



TEIJIN ARAMID

Teijin Aramid

PVI on-line inspiration tour

December 12, 2023

J Roos,
Director Energy Transition &
Sustainable Development
Teijin Aramid BV

One Teijin

- 170 companies
- 20,000 employees
- In 20 countries

Fiscal year ending March 31, 2023

| | ¥ billion | \$ billion | € billion |
|-------------------|-----------|------------|-----------|
| Consolidated sale | 1,018,8 | 7,6 | 6,52 |
| Total assets | 1,242,4 | 9,2 | 7,96 |

TEIJIN ARAMID



One Teijin, many industries

Aramids



Carbon fiber



Polyester & resins



Software



Healthcare



Teijin Aramid

The facts

50+

Years of experience
and expertise

1st

Globally, in aramid
production capacity

750+

Registered patents

2000






Professionals on staff

Our global presence

Headquarters

Arnhem, The Netherlands








Research & Development

- | | |
|---|---|
|  Arnhem |  Iwakuni |
|  Wuppertal |  Matsuyama |
|  Shanghai | |

Production facilities

- | | |
|--|---|
|  Arnhem |  Ayutthaya |
|  Emmen |  Iwakuni |
|  Delfzijl |  Matsuyama |

Sales offices

- | | |
|---|---|
|  Wuppertal |  Sao Paulo |
|  Shanghai |  Bangkok |
|  Pune |  Tokyo |
|  Conyers | |

Our history

Decades of determination

- **1970:** Leo Vollbracht polymerizes aramid in Arnhem, the Netherlands
- **1985:** Two new plants are built. Twaron® spinning begins
- **1990's:** Start to reprocess own spinning waste
- **2000:** Twaron® purchased by the Teijin Group
- **2017:** Twaron®, Teijinconex® and Technora® brought under one umbrella
- **2023:** Successful industrial trial Twaron® with recycled content



Twaron[®]: a true all-round para-aramid performer

- **Lightweight:** Density: 1.44 g/cm³
- **Strong and Stiff:** 7x stronger than steel at the same weight; high modulus
- **Resists Heat & Chemicals:** No corrosion; decomposition 500C; no melting
- **Durable and Stable:** Very low creep; excellent dimensional stability

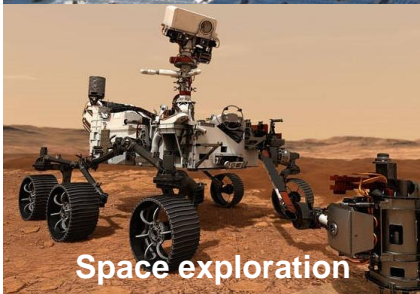


TEIJIN ARAMID

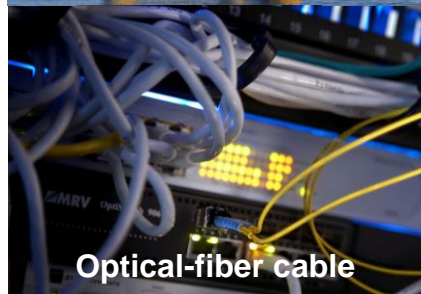


Trusted for decades across industries

Aerospace



Renewable energy & telecom



Automotive



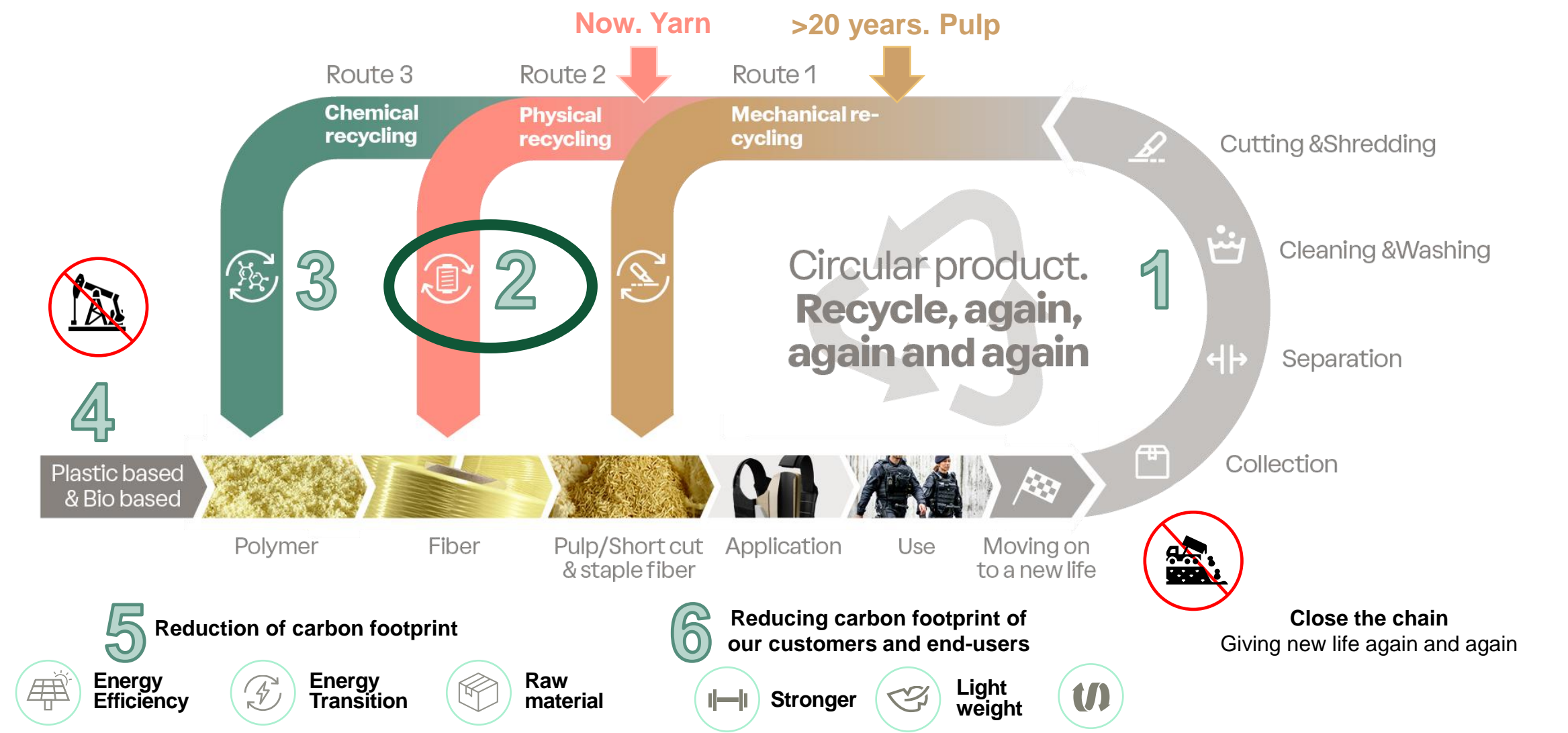
Protective wear



Ballistics




Sustainability in materials business: Twaron®






Feedstock



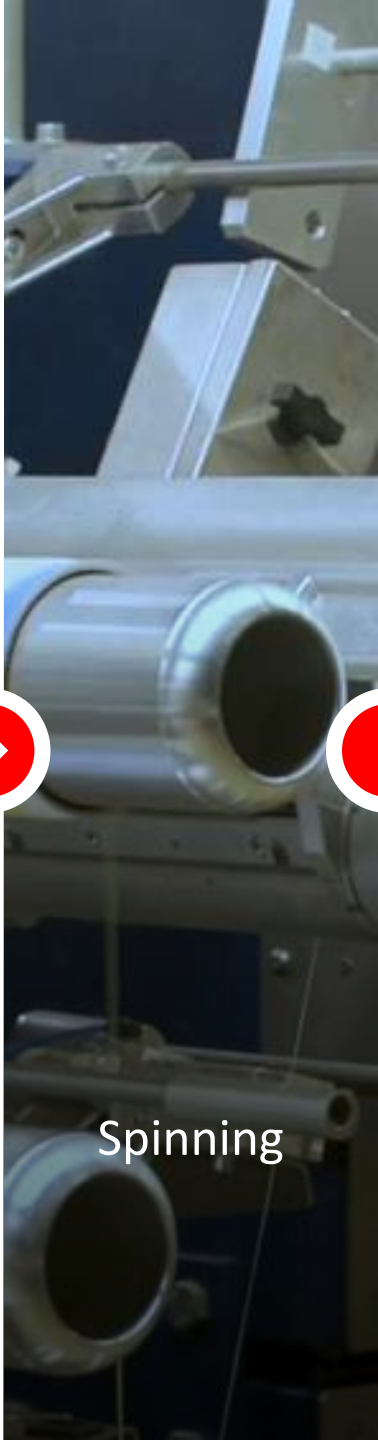
Cutting short
length



Shredding



Spin dope
preparation



Spinning



Twaron®
with recycled
content

Progress: We are the first to produce p-aramid filament yarn on a commercial production line using recycled material!

- April 2023 Successful 1st Plant Trial



Together with FibreMax and Hampidjan we have demonstrated the potential of circular high-performance fibers

Our greatest sustainability breakthrough has been the creation of circular Twaron®. Technically a gamechanger but also how we partnered with two pilot customers. Traditionally we would test and scale up a new invention well under the radar, but as there is no time to waste to realize the circular economy we started to partner in the earliest stage to speed up these circular developments.

The market is asking for more sustainable solutions

FibreMax and Hampidjan produced a number of slings and pendants with the pilot material so that tests could be performed to explore if the product properties of circular Twaron® would be the same as traditional Twaron®. Overall a very positive outlook for circular products, the market has shown great interest and the tests so far proved our scientists right.

The advantage of this approach is that we shorten the time to market by cooperating intensively with our customers. The big challenge is to get enough end-of-life material back from the market, simply as there will be no circular products without aramid take back material.

This is **Physical Recycling Route 2** (see page 6).

What began as a partnership between a few frontrunners is now helping to improve sustainability and recyclability across multiple industries, cutting a path toward a fully circular aramid chain.



Duco Handgraaf | FibreMax

"We proved it to be at least as strong as standard material. This shows me that we can confidently sell our cables with recycled material."



David Waage | Hampidjan

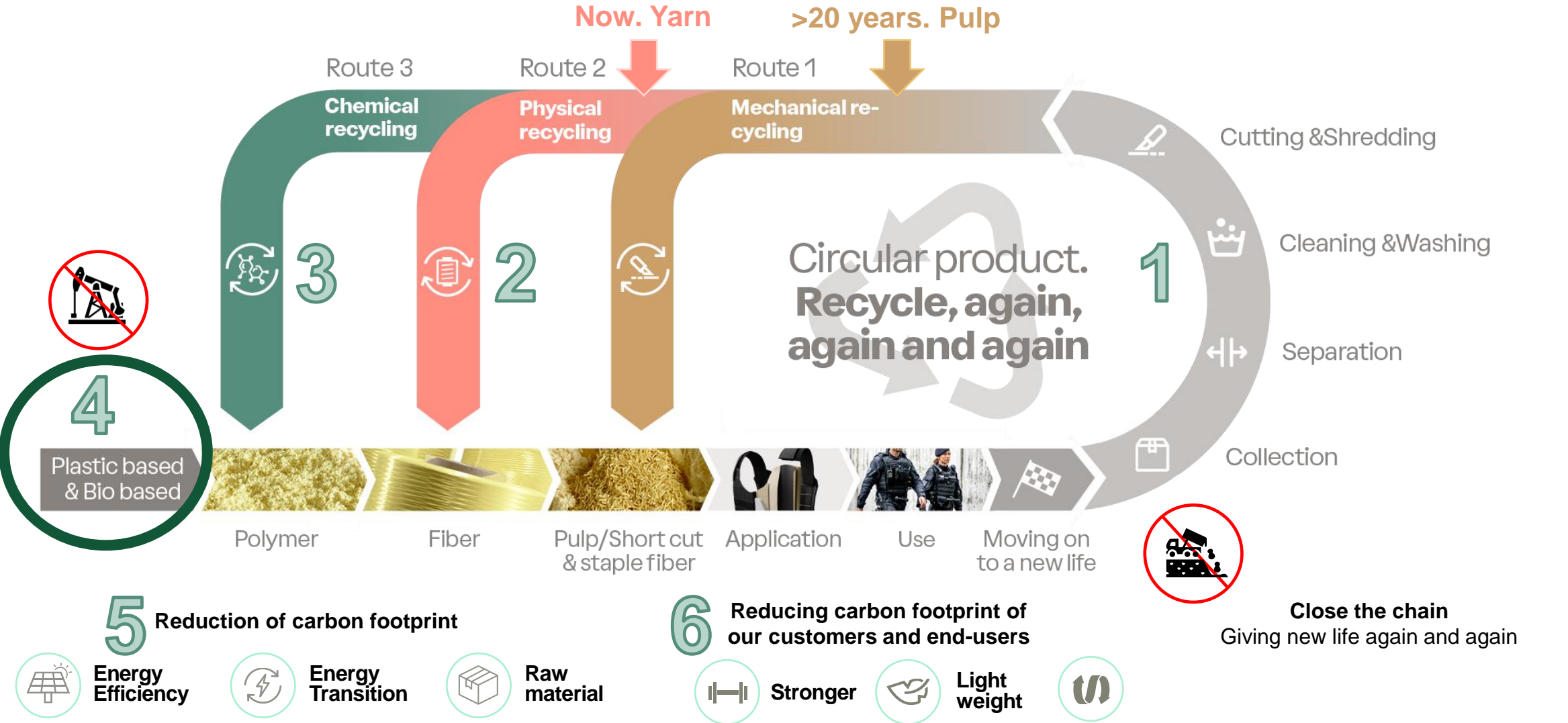
"The cooperation with Teijin has gone really well, we get extremely good technical back up and the knowledge level is amazing."



Highlights

- > Several hundred kilograms of Twaron® yarn produced from materials of various recycling statuses
- > Excellent properties of this circular Twaron® fiber, equal performance
- > Real-life tests performed with FibreMax and Hampidjan (ropes & cables) applications
- > Teijin Aramid to scale up production of its fully circular high-performance fiber
- > Goal is to have circular Twaron® commercially available by 2025
- > Calculations show that every kg of used aramid saves 4 kg of potential CO₂ emissions

Sustainability in materials business: Twaron®



Renewable Carbon Raw Materials

Proof of concept



Vegetable oils & fats



Proof of Principle

Final showcase 2020



InReP project



Polyolefines (PE)



Twaron®



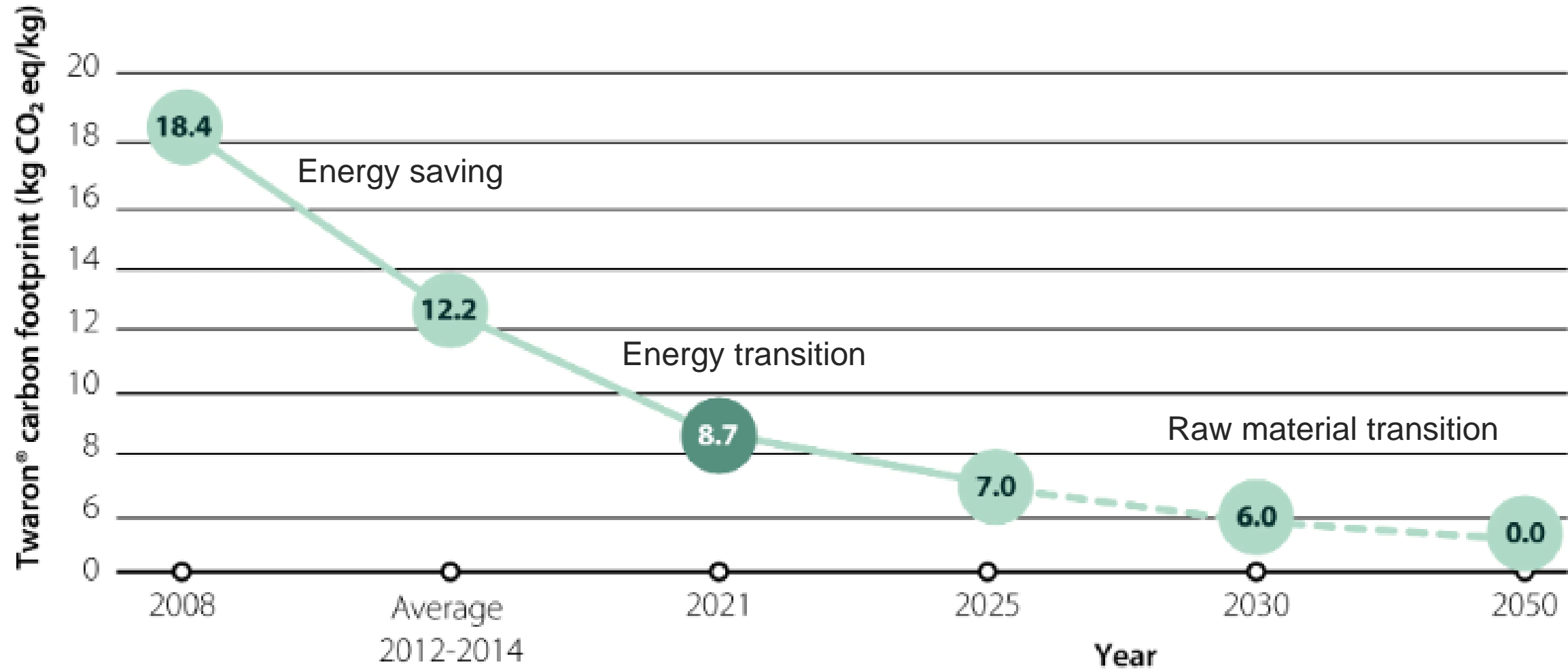
PET



Twaron®

ISPT - DPI

Twaron® Carbon Footprint journey





TEIJIN ARAMID

Thank you

Materializing ambitions

Contact

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This is our Past and our Future

1918

Establishment of Teikoku Jinzo-Kenshi Kaisha, Ltd.
Beginning Japan's first commercial production of rayon fibers



Rayon fibers business is discontinued
Beginning of PET film business
Beginning of meta-aramid fibers, *Teijinconex* business



1952



1958

Beginning of polyester fibers, *Tetoron* business

Beginning of trading business

1962

Company name changes to Teijin Limited



1960

Beginning of polycarbonate resin, *Panlite* business



1973

Beginning of pharmaceuticals business

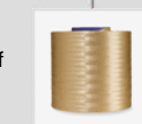
1983

Beginning of IT business

1982

Beginning of Japan's first home oxygen therapy (HOT) business

1987



Beginning of para-aramid fibers, *Technora* business

1993



1999

Beginning of carbon fibers, *Tenax* business

2000

Expansion of the para-aramid fibers business by starting *Twaron* business



New corporate brand is introduced including new logo and brand statement

2003

2016



World first in establishing mass production technology for carbon fiber-reinforced thermoplastics (CFRTP)



Entered the functional food Ingredients business



2018

100th Anniversary

2019

Transfer of Films Business

2017

Acquisition of US-based Continental Structural Plastics Holdings Corporation
Expansion of composites business

