Onze route naar duurzaamheid – een (energie) transitie

Danielle van Woerden – CSR officer

10-10-2018
<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Established</strong></td>
<td><strong>June 17, 1918</strong></td>
</tr>
<tr>
<td><strong>Capital</strong></td>
<td><strong>70,816 Million yen</strong></td>
</tr>
<tr>
<td><strong>Teijin Group Companies</strong></td>
<td><strong>169 (Japan 58, Overseas 111)</strong></td>
</tr>
<tr>
<td><strong>Teijin Group Employees</strong></td>
<td><strong>19,292 (Japan 9,238, Overseas 10,054)</strong></td>
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</table>
Aramid fibers are man-made high-performance fibers, with molecules that are characterized by relatively rigid polymer chains.

These molecules are linked by strong hydrogen bonds that transfer mechanical stress very efficiently, making it possible to use chains of relatively low molecular weight.
Teijin Aramid in short

The first spool of Twaron came off the spinning machine in May 1986.

Teijin Aramid has 1750 employees worldwide.

We produce 3 para-aramids:
- Twaron
- Technora
- Sulfron

We have customers in many markets, amongst which:
- Protection and Defense
- Automotive
- Oil & Gas
- Telecom

1 meta-aramid:
- Teijinconex

1 polyethylene:
- EnduMax

The power of Aramid
Our Twaron production process
Our products

Twaron® | Technora® | Teijinconex® | Sulfron®

The power of Aramid
<table>
<thead>
<tr>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soft ballistics</strong></td>
</tr>
<tr>
<td><strong>Helmets</strong></td>
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<tr>
<td><strong>Hard ballistics</strong></td>
</tr>
<tr>
<td><strong>Conveyor belts</strong></td>
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<tr>
<td><strong>Specialty paper</strong></td>
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<tr>
<td><strong>Ropes and cables</strong></td>
</tr>
<tr>
<td><strong>Reinforced thermoplastic pipes</strong></td>
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<tr>
<td><strong>Optical fiber cables</strong></td>
</tr>
<tr>
<td><strong>Heat- and flame-resistant garments</strong></td>
</tr>
<tr>
<td><strong>Engineering plastics</strong></td>
</tr>
<tr>
<td><strong>Flexible flowlines and umbilicals</strong></td>
</tr>
<tr>
<td><strong>Sealing materials</strong></td>
</tr>
<tr>
<td><strong>Friction products</strong></td>
</tr>
<tr>
<td><strong>Elastomer reinforcements</strong></td>
</tr>
<tr>
<td><strong>Cut-protection products</strong></td>
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<tr>
<td><strong>Civil engineering products</strong></td>
</tr>
<tr>
<td><strong>Tires</strong></td>
</tr>
<tr>
<td><strong>Composites</strong></td>
</tr>
</tbody>
</table>
Onze route naar duurzaamheid
Reduce pain

- CO₂ reduction
- Ecofootprint

Align chain - Circularity

Enlarge gain

- Customer Benefit Model
- New Business models

Actions to reduce pain in production

- Energy Efficiency
- Energy Transition
- Biobased raw material
- CO₂ reduction worldwide
- Value Chain Thinking

Innovative applications of Twaron to avoid CO₂ emissions

- Lighter and stronger conveyor belts
- Light weight air freight containers
- Light weight and durable tires
1) “Enlarge gain”

Enlarge gain:
The biggest gain is in the use of our products and solutions further in the value chain.

Cradle  Suppliers  Teijin Aramid  Customers  End users  End of life

From volume to value
Measuring eco-performance across the value chain

Value Chain Thinking
Total eco-performance comparison:
Eco-performance over the total value chain and costs over the total value chain

Calculation shows it’s green
The Customer Benefit Model (CBM) can be used to calculate total eco-performance and cost performance. This TÜV-certified model compares solutions according to their function over the total value chain, both ecologically and financially. This is what we call Value Chain Thinking.

Customer Benefit Model

Eco-profiles
Energy
Materials
Costs
Regional circumstances

Functional comparison

What, how much, how long, how well

Together with you
Iterative process with value chain partners

Eco-performance
- Lower CO₂ footprint
- Energy savings
- Less fine dust

Cost performance
- Total Cost of Ownership
- Payback time
- Net Present Value

For more information, please visit www.teijinaramid.com/eco-efficiency
Reinforcement with Twaron:
Conveyor belt weight: 40% lighter than steel reinforced belt
Less rubber, less reinforcement material

Key advantages and the financial and ecological results:

- Increased transportation capacity
- Low energy consumption: ~ 15% energy savings, CO₂ emission savings
- Low maintenance – cost savings & material savings
- Longer lifetime – cost savings & material savings
2) “Reduce pain”

Reduce pain – the internal focus

1) Energy efficiency: 2009 – nu, 2% per jaar per locatie
2) Energy transition
3) Raw materials

Reduce pain

Cradle Suppliers Teijin Aramid Customers End users End of life
Cradle Suppliers TEIJIN Customers End users End of life

Reduce pain
CO₂ reduction
Ecofootprint

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Enlarge gain
Customer Benefit Model
New Business models

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Waar staan we nu?

- Increase the gain - eco efficiency in de keten: is een volwassen gebied en timmeren we aan verder;

- Reduce the pain:
  - Energy efficiency: lopend programma tot 2020
  - Energy transitie: we staan aan het begin
  - Programma om routes te verbinden in de maak
  - Belangrijke stappen hierin:
    - Focus aanbrengen – richten op energie (stroom, stoom, gas)
    - Organiseren van betrokkenheid – op MT nivo en op productie / R&D / Staf nivo
    - Concreet maken van “waar hebben we het over” – wat draagt welke stap bij
    - Kennis ontwikkeling: eigen kennis nivo en wie zijn relevante kennisdragers om te betrekken
    - Netwerken – opzoeken van samenwerkingspartners
Dilemma’s – vraagstukken

• Hoe weten we nu wat passende technologieën zijn?
• Hoe maken we de juiste keuze uit alle mogelijke opties?
• Hoe nemen we deze keuzes mee in de huidige manier van projecten formulering – bv de business case?
• Moeten we ons richten op de grote stappen alleen? Of ook nadenken over minder impactvolle stappen?
• Hoe krijgen we de tijd beschikbaar van mensen om mee te denken / werken?
• ....

Herkenbaar?
Waar lopen jullie tegenaan?
Danielle van Woerden

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Achtergrond informatie
Twaron

- Excellent strength-to-weight properties
- Resistant to heat, flames and chemicals
- High dimensional stability
- Adjustable to different applications
- Available in different colors
- Sustainable solution across the total value chain
Sulfron

- Reduces frictional energy and heat build-up
- Reduces hysteresis
- Reduces rolling resistance
- Improves cut, chip and chunk resistance
- Improves product durability
Technora

- Excellent resistance to heat degradation
- Excellent tensile strength and fatigue resistance
- Superior resistance to chemicals
- Adjustable to different applications
- Long-term dimensional stability
Teijinconex

- Strong, light and soft
- Excellent flame resistance
- Resistance to long-term heat exposure
- Ideal for textile applications
Endumax

- Very high modulus UHMW-PE
- Available as film and as crossply
- High impact resistance
- Outstanding durability
Filament Yarn

- Excellent strength-to-weight properties
- Resistant to heat, flames and chemicals
- High dimensional stability
- Adjustable to different applications
- Available in different colors
Staple Fiber

• Inherent resistance to heat and flame
• Excellent cut resistance
• Superior strength-to-weight
• Exceptional flexibility
Pulp

• Delivers excellent strength-to-weight
• Improves heat and chemical resistance
• Reduces product brittleness
• High fibrillation
• Versatile and adjustable
Paper

- Improves chemical and heat resistance
- Superior dimensional stability
- Higher abrasion resistance
- Excellent strength-to-weight
- Excellent electrical insulation
Short-Cut Fiber

- Superior abrasion resistance
- Excellent weight-to-strength properties
- Reduction of vibration
- Adjustable to desired wear resistance
- Excellent bonding properties
Fabrics & Laminates

- Wide variety of filament types
- Exceptional strength and durability
- Easy to integrate into production processes
Powder

• High wear resistance
• Easy to dose
• Easy to integrate into production processes
• Sound dampening
Tape

- Enables faster cable production
- Cost-effective
- Easy handling
- No need to apply low linear density yarns
- High strength and crush resistance
Jet-Spun Products

• Outstanding adjustability to applications
• Improved tensile and tear strength
• Z-strength delamination resistance
• Excellent dimensional stability
• High wet strength
• Superior bursting pressure