produce high-quality products for our customers. After determining a baseline of our energy use, we measure and monitor our kWh usage monthly – and make it a goal to reduce that metric by 2% throughout the year.

Reducing waste and hazardous liquids

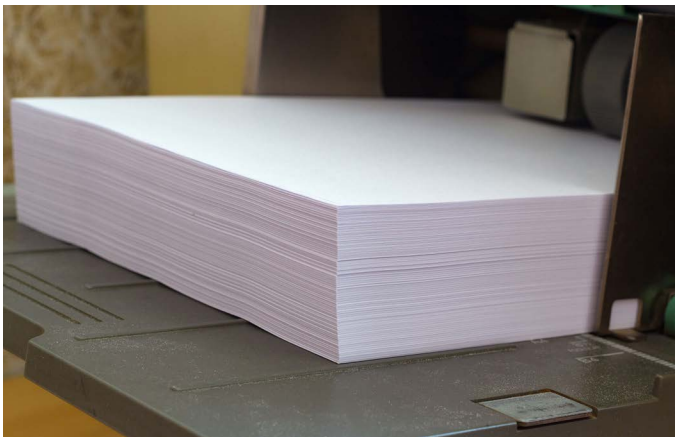
Tapecon designed processes to reduce hazardous waste by 10%, compared to baseline.

- *We've implemented new ink technologies in our printing processes that produce less waste and VOC emissions.*
- *Our team participated in the WNY Clean Production Leaders program, which works with small and medium-sized manufacturers to reduce their chemical footprint.*
- *We completed a Chemical Footprint Survey and are working on a Chemical Policy to create a management system that aims to avoid chemicals of high concern and select safer alternatives.*

Optimizing materials

Being mindful of how we use raw materials during converting or printing processes is crucial to minimizing waste. A few of our practices include:

- *Using a "first-in, first-out" inventory system that prioritizes using older chemicals prevents them from expiring before use*
- *Separating non-hazardous and hazardous waste streams to reduce the amount of hazardous waste that must be disposed of*
- *Sealing and containing processes to prevent the escape of fumes or leaks*
- *Carefully transferring chemicals to minimize spills and additional waste generated during cleanup*



Workforce Development

Tapecon team members are educated on practices and supported with a safe work environment. We provide communication and conduct training that helps our operators reduce hazardous waste, use less solvent and ink, and eliminate non-conforming products that lead to unnecessary waste.

Founding member of WNYSBR

As a sign of our commitment to Buffalo and the Western New York region, Tapecon was a founding member of the WNY Sustainable Roundtable (WNY SBR) in 2014. Today, the group is comprised of over 60 organizations that collaborate on environmentally friendly business practices.

Western New York
Sustainable Business Roundtable
Creating an environmentally and economically resilient Buffalo-Niagara

MAKING GREAT PRODUCTS AS SUSTAINABLE AS POSSIBLE

With over 100 years of manufacturing experience, Tapecon works with product teams to solve challenges, create products, and enhance lives. If you're seeking a manufacturing partner that prioritizes quality and sustainability, contact Tapecon or call (716) 854-1322 to discuss your project or request a quote.