

# New Resins from Bio-feedstock for Enhanced Sustainability

November 11, 2021



# The Presenters



**Mark Hazel,**  
Global and Regional Marketing



**Marta Dal Molin,**  
Delrin® Business Development

# Committed to Sustainability



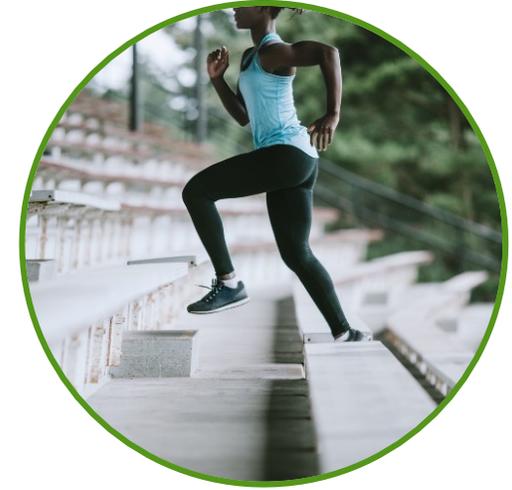
## innovate **now**

- Delivering solutions for global challenges
- Enabling a circular economy
- Innovating safer by design



## protect **now**

- Acting on climate
- Leading water stewardship
- Delivering world-class health and safety



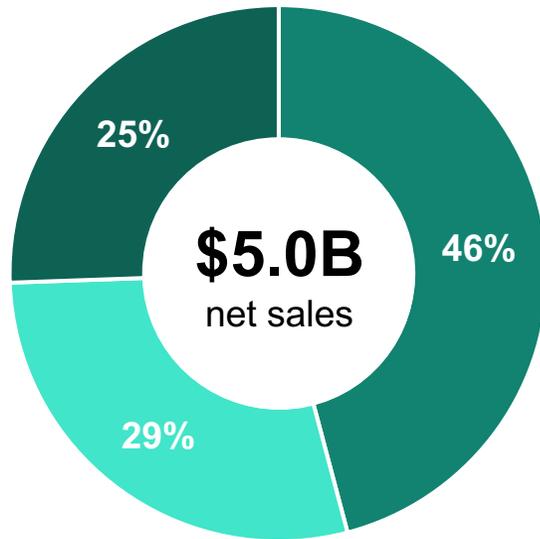
## empower **now**

- Accelerating diversity, equity and inclusion
- Cultivating wellbeing and fulfillment
- Building thriving communities

# Premier Multi-industrial with Market-leading Businesses

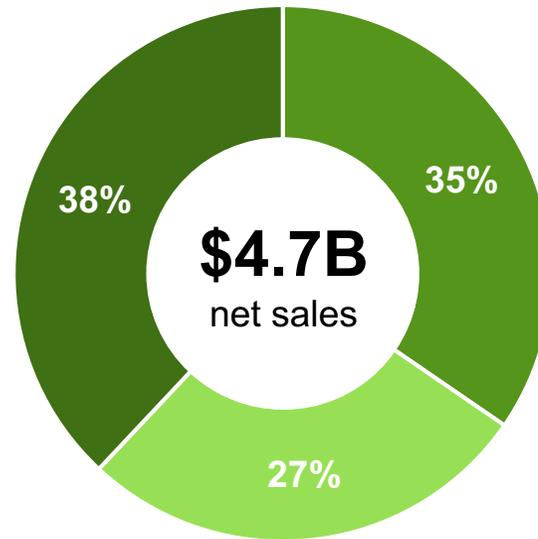
2020 Financial Data <sup>1</sup>

## Water & Protection



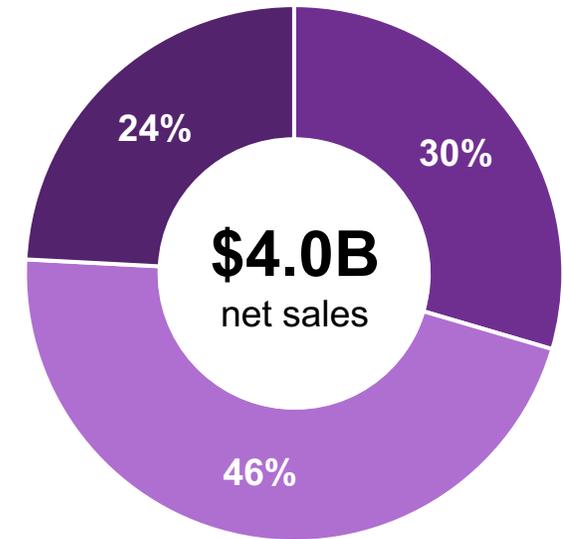
- Safety Solutions
- Shelter Solutions
- Water Solutions

## Electronics & Industrial



- Industrial Solutions
- Interconnect Solutions
- Semiconductor Technologies

## Mobility & Materials



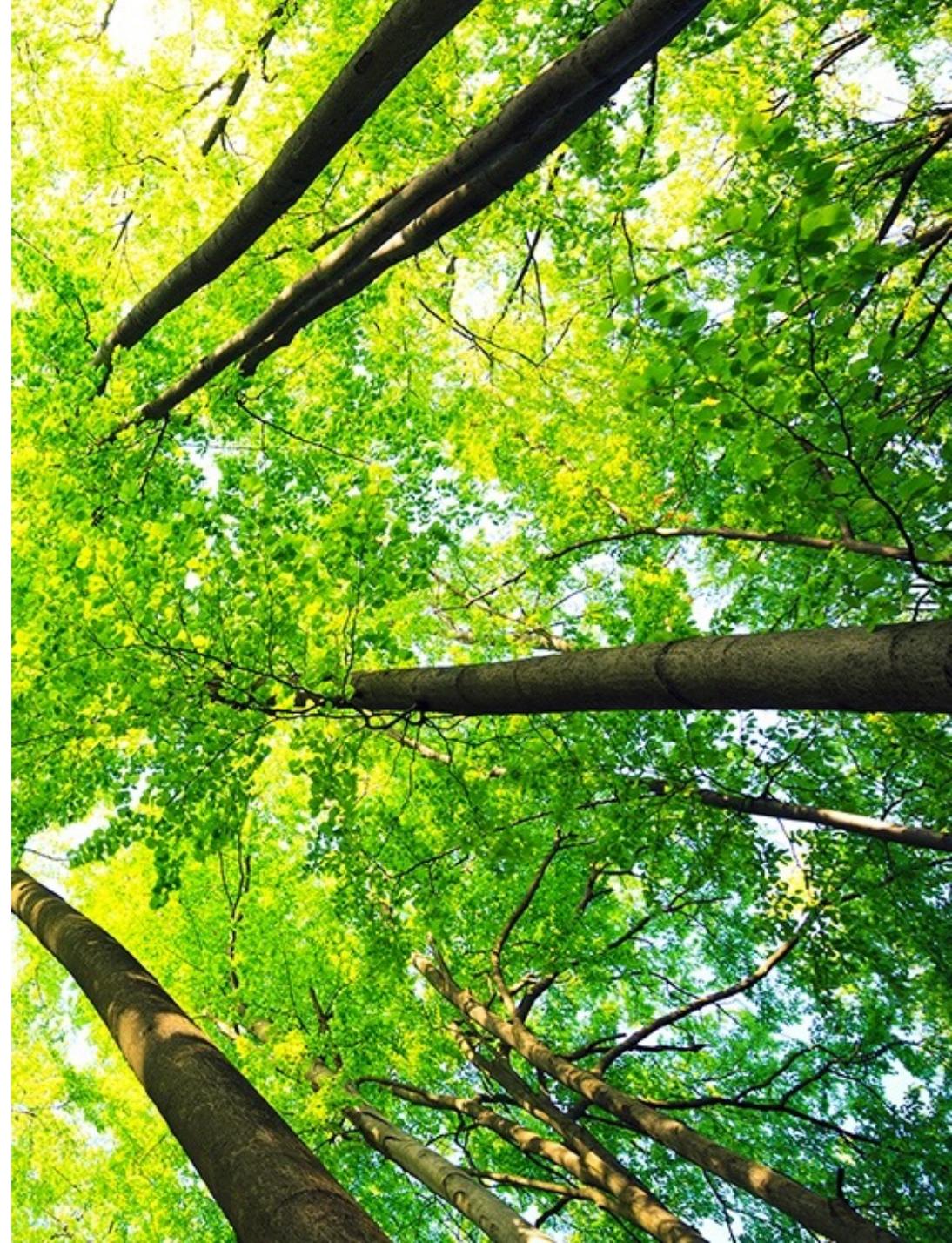
- Advanced Solutions
- Engineering Polymers
- Performance Resins



<sup>1</sup> Reflects revised, unaudited financial and select supplemental segment information included in [DuPont's Current Report on Form 8-K](#) filed on February 24, 2021. DuPont has signed agreements to divest the Biomaterials, Clean Technologies and Solamet businesses and these divestitures are expected to occur during 1H 2021 subject to regulatory approval and customary closing conditions. DuPont will report these businesses in Corporate through the date of the divestitures. Net sales and operating EBITDA for Corporate were \$666 million and \$70 million, respectively, for FY2020.

# Toughest Challenge:

Limit global warming below 1.5°C by  
decreasing greenhouse gas emissions



# Environmental Questions from Stakeholders

How can it be recycled?

How do we reduce our carbon footprint?

How can I accelerate the climate action at my company?

What is the mass balance approach?

What is sustainable design?

Is the sustainable benefit backed by data?



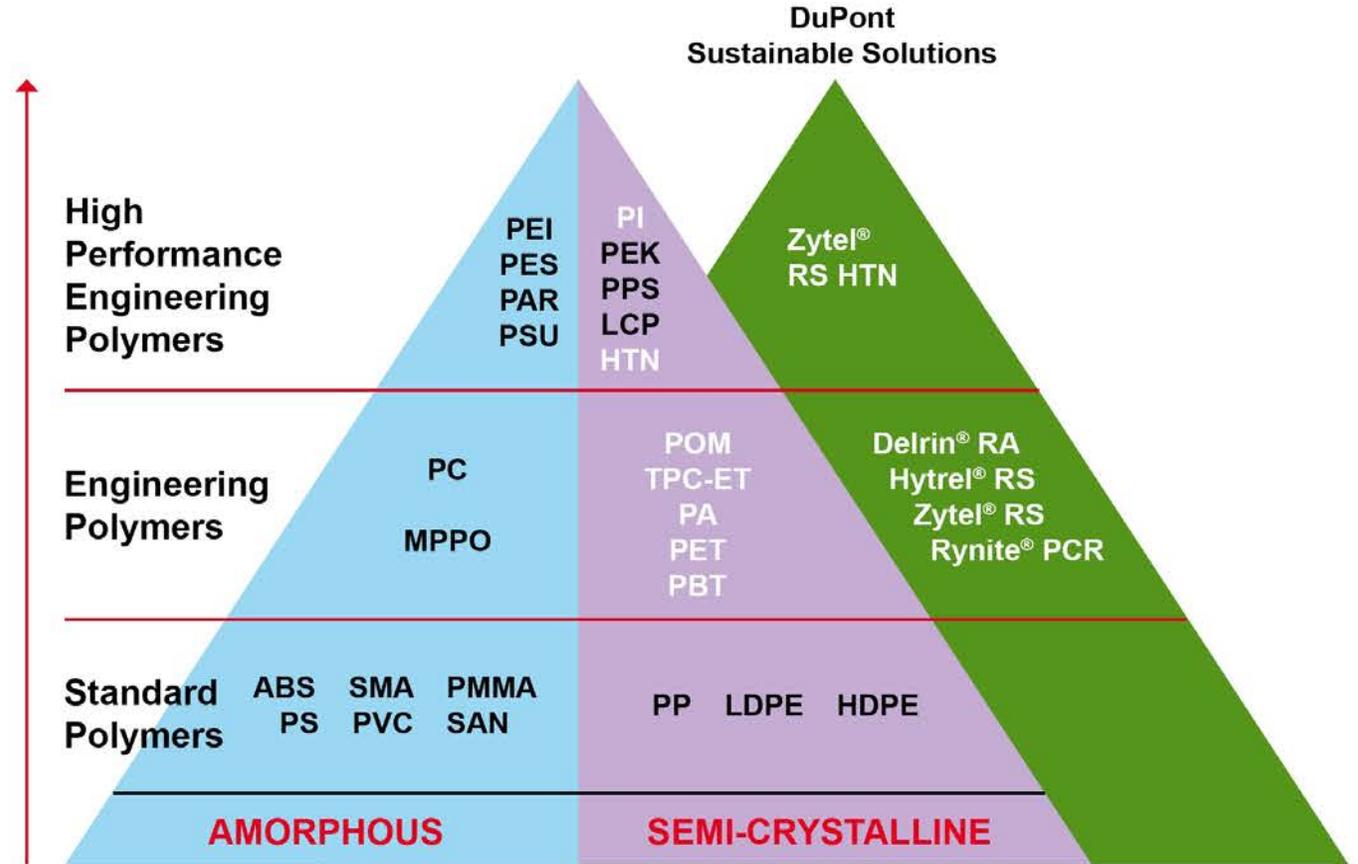
# How Can DuPont Help?

The environmental impact of materials has become an important parameter in the material selection, design and circularity goals.

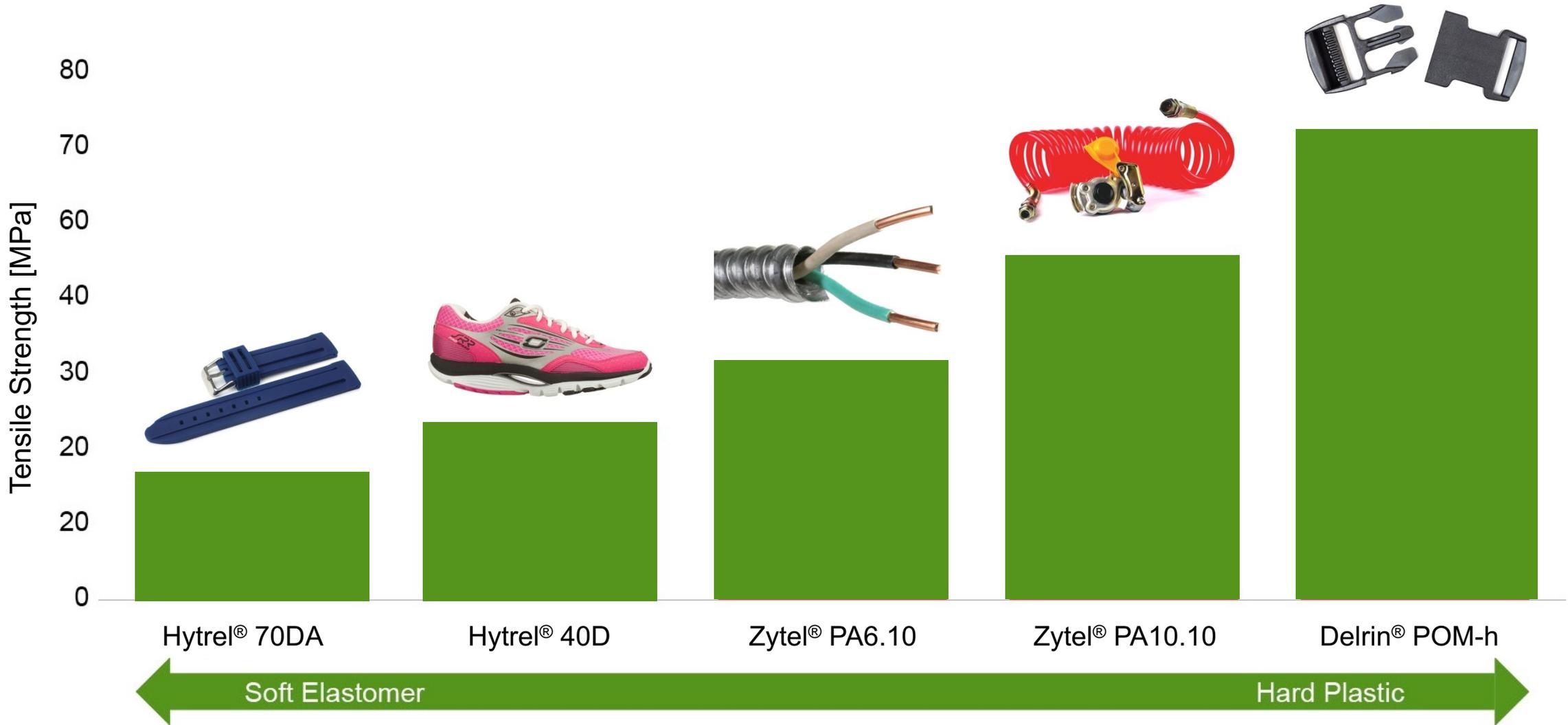


# Sustainable Resins Offering

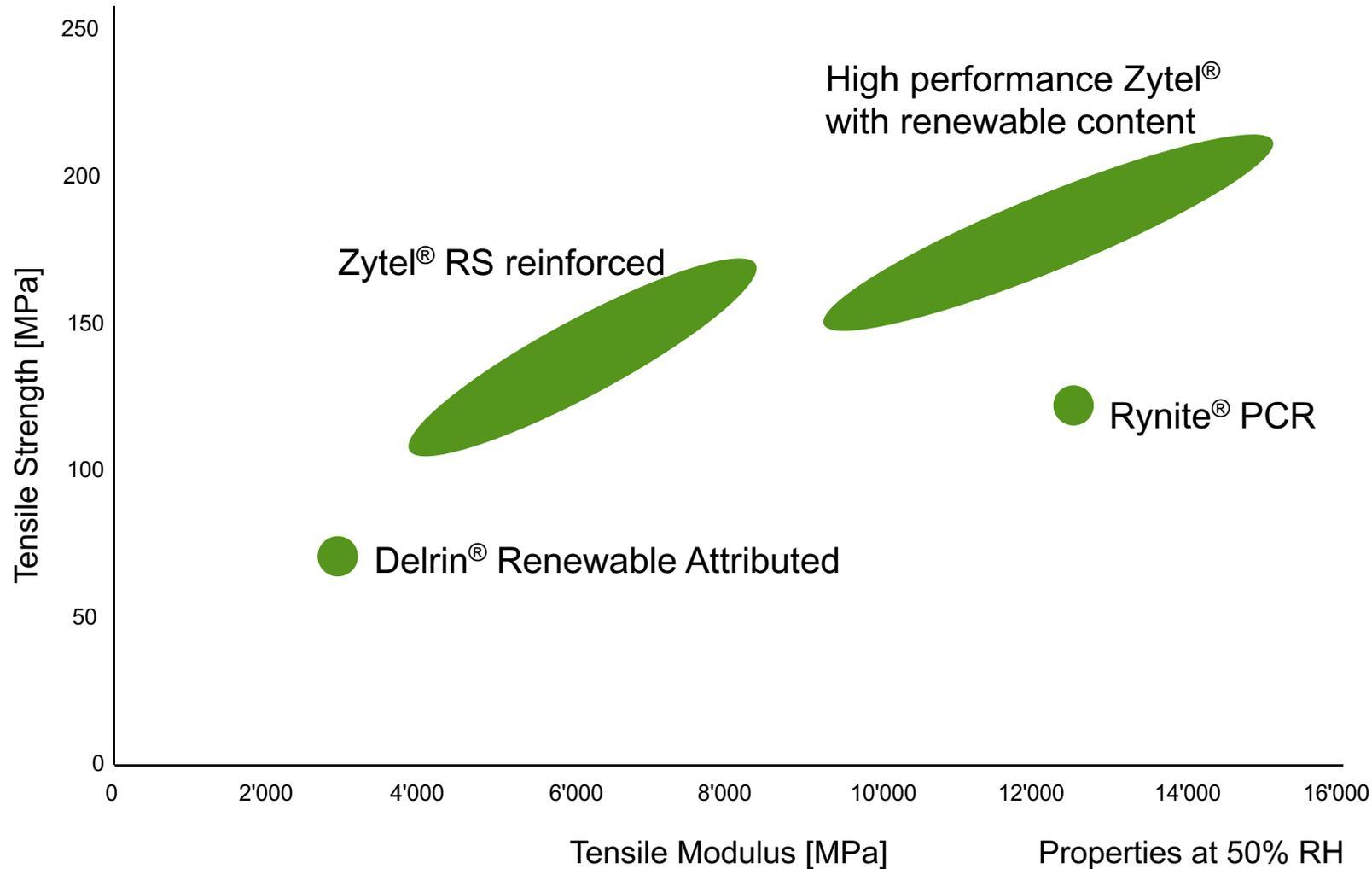
- Delrin® Renewable Attributed (RA)
- Hytel® RS Thermoplastic Elastomer
- Rynite® Post-consumer Recycled PET
- Zytel® RS 6,10 and 10,10 Long Chain Polyamides



# Range of Unreinforced Grades



# Materials for Metal Replacement



**Robotic vacuum cleaner**

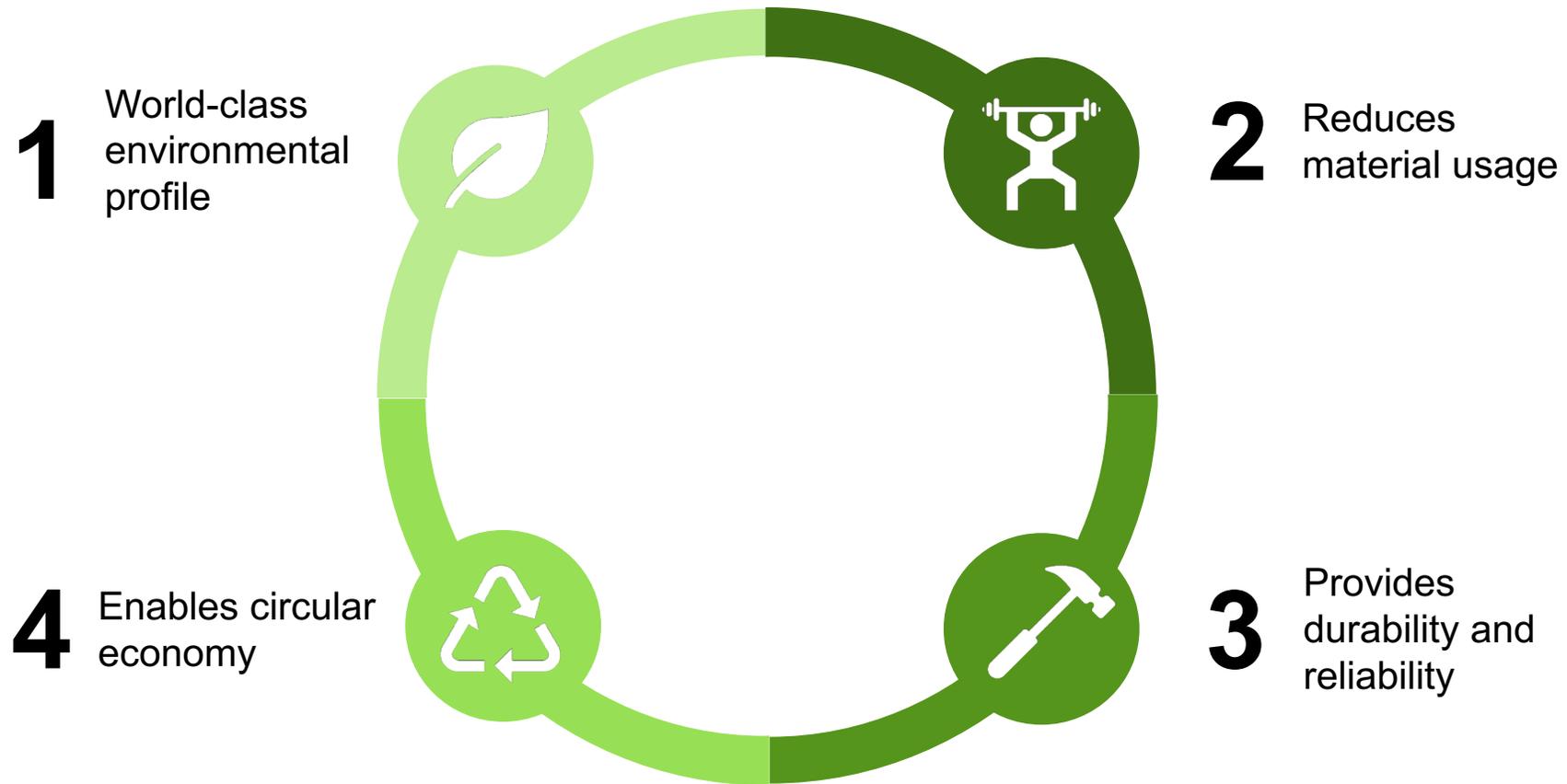


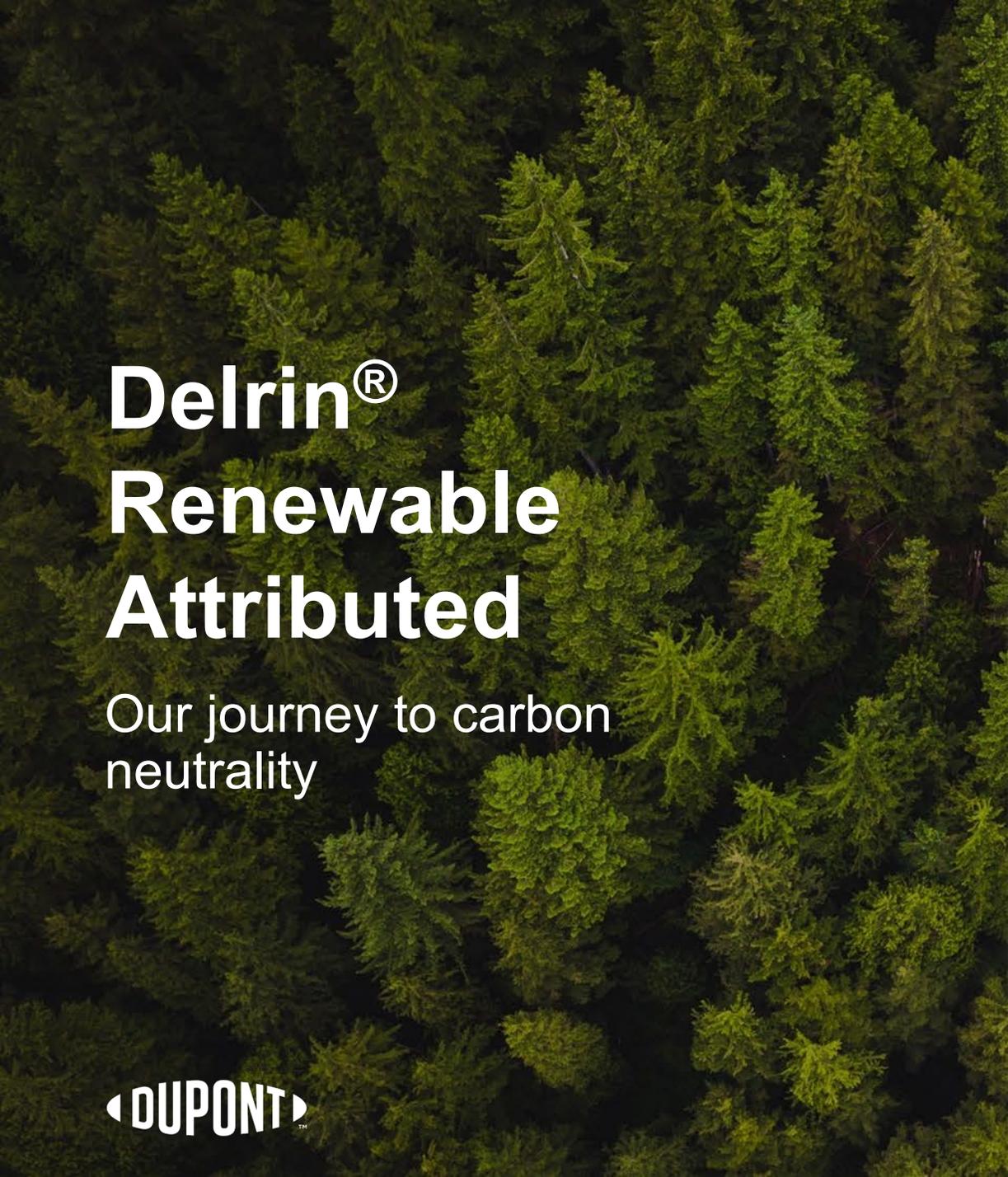
**Radiator end-tanks**

# Introducing Delrin® Renewable Attributed



# How Delrin<sup>®</sup> Renewable Attributed Enables Sustainable Design





# Delrin<sup>®</sup> Renewable Attributed

Our journey to carbon  
neutrality



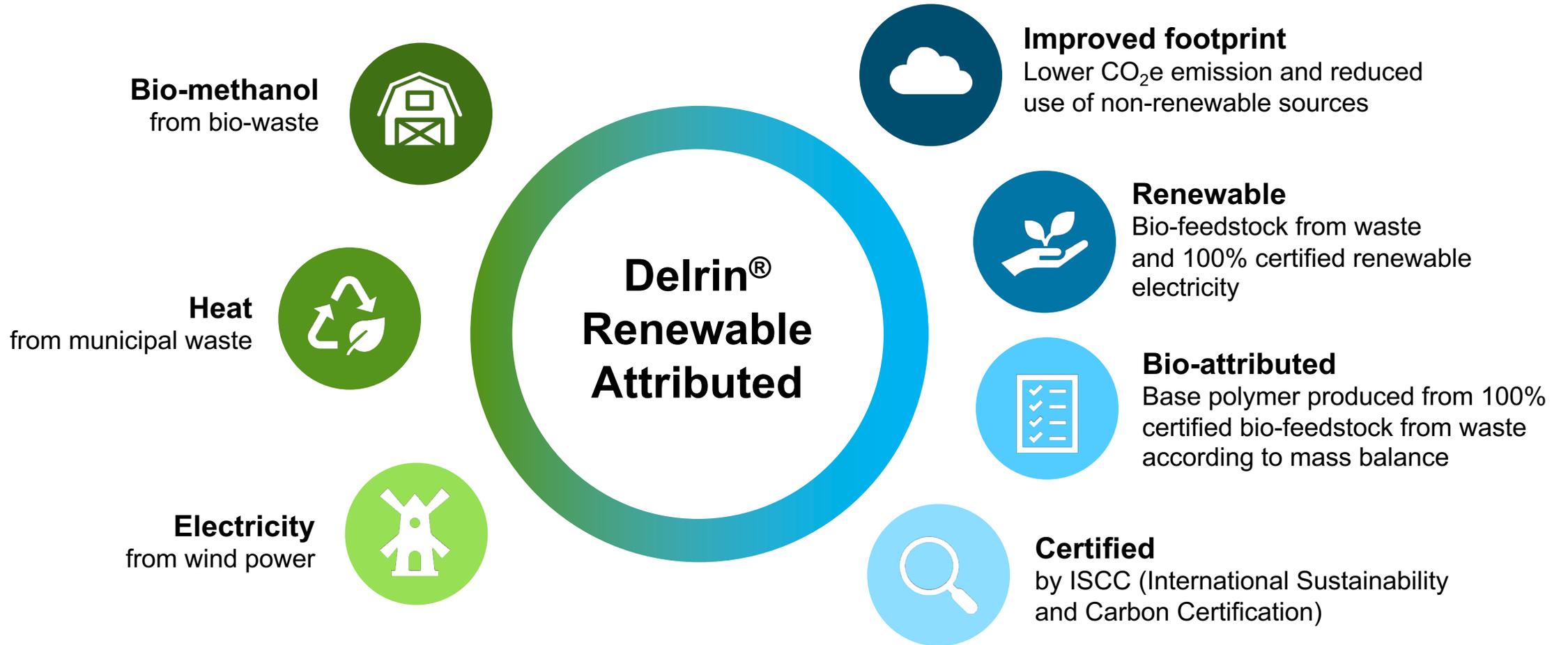
**World-class environmental profile**

Reduces material usage

Provides durability and reliability

Enables circular economy

# Delrin<sup>®</sup> Renewable Attributed: Our Journey to Carbon Neutrality



# Mass Balance: A Smooth Transition to Sustainable Feedstock

Fossil feedstock



Renewable feedstock

Segregated in bookkeeping  
Physically mixed



Segregated in bookkeeping  
Physically mixed

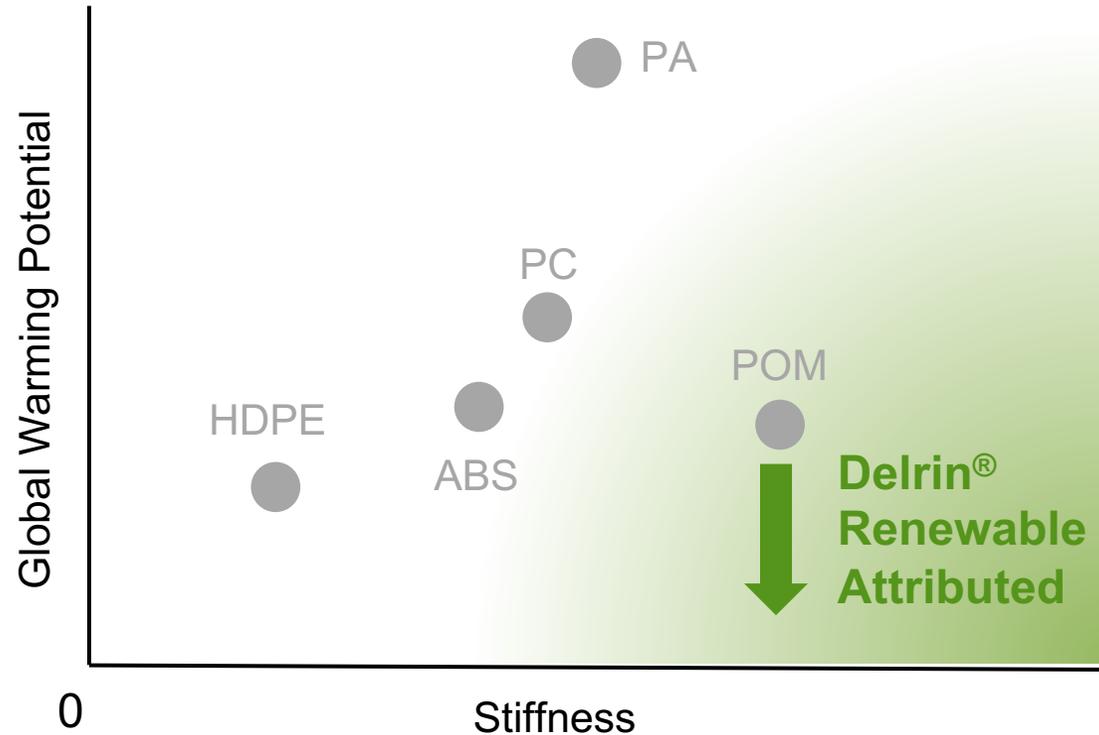
Delrin®



Delrin® Renewable Attributed



# Low Carbon Footprint Among Engineering Resins



Get environmental and financial benefits while realizing sustainable advantages

Less CO<sub>2</sub> is emitted in the atmosphere



Indicative comparison using cradle-to-gate data from PlasticsEurope. Average tensile modulus of non-reinforced resins, extracted from public database (Campus)

# Delrin<sup>®</sup> Renewable Attributed portfolio



**High performance**



**Food & water contact**



**Healthcare**

# Delrin® Renewable Attributed Gears for E-bikes Help Reduce Greenhouse Gas Emissions

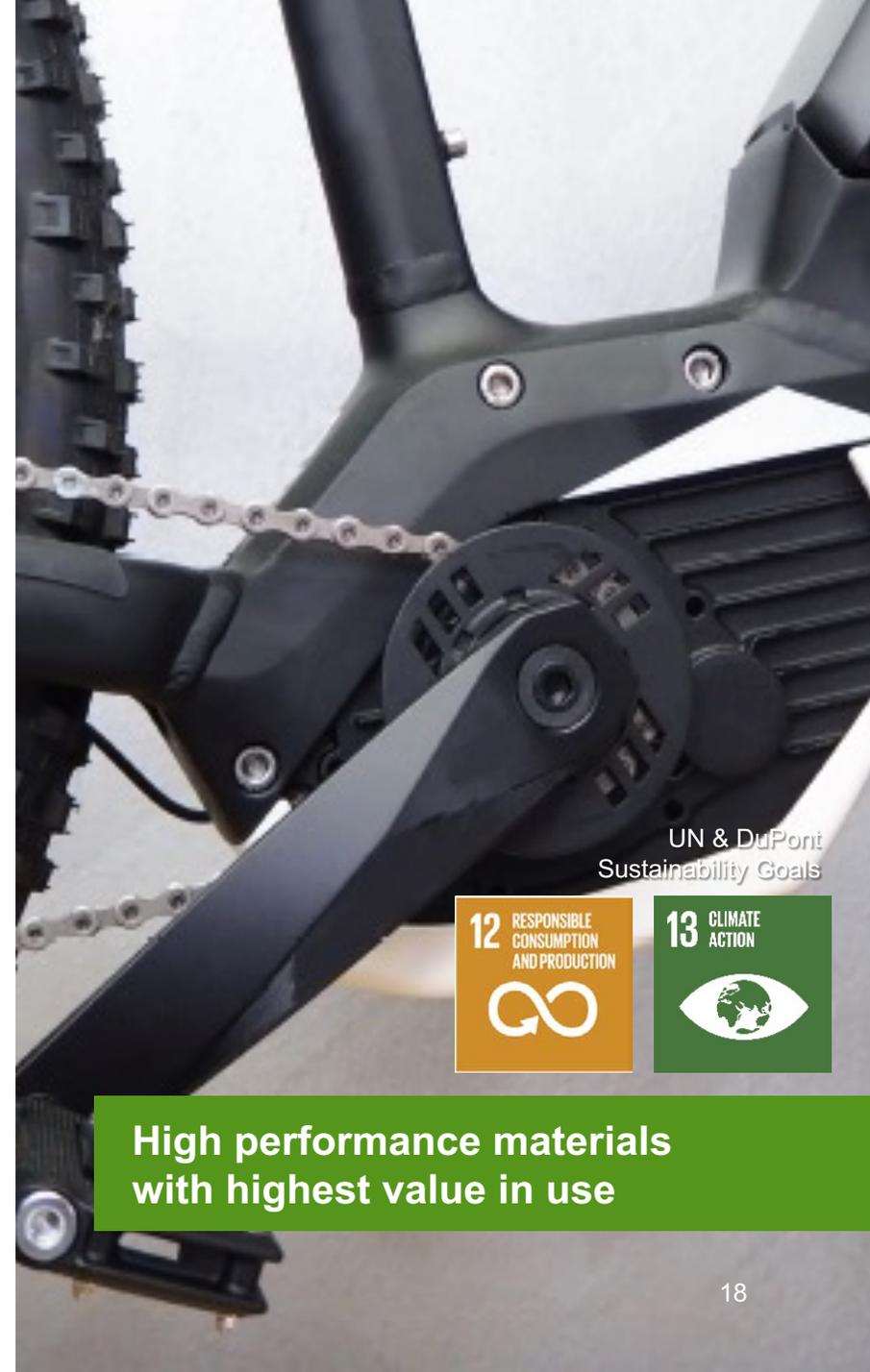
## Challenge:

Working toward a goal of becoming carbon neutral in 2050<sup>1</sup>, the European Union urges everyone to find more sustainable mobility.

## Solution:

When replacing a car with an e-bike, up to 700 kg of CO<sub>2</sub> per person could be saved each year<sup>2</sup>.

Delrin® Renewable Attributed is the material of choice for plastic gears in e-bike motors thanks to its unique combination of high fatigue lifetime at low weight, low noise, and low wear properties compared to metal.



UN & DuPont  
Sustainability Goals



High performance materials  
with highest value in use



1. The European Green Deal, 2019, Brussels  
2. Philips I. et.al., "e-bikes carbon savings - how much and where?" CREDS policy brief 011, Center for Research into Energy Demand Solutions, Oxford

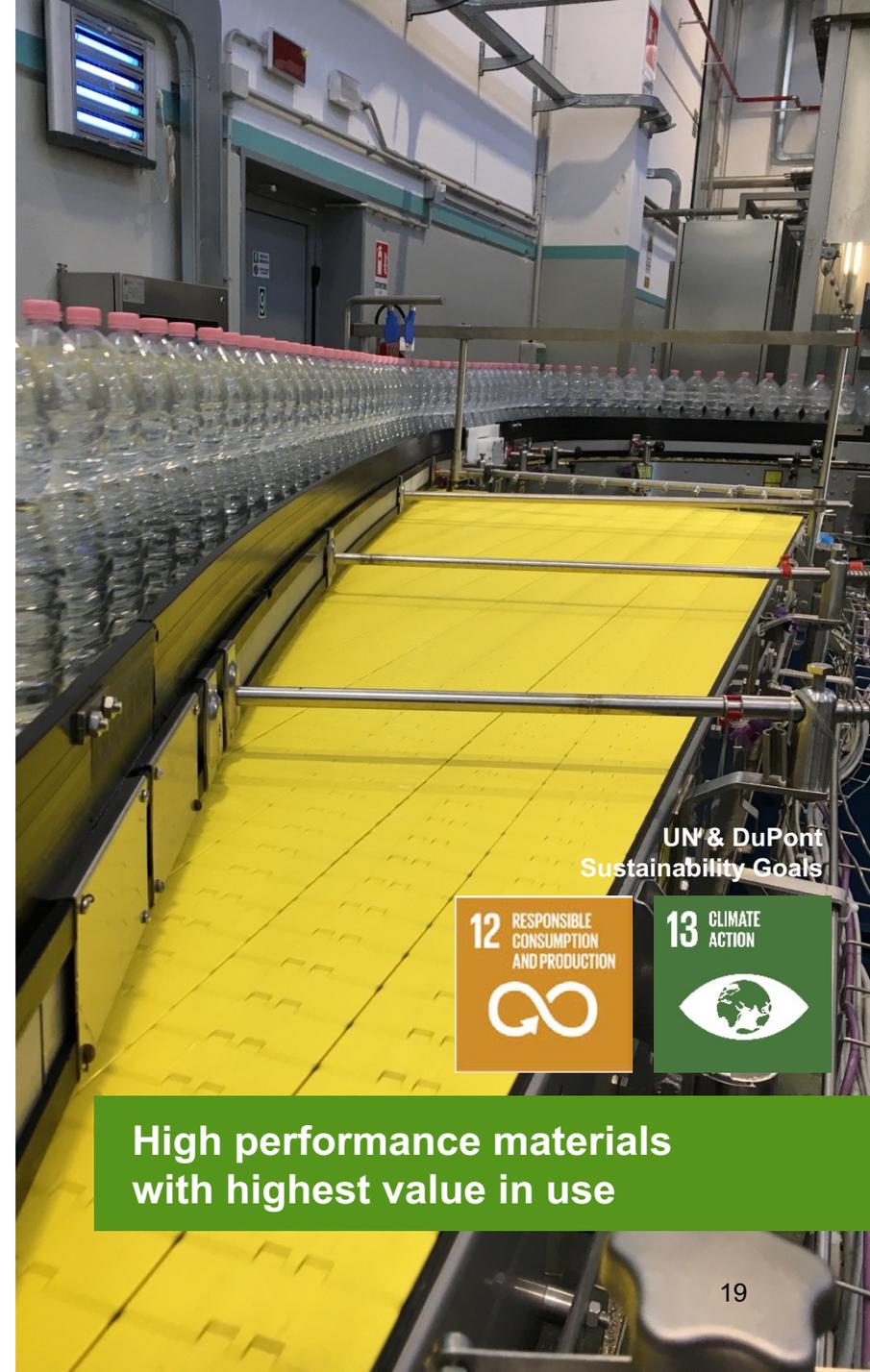
# Delrin<sup>®</sup> Renewable Attributed Enables Sustainable Food and Bottling Operations

## Challenge:

Improve the sustainability of bottling operations through the whole life cycle.

## Solution:

The new Delrin<sup>®</sup> Renewable Attributed Food Contact Grade preserves consistently very low coefficient of friction (COF) over extended periods of time, reducing chain pull, extending the useful life of the conveyor, decreasing the amount of energy needed to run the line by up to 40%, and eliminating the need for external lubrication.



UN & DuPont  
Sustainability Goals



High performance materials  
with highest value in use

# Delrin® Renewable Attributed Medical Grades Enable Smooth Drug Delivery

## Challenge:

Smarter and easier-to-use medical devices and drug delivery systems.

## Solution:

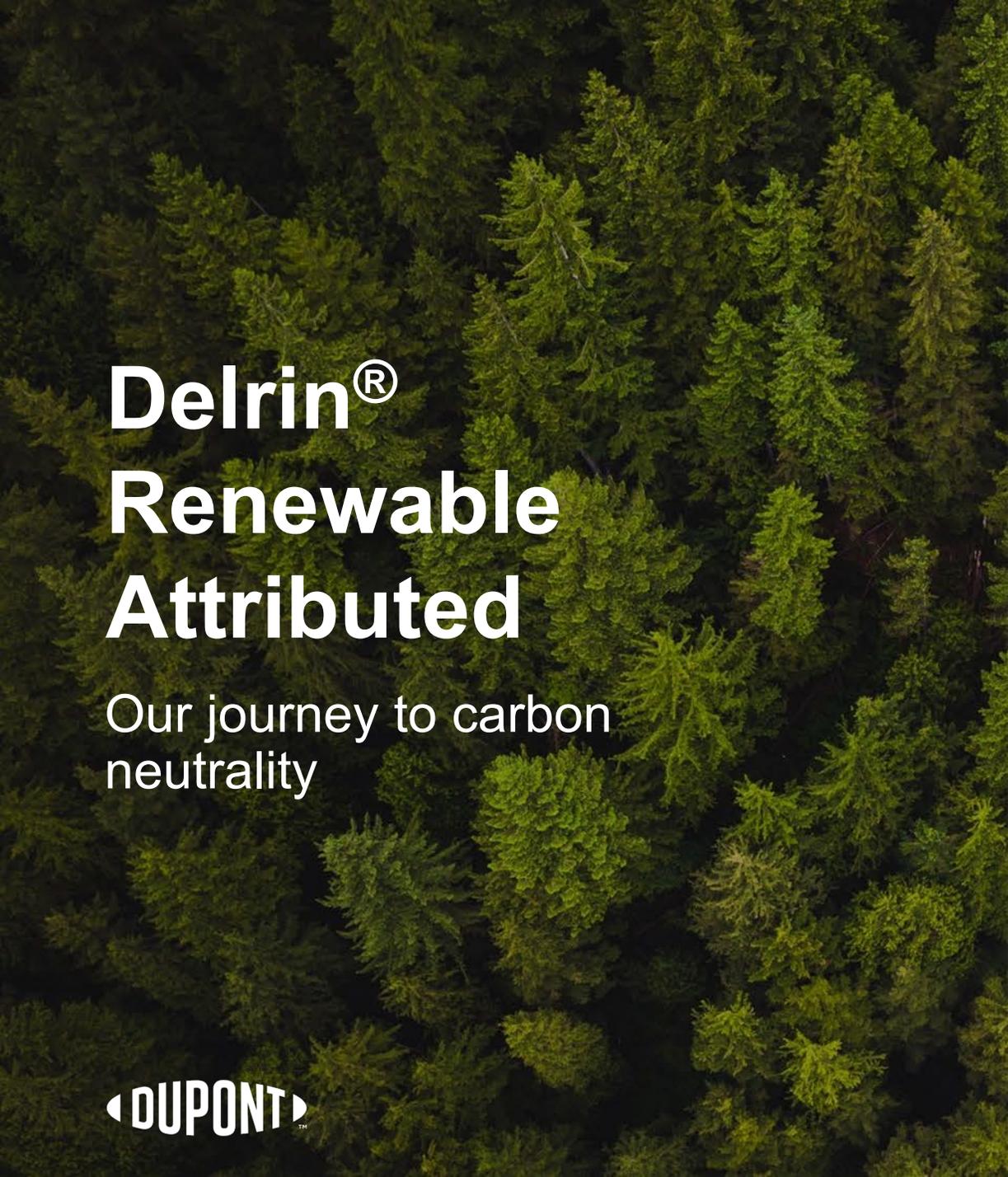
Delrin® Renewable Attributed medical grade portfolio allows manufacturer to design drug delivery devices with a reduced carbon footprint, maintaining compliance with strict healthcare industry standards.



UN & DuPont  
Sustainability Goals



Design solutions that  
can do more with less



# Delrin® Renewable Attributed

Our journey to carbon  
neutrality



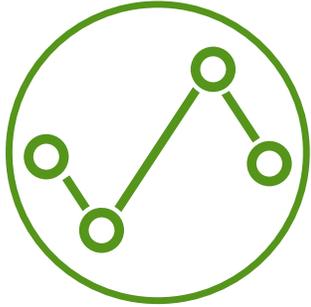
World-class environmental profile

**Reduces material usage**

Provides durability and reliability

Enables circular economy

# Delrin<sup>®</sup> Renewable Attributed (RA) CPE portfolio



## Performance

Delrin<sup>®</sup> CPE offers:

- Tensile modulus
- Yield strength
- Impact strength
- Creep resistance
- Fatigue resistance



## Productivity

Without compromising performance, Delrin<sup>®</sup> CPE adds:

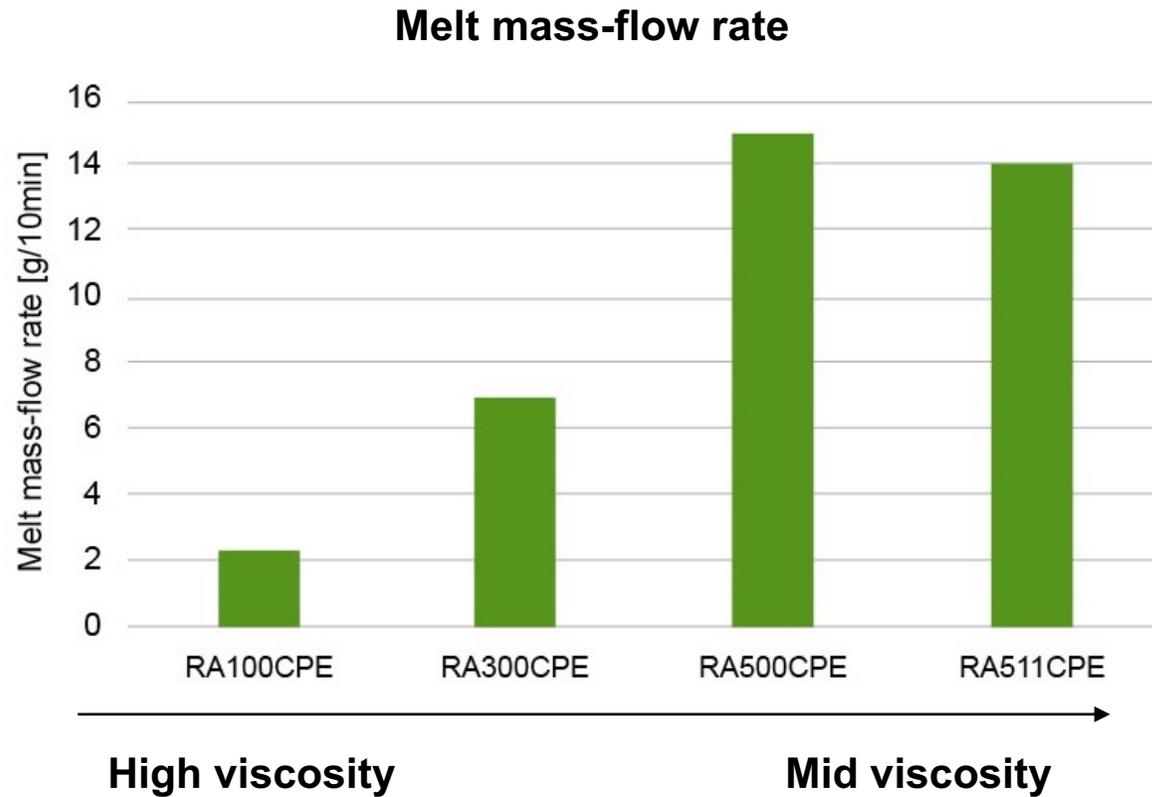
- Higher productivity due to low mold deposit
- Low VOC emission



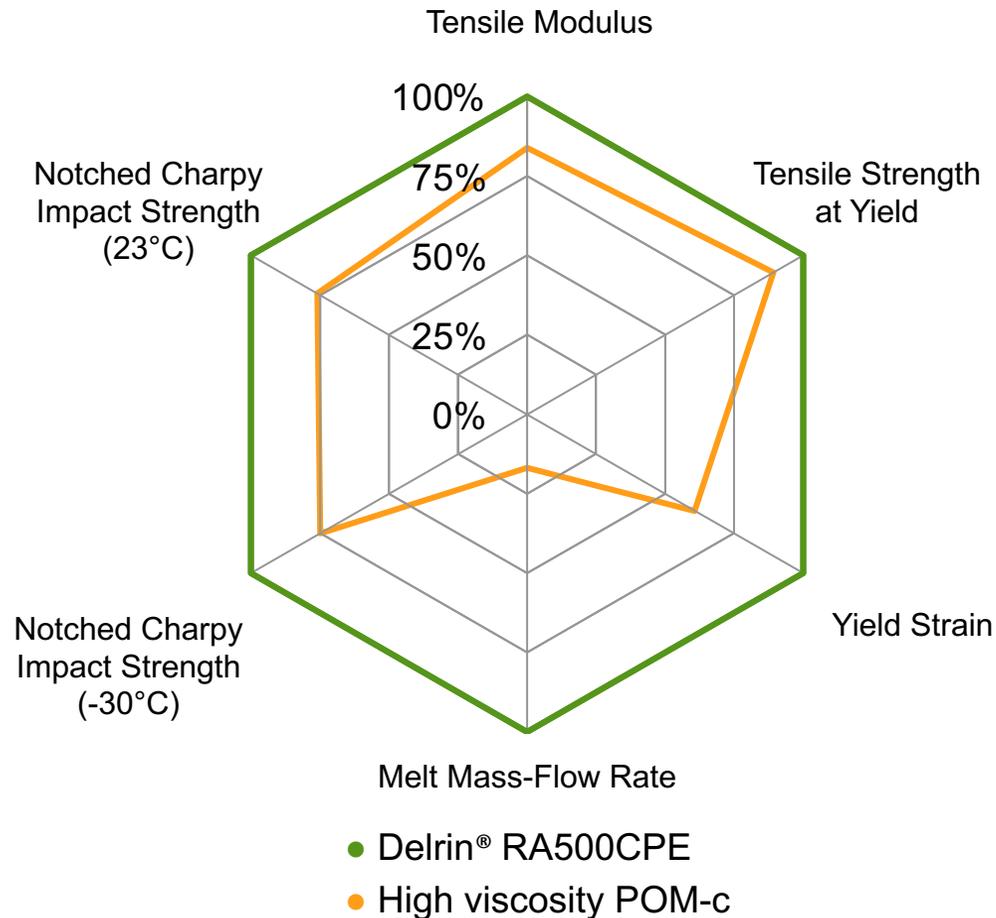
## Footprint

Delrin<sup>®</sup> Renewable Attributed CPE combines the superior performance with reduced carbon footprint

# Delrin<sup>®</sup> Renewable Attributed CPE portfolio



# Delrin<sup>®</sup> Renewable Attributed Enables Sustainable Design



**Reduction**  
of  
parts weight

**Reduction**  
of  
hold pressure  
time



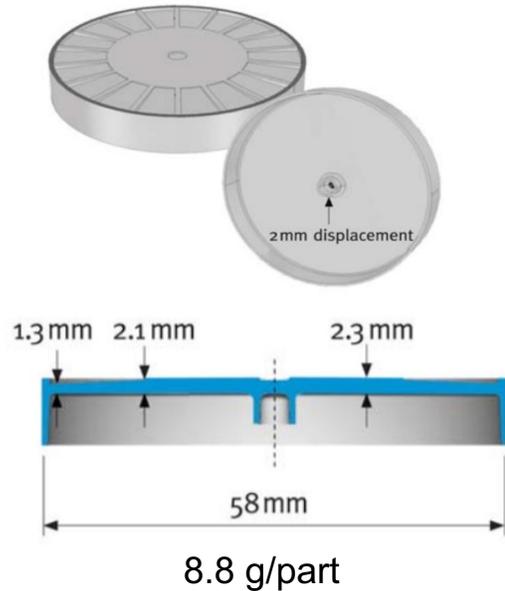
**CO<sub>2</sub>**  
per part  
reduction



Cost  
reduction

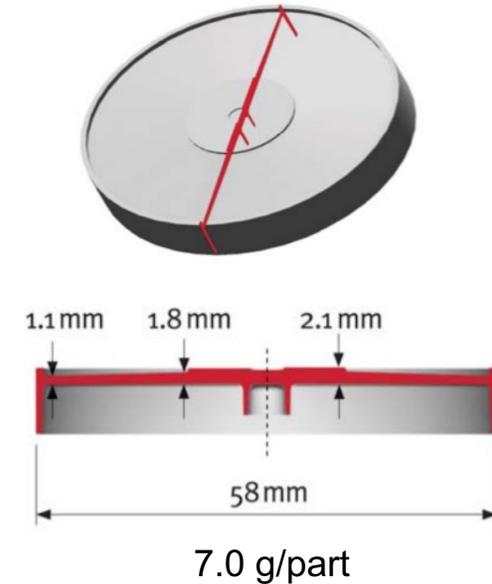
# Case Study: Acetal Copolymer Replaced by Delrin® Renewable Attributed

Old design with acetal copolymer



- 20% weight reduction
- 11% molding time reduction
- 12% cost/part reduction

Improved design with Delrin® Renewable Attributed



For an acetal consumption of 1000 ton/year, when parts are redesigned in Delrin® Renewable Attributed, you save potentially:

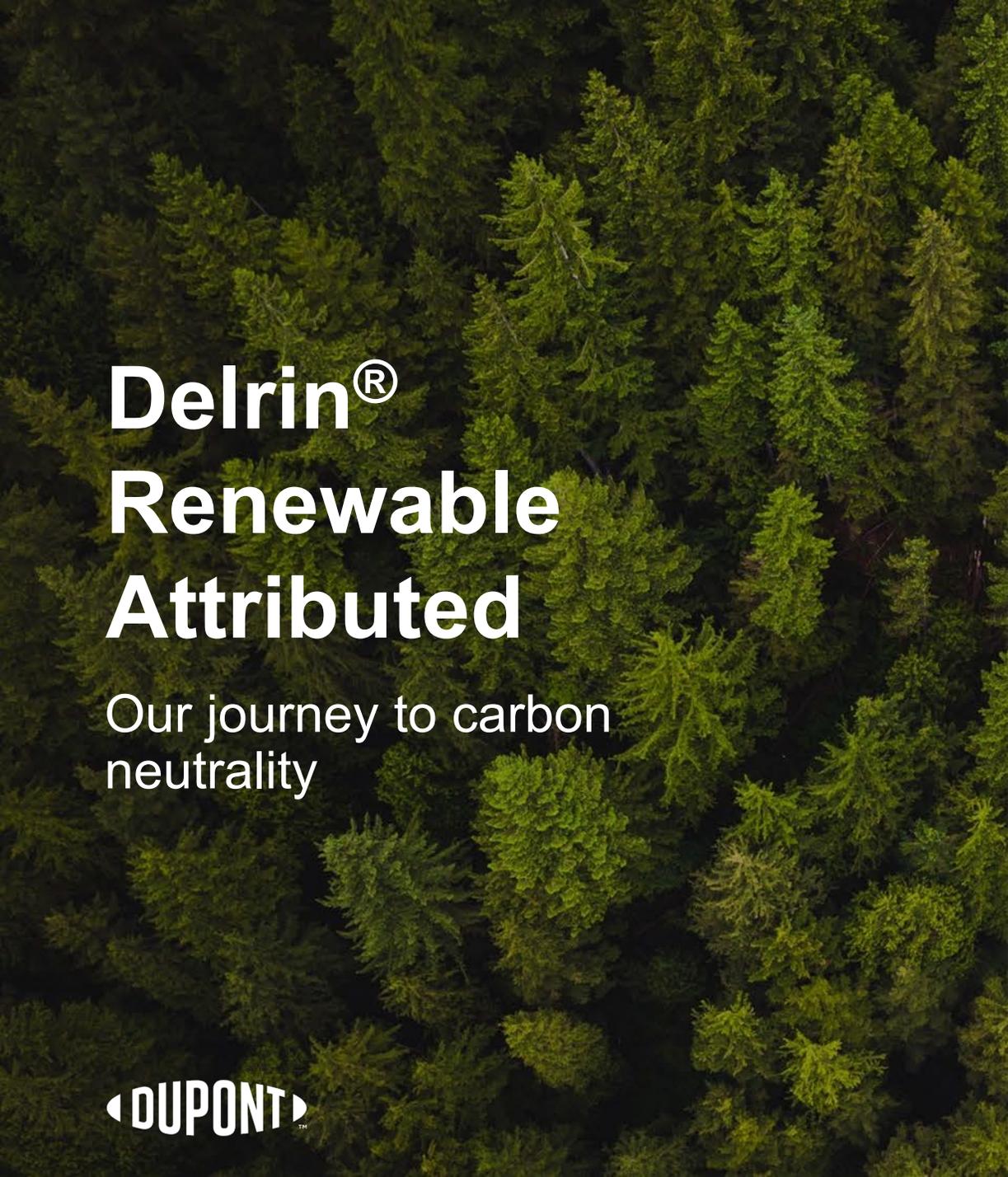
**2600 Ton of CO<sub>2</sub>**



**580 cars** off the road for 1 year



The energy of **320 homes** for 1 year



# Delrin® Renewable Attributed

Our journey to carbon  
neutrality



World-class environmental profile

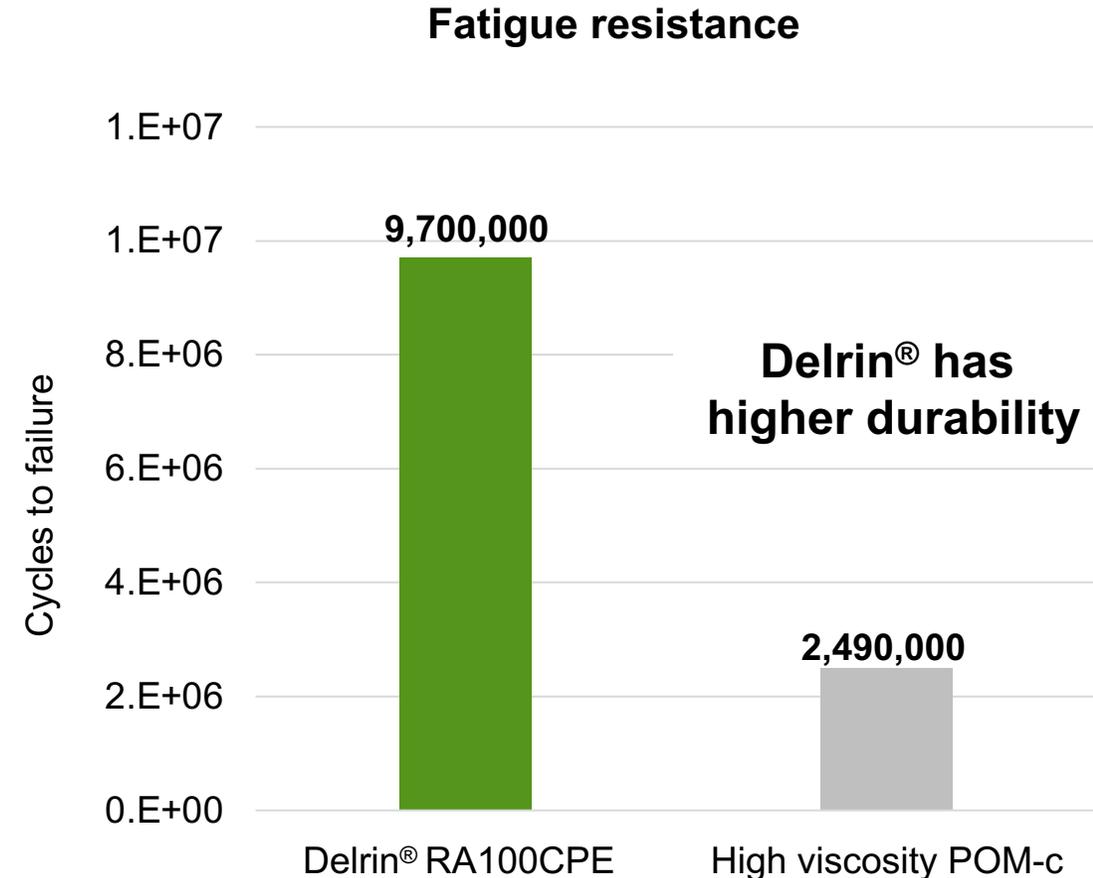
Reduces material usage

**Provides durability and reliability**

Enables circular economy

# Increase Part Durability with Higher Long-term Performance

- Improve your brand recognition by producing high quality parts which last longer
- No need to produce new parts
- Parts require less maintenance



# Delrin<sup>®</sup> Renewable Attributed Acetal Homopolymer Improves Quality of Life for Amputees

## Challenge:

Prosthetics are not readily available to amputees in underdeveloped countries.

## Solution:

The use of **Delrin<sup>®</sup> RA100CPE** acetal homopolymer optimizes productivity and allows large-scale part production to service more amputees.

The dimensional stability, lubricity, and exceptional fatigue resistance of Delrin<sup>®</sup> provides high durability, making it an ideal material for this application.



UN & DuPont Sustainability Goals



High-performance materials with highest value in use



# Delrin® Renewable Attributed

Our journey to carbon  
neutrality



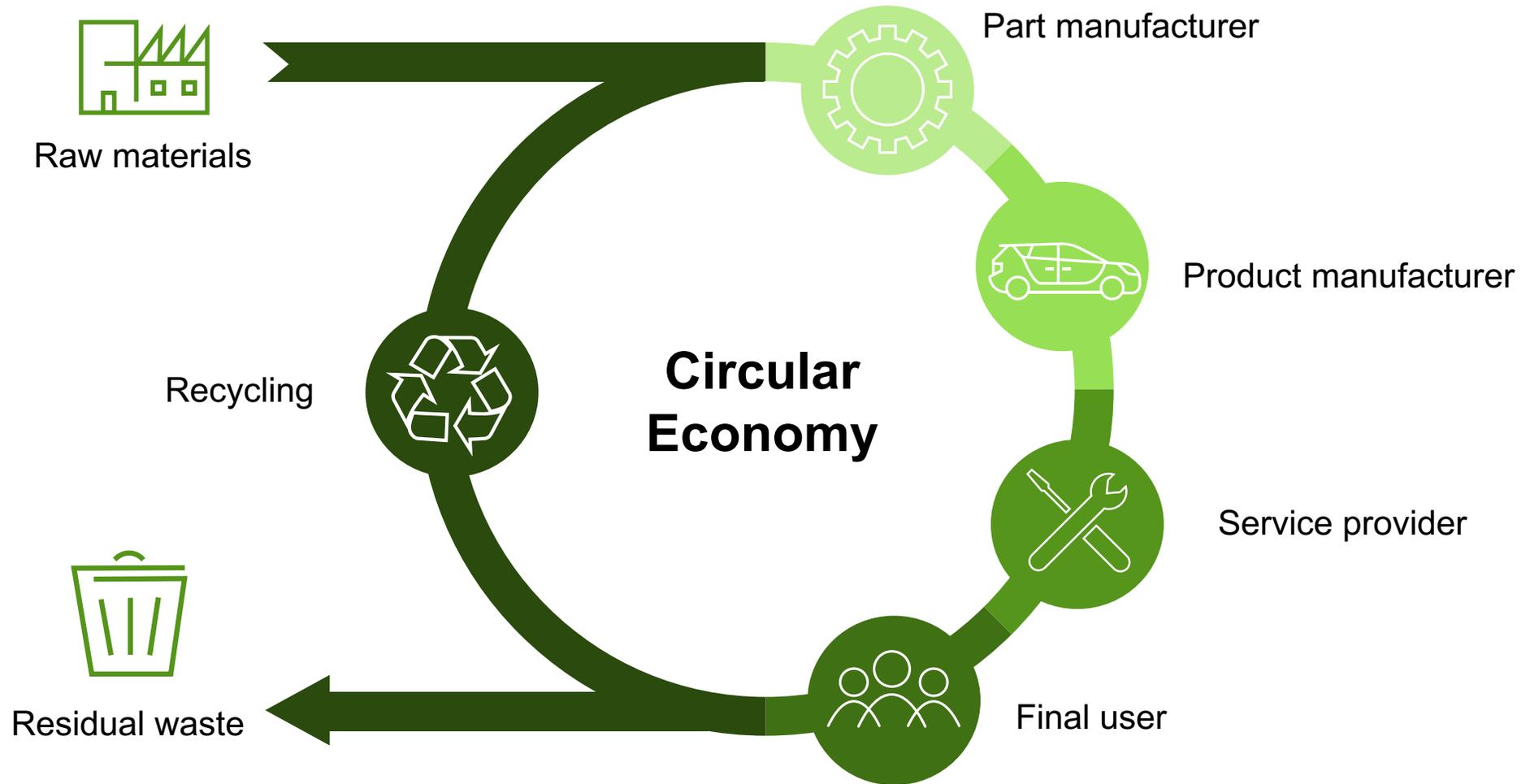
World-class environmental profile

Reduces material usage

Provides durability and reliability

**Enables circular economy**

# Circular Economy



# Enabling Circularity

## Design for recycling

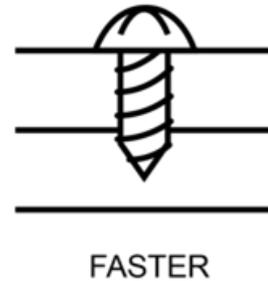
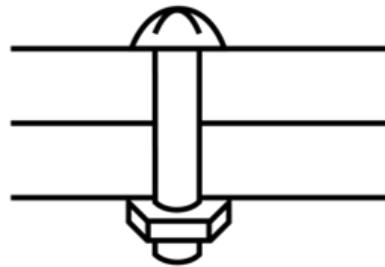
### Fewer parts

### Less materials to separate

### Fastening:

- Snap fits
- Accessible fasteners
- Standardized fasteners (need fewer tools to remove)

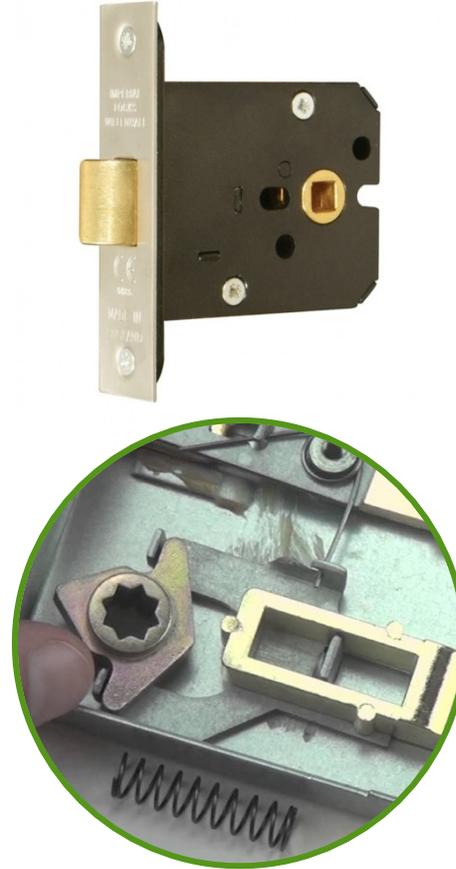
### Avoid welding dissimilar materials



# Design using less Parts and Materials

Concept door latch using the mechanical properties of Delrin® acetal to reduce number of components in an assembly.

- Reduces number of parts
- Reduces assembly time and cost
- Reduces complexity of recycling
- No grease



**From 8 parts / 3 materials**



**to 2 parts / 1 material**

# Proof of Concept

CAE analysis shows that the concept provides the desired movement within acceptable stress limits for Delrin®



# Enabling Solutions for Circular Economy

**100%**

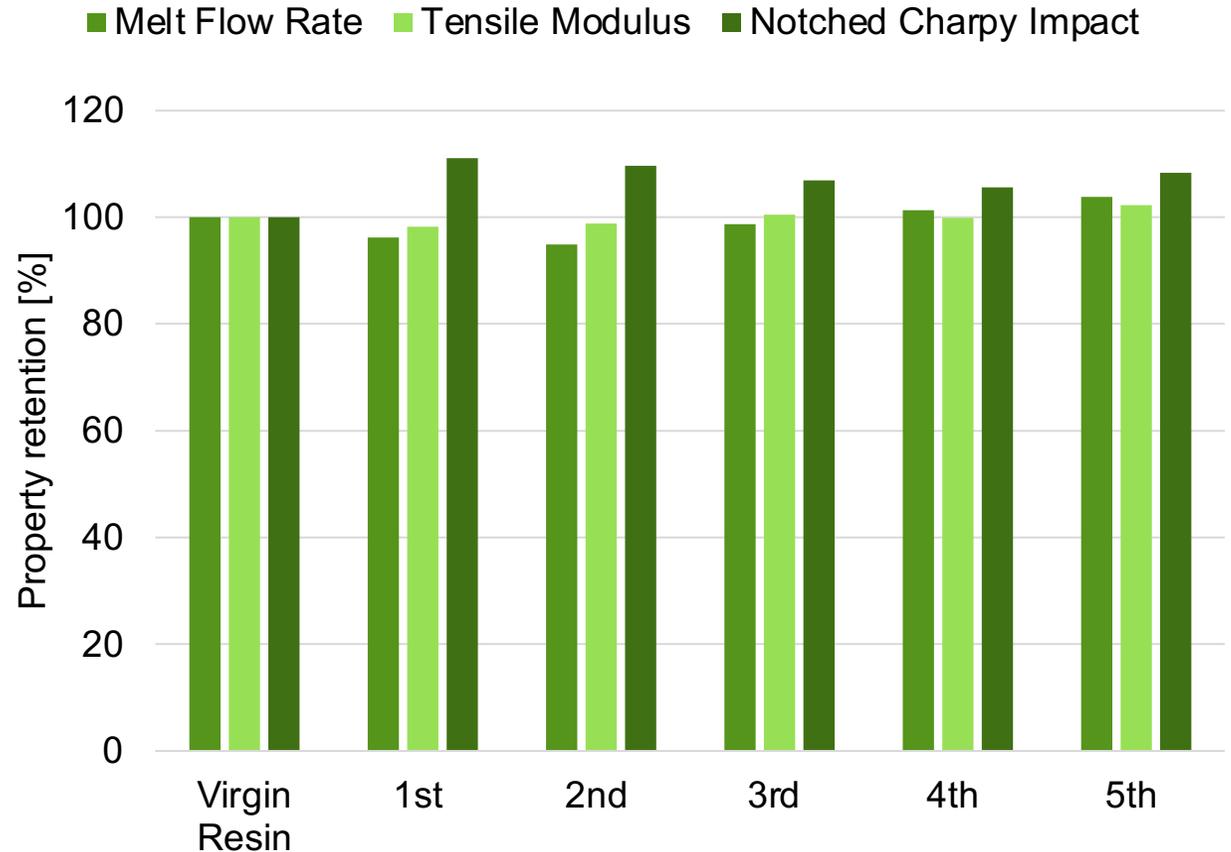
mechanical properties retention after five passes of 100% regrind

**Reduce**

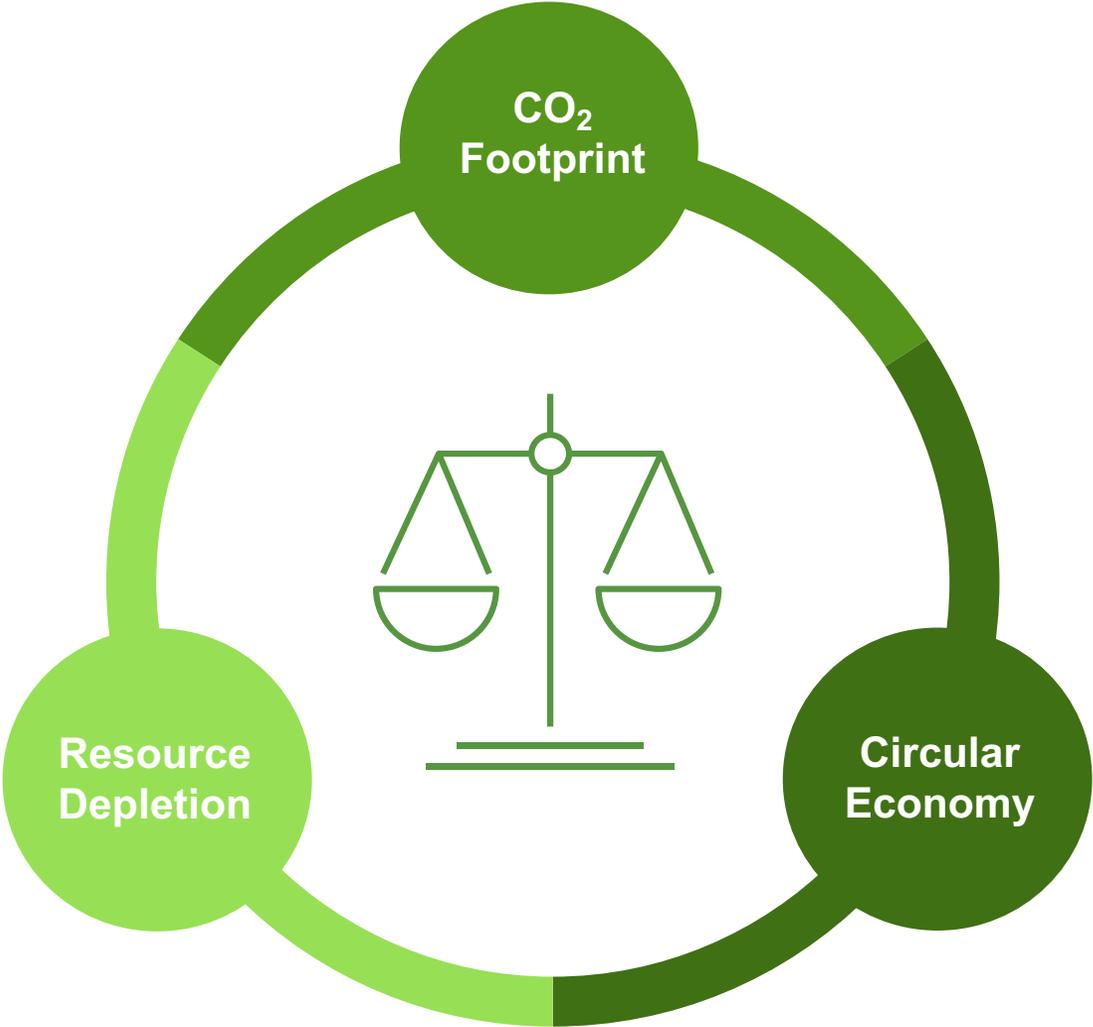
your material use and your waste

**Increase**

your internal recycling of material with financial and environmental benefits



# A Great Balance



# Connect with Us

## Mobility & Materials

Transforming Industries and Improving Lives Through Material Science

Send questions and/or feedback to:

**[ticomms@dupont.com](mailto:ticomms@dupont.com)**

**Learn More**

**[DuPont.com/Delrin RA](https://www.dupont.com/Delrin_RA)**

**[DuPont.com/mobility](https://www.dupont.com/mobility)**



**[LinkedIn.com/Company/  
DuPont-Mobility/](https://www.linkedin.com/company/dupont-mobility/)**



© 2021 DuPont. All rights reserved. DuPont™, the DuPont Oval Logo, and all trademarks and service marks denoted with ™, SM or ® are owned by affiliates of DuPont de Nemours, Inc. unless otherwise noted. Nothing contained herein shall be construed as a representation that any recommendations, use or resale of the product or process described herein is permitted and complies with the rules or regulations of any countries, regions, localities, etc., or does not infringe upon patents or other intellectual property rights of third parties.

The information provided herein is based on data DuPont believes to be reliable, to the best of its knowledge and is provided at the request of and without charge to our customers. Accordingly, DuPont does not guarantee or warrant such information and assumes no liability for its use. If this product literature is translated, the original English version will control and DuPont hereby disclaims responsibility for any errors caused by translation. This document is subject to change without further notice.