

# Polyamides & CirculenRecover EP PA

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LyondellBasell Polyamide range

Introducing the Circulen Brand

Introduction of *Circulen*Recover EP PA

• Trends & next steps in *Circulen*Recover EP PA Range

Example application – introducing TSL Outdoor's 2023 Snow shoe





# LyondellBasell Polyamides range

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# Schulamid grades – The Complete Polyamide Product Range

<i>Schulamid</i> Product Range	General Information
Schulamid 6	compounds based on PA 6
Schulamid 66	compounds based on PA 66
Schulamid 612	compounds based on PA 612 (long chain polyamide)
Schulamid XT	compounds for extreme temperature applications requiring elevated long term heat aging properties
Schulamid XM	compounds blended with semi-aromatic polyamides showing an extreme modulus
Schulamid PPA	compounds based on semi-aromatic polyamides for high temperature applications
Schulamid RD	compounds with reduced density (followed by the number of base polymer – Schulamid RD6)
CirculenRecover EP	compounds based on post industrial recyclates (PIR)

Base Resin	Fillers	Features	Symbol	Color code	Packaging
PA6	Unreinforced	Heat Stabilized	Н	Natural	Bulk
PA66	Glass Fiber	High Impact	HI	Blk	Octabins
PA666	Carbon Fiber	UV Stabilized	U	Other	25kg bags
PA612	Glass Beads	Laser Weldable / IR transparent	LW		Other
PPA	Mineral	Laser Markable	LM		
PA based mix (XM)		Improved Surface	IS		
Blend (RD)=		Fire retardant	FR		
reduced density		Glow Wire Tested	GW		
		Recycled Content	RC	Changes to	circulen
		And many more			by lyondellbasell

### Example: SCHULAMID 6 GF50 H BLK968001, BG25HT

- MARKETS
  - Automotive: Fans, shrouds, covers, Structural components, light weighting
  - Fire retardants: Automotive grades, connectors, E&E applications, Appliances
  - New mobility: Advanced compounds (shielding, signal compatibility, hydrolysis resistance), metal replacement
  - **Consumer goods**: Structural components, covers, sporting equipment, permanent anti-static ATEX applications
  - Building & construction: Technical functions, hand-held & power tools
- Range architecture built around features rather than applications
- Compounding ability: custom products design & development



# Introducing the Circulen Brand

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### Links



- <u>www.lyondellbasell.com/Circulen</u>
- www.lyondellbasell.com/sustainability



# *Circulen*Recover EP PA Range

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#### **Circulen**Recover Polyamides – Material choice



## Engineering plastic compounds based on recycled materials: *Circulen*<u>R</u>e<u>C</u>over



## *Circulen*Recover – EP PA performance overview



# **Circulen**Recover EP – Base Products in Development Phase

#### Schulamid RC new nomenclature (PA6 and PA66 Circular Economy Polyamide Compounds)

## Brand name: CirculenRecover EP

<i>Circulen</i> Recov	ver EP: PA6 resin	Functionalities *	<i>Circulen</i> Recover: PA66 resin	Functionalities *
CirculenRecover EP PA6 GF20 H BLK		H, FR	CirculenRecover EP PA66 GF15 HI H BLK	H, HI
CirculenRecover EP PA6 GF30 H BLK		H, FR	CirculenRecover EP PA66 GF20 H BLK	H, FR
CirculenRecover EP PA6 GF30 HI H BLK		H, HI	CirculenRecover EP PA66 GF30 H BLK	H, FR
CirculenRecover EP PA6 GF35 H BLK		H, FR	CirculenRecover EP PA66 GF30 HI H BLK	H, HI
CirculenRecover EP PA6 GF50 H BLK		Н	CirculenRecover EP PA66 GF35 H BLK	H, FR
			CirculenRecover EP PA66 GF50 H BLK	Н
	Product datasheets available online <i>New</i> – Datasheets now feature DIN91446 data		CirculenRecover EP PA66 GB30 H BLK	Н
circulen recover			<i>Circulen</i> Recover EP PA66 MKF4015 H BLK	Н
			CirculenRecover EP PA66 MV HI H BLK	HI, H
			CirculenRecover EP PA66 MV SHI H BLK	SHI, H

\*: H: heat stabilized; HI: high impact; SHI: super high impact, FR: Flame retardant

### **Circulen**Recover EP – Base Products in Development Phase

# *Circulen*Recover EP PA (PA6 and PA66 Polyamide Compounds)

<i>Circulen</i> Recover EP PA6	Pre-consumer Recycled Content	<i>Circulen</i> Recover EP PA66
	[%]*	CirculenRecover EP PA66
CirculenRecover EP PA6 GF20 H BLK	55	CirculenRecover EP PA66
CirculenRecover EP PA6 GF30 H BLK	45	CirculenRecover EP PA66
<i>Circulen</i> Recover EP PA6 GF30 HI H BLK	30	CirculenRecover EP PA66
CirculenRecover EP PA6 GF35 H BLK	40	CirculenRecover EP PA66
CirculenRecover EP P	25	CirculenRecover EP PA66
		CirculenRecover EP PA66
circulen recover		<i>Circulen</i> Recover EP PA66 I BLK
		CirculenRecover EP PA66 I
		CirculenRecover EP PA66

CirculenRecover EP PA66	Recycled Content [%]*
<i>Circulen</i> Recover EP PA66 GF15 HI H BLK	75
CirculenRecover EP PA66 GF20 H BLK	75
CirculenRecover EP PA66 GF30 H BLK	65
<i>Circulen</i> Recover EP PA66 GF30 HI H BLK	55
CirculenRecover EP PA66 GF35 H BLK	60
CirculenRecover EP PA66 GF50 H BLK	45
CirculenRecover EP PA66 GB30 H BLK	65
<i>Circulen</i> Recover EP PA66 MKF4015 H BLK	55
CirculenRecover EP PA66 MV HI H BLK	90
CirculenRecover EP PA66 MV SHI H BLK	80

\*Pre-consumer recycled Content: Based on 100% of total formulation (including filler, additives, additives and pigments) – rounded in 5% steps The tradename "*Schulamid*" may be abbreviated "SAM" in documents or on labels, "Recover" may be abbreviated "RC".

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#### Documentation level

• All Technical datasheets are available in LyondellBasell portal

https://www.lyondellbasell.com/en/products-technology/advanced-polymer-solutions/technical-data-sheets/engineered-polymers-tds/

- TDS are documented according to DIN spec 91446:2021
  - Aiming at controlling the way recycled content is reported
  - As well as grading a documentation level related to the recycled content source
- Safety Datasheets are available as well
- LCA data is being documented (Work in progress)
  - An LCA request form has to be filled in
  - Please reach out





# **Circulen**Recover EP PA Range trends



### **Circulen**Recover EP PA – FIRE RETARDANT

- CirculenRecover EP PA FR versions first tests
  - CirculenRecover EP PA shows good fire resistance compatibility
  - Heat deflection, impact slightly lower as recycled content increases
  - Flammability properties like UL94, GWIT and GWFI show identical values
  - UL listing would not be an issue
  - Electrical properties are unchanged



#### **Circulen**Recover EP PA – new developments

#### Color matched compound

- New source allows even up to WHITE coloration (PA 6)
  - Volume secured and guaranteed
  - 40+ T available today (white)
- Other colors possible:
  - Blue, green, red going through customer validation stages today
  - Vivid colors preferrable (light yellow, brown difficult)
  - PA6 or 66 base
  - NAT version in progress =>

#### Trend: Visualize recycled source

- Customer ask for "dots" or "points" to differentiate product
- Achievable through compounding or masterbatch
- Example: Background color + black dots







## Schulamid Polyamides – Moving forward

#### Current developments

- Post-Consumer sources
  - Origin & content challenges
- Recycled origin fillers
  - Carbon Fibers
- Conductivity & resistivity
  - Thermal
  - Electric
  - Signal conductivity or shielding
  - Anti-static
  - EMI
- Food contact grades range extension

#### Technology trends

- UWB, radar signals
- Automation & sensors (camera, sensor activation of functions, remote accessibility, autonomous driving)
- New drivetrains = new requirements (temperature, batteries, dielectric fluids, function controls)
- Screen controls vs buttons, device connectivity (phone, keys)
- Passenger experience (touch, feel, lighting, comfort, assistance & connectivity)





# Success story: introducing TSL Outdoor 2023 Snow shoes

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TSL is world leader in
 Snowshoes development
 & manufacture

- Brand values are strongly connected to the respect of nature, well-being & innovation
- Thus leading TSL to investigate recycling, sustainable material in products design
- www.tsloutdoor.com



## **Snowshoes: product profile**

- Typically, snowshoes are principally composed of
  - PP based materials
  - PA blends
- Critical characteristics
  - Resistance to impact
  - Cold temperature behavior
  - Fatigue in challenging conditions (cold, steps repeating)
  - Usually incompatible with recycled content products
- Timeline
  - LyondellBasell sampled CirculenRecover EP PA6 MV SHI H Black in December 2021
  - Trials ran end of January 2022 due to production constraints
     @ TSL & suppliers
  - Winter testing successfully completed March 2022 100 days in the snow



Model: Symbioz

Phoenix product range

### **Snowshoes: product profile**

#### CirculenRecover EP PA value proposition

- Recycled content
- Quality of pre-consumer recycled content
- Compounding experience of LyondellBasell
- Processability, perceived quality after injection
- Successfully passed physical testing in snow environments

#### Future developments

- CirculenRecover EP PA is differentiated by its color in the TSL range: Black vs a corporate grey on "virgin material" parts
- This allows communication based on the recycled content of the shoe
  - Thus targeting specific markets
  - And extend the product offer
- Production differentiation: recycled content parts are easily recognizable in production
- *Circulen*Recover EP PA color-ability also allows the potential for future differentiation specific to customers, countries...



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Yoan BIBOLLET – TSL Outdoor – Head of product development

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TSL products based on *Circulen*Recover are presented in the exhibition floor, at LyondellBasell Stand.



# Thank you

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