

CHEMISTRY THAT MATTERS™



DISCOVER MORE SUSTAINABLE OPTIONS

-UPCYCLED, MECHANICALLY RECYCLED AND CERTIFIED RENEWABLE OFFERINGS

Somasekhar Bobba, Global Technology Manager
SABIC Polymers, Specialties Business Unit



INTRODUCTION

SABIC AT A GLANCE



1976

Company established



29,000

Employees around the world



140

Countries served



≈ 11,000

Global patents and pending applications



Top 2

Chemical Brand Value*

4.9

US\$ bn

Estimated Brand Value*

78.5

US\$ bn

Total assets

0.35

US\$ bn

Net income

37.7

US\$ bn

Annual revenue



≈ 150

New products each year



63

World-class plants worldwide

SPECIALTIES: BUSINESS OVERVIEW



As the 'home of unique offerings' within SABIC, the Specialties business is focused on challenging technology endeavors that deliver fundamental progress to the way the world travels, communicates, works and lives. Leveraging global application technology centers and deep materials processing expertise, Specialties' solutions are provided to a wide range of industries and include engineering thermoplastic resins and compounds, sheet and film, filaments, thermosets and additives.

KEY OFFERINGS

- NORYL™ resins
- ULTEM™, EXTEM™ and SILTEM™ resins
- LNP™ compounds and copolymers
- Specialty additives
- Application development & prototyping

KEY INDUSTRIES

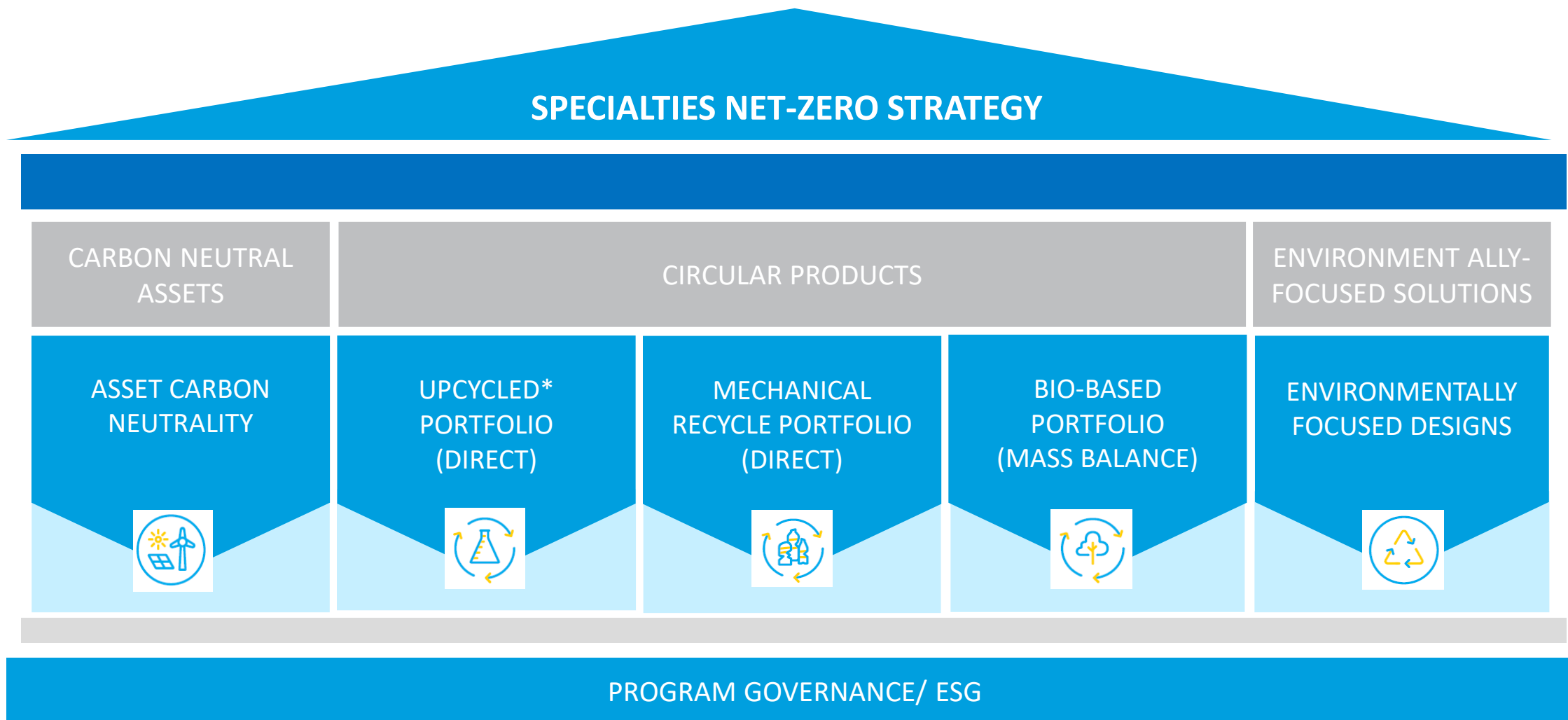
- Mobility
- Industrial
- Electronics
- Healthcare
- Infrastructure

INNOVATION HIGHLIGHTS

- 6 Technology and Application Centers in USA, Netherlands, India, Korea, Japan and China
- ULTEM filaments for fused deposition modeling
- ULTEM ultra thin-film for high temperature capacitors

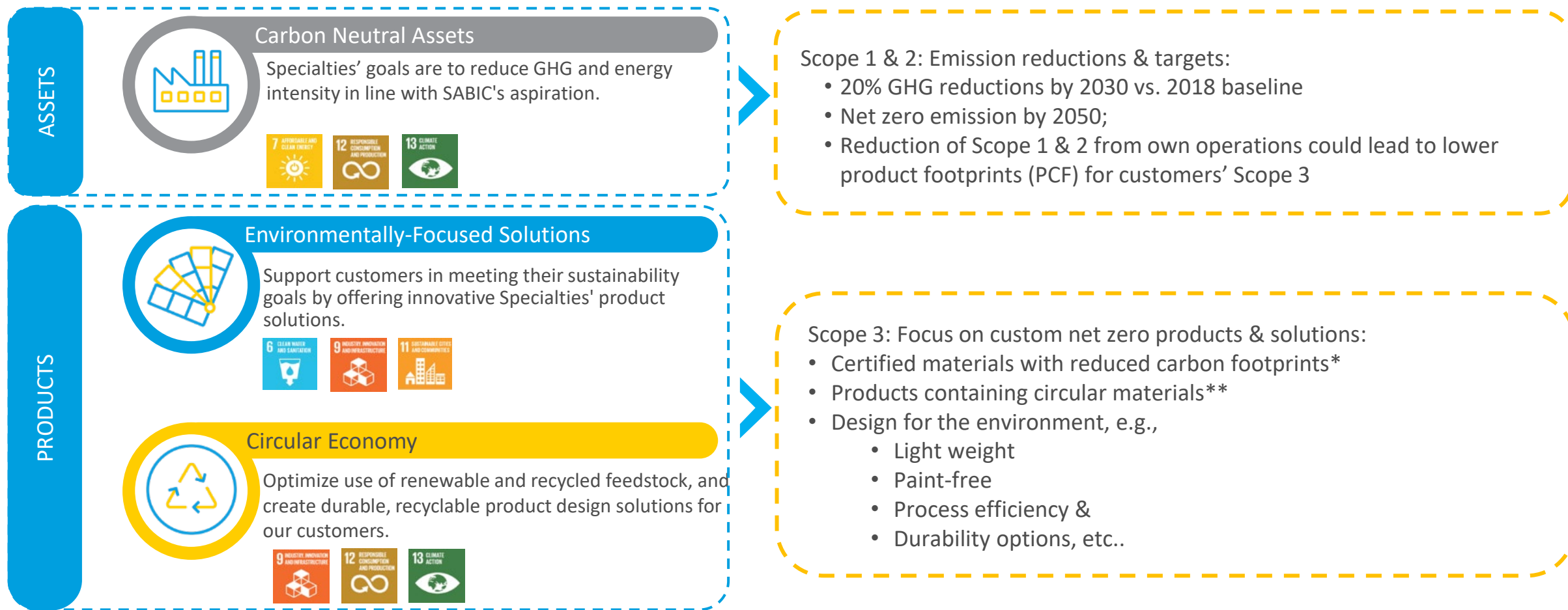
APPROACH & STRATEGIES

COMPLEMENTARY PILLARS OF SPECIALTIES NET ZERO STRATEGY



*Upcycled portfolio describes SHPP patented proprietary depolymerization technology for the iQ PBT portfolio

SABIC'S SPECIALTIES BUSINESS NET ZERO PRIORITIES



SABIC'S SPECIALTIES BUSINESS NET ZERO TARGETS

2030

Carbon Neutral Assets



20% reduction¹ in Scope 1 and 2 GHG emissions compared to 2018, with **NET ZERO** emissions by 2050

2030

Value Creation through Circular Products



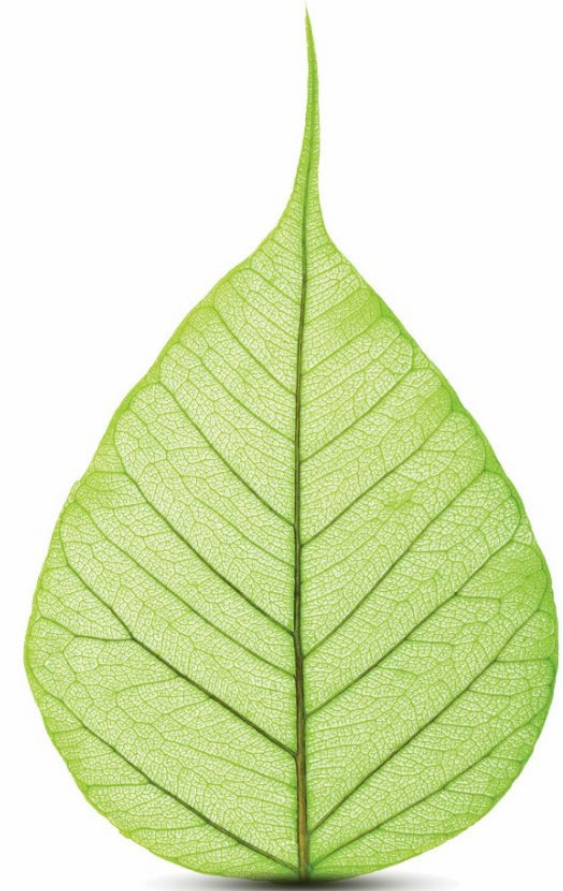
More than **10%** of total revenue²

2030

Environmentally-Focused Solutions



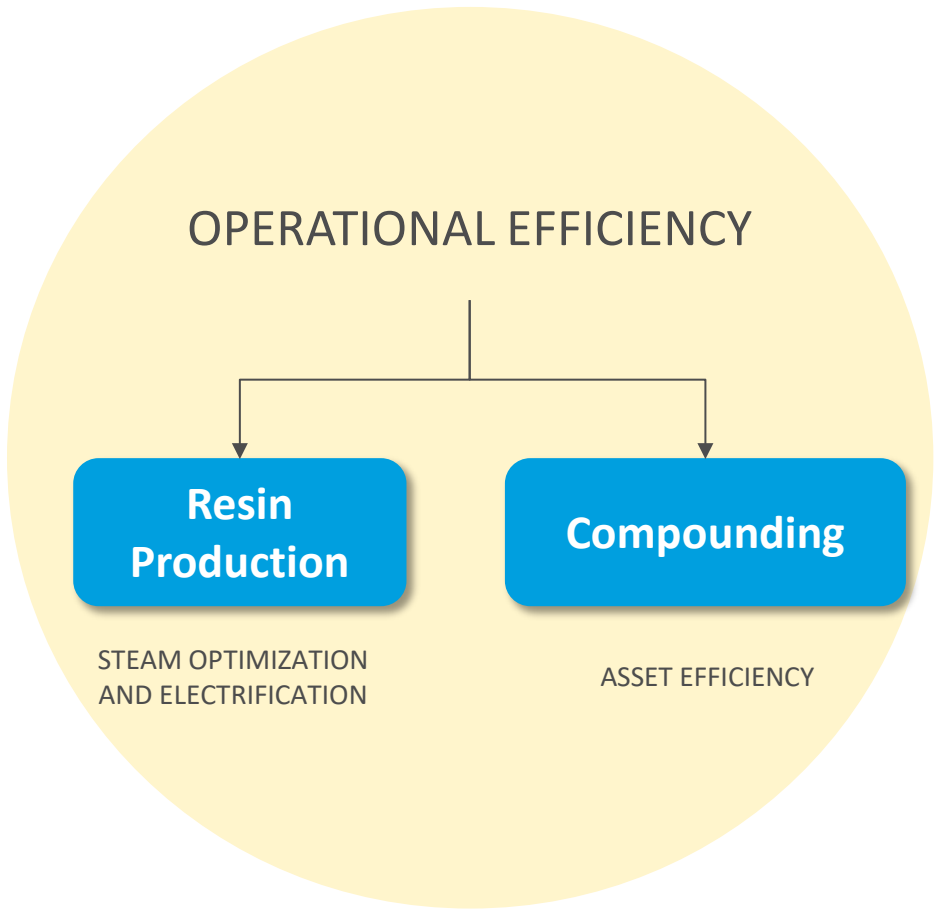
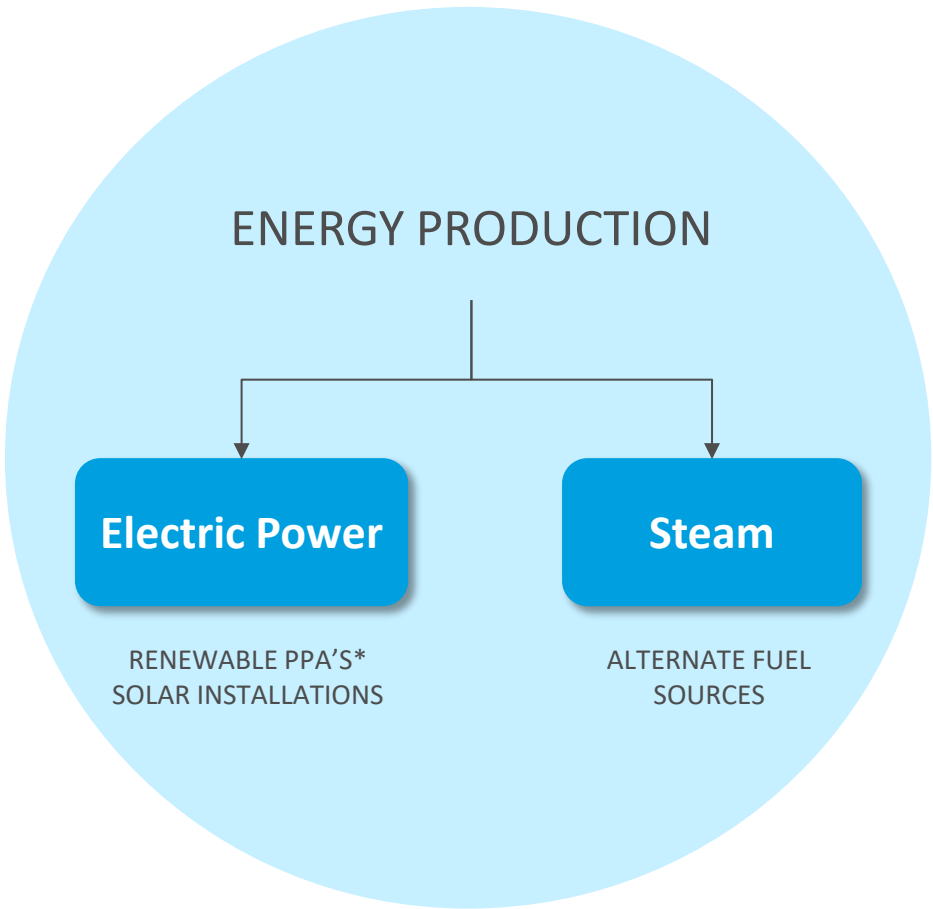
More than **40%** of total revenue



CARBON NEUTRAL ASSETS

WE HAVE TWO CATEGORIES TO REDUCE CO₂ EMISSIONS FROM SCOPE 1 & 2

CO₂ Emission Savings Scope 1 & Scope 2



*PPA'S=Power Purchase Agreements

CARBON NEUTRAL ASSET PROJECTS

RENEWABLE ENERGY

- **Alternative fuel steam production** in BOZ is currently under evaluation to replace the use of natural gas for steam production
- Power Purchase Agreements (PPAs) for our sites put **additional renewable energy** on the electric grid and provide electricity with **net zero CO2 emissions**
- **Solar panels** at our compounding sites, such the 1 MW solar installation at Rayong allow us to **reduce emissions from electricity usage**, the primary source of compounding emissions



RESOURCE EFFICIENCY

- Use of the Mechanical Vapor Recompression system in Selkirk uses **electricity instead of steam** for heating, resulting in **reduced emissions**



**20% REDUCTION IN SCOPE 1 and 2 GHG EMISSIONS by 2030
WITH NET ZERO EMISSION BY 2050**

NET ZERO SOLUTIONS

CIRCULAR PRODUCTS

CIRCULAR PRODUCTS OF LOWER PRODUCT CARBON FOOTPRINTS

13 CLIMATE ACTION



NET-ZERO CARBON

**Unique offerings,
lower carbon footprint¹**

UPCYCLED PORTFOLIO

COMPOUNDS WITH VIRGIN FEEDSTOCK-EQUIVALENT PROPERTIES
LNP™ ELCRIN™ IQ PORTFOLIO

- Patented depolymerization process
- Green content potentially up to ~100%
- 3rd Party² verification of material chain of custody for responsibly sourced feedstocks

MECHANICAL RECYCLING

COMPOUNDED RESINS
LNP COMPOUNDS
NORYL™ RESINS

- Post-Consumer Recycled content up to 80%
- Hybrid solution; mix with virgin material
- Closed loop opportunities

BIO-BASED PORTFOLIO

BIO-BASED COMPOUNDS & RESINS
ISCC+ CERTIFIED LNP PRODUCTS
ISCC+ CERTIFIED ULTEM™ RESINS
ISCC+ CERTIFIED NORYL RESINS

- Mass balance approach
- Feedstocks not in competition with human food chain
- Virgin equivalent properties

¹Lower carbon footprint in comparison to same materials containing 100% crude oil feedstock.

². 3rd party listed on page 67

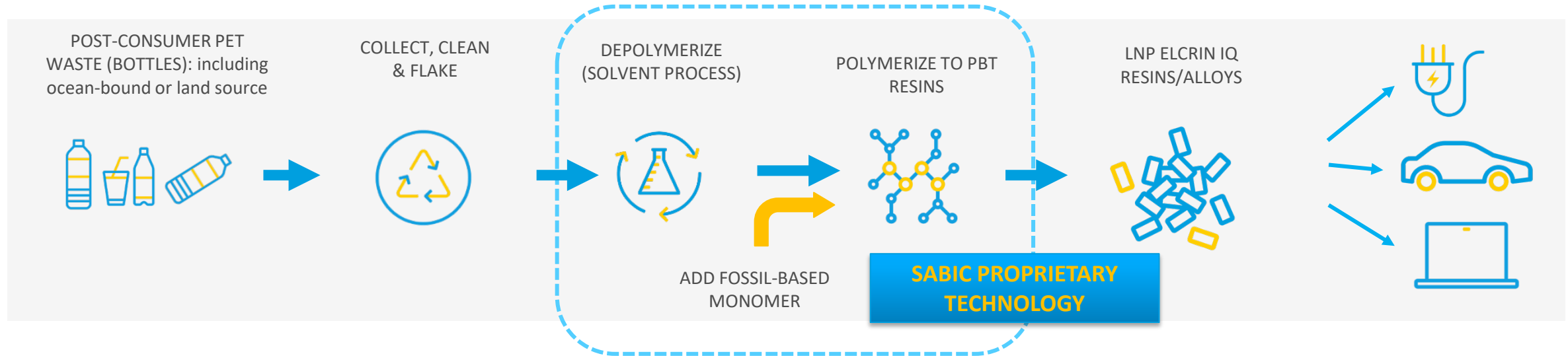
UPCYCLED PORTFOLIO

- LNP[™] ELCRIN[™] iQ PBT

PROCESS | POTENTIAL BENEFITS | OFFERINGS

LNP™ ELCRIN™ iQ : PATENTED CHEMICAL UPCYCLING PROCESS

UPCYCLING OF POST CONSUMER PET WASTES INTO LNP ELCRIN iQ PRODUCTS



- LNP ELCRIN iQ compounded resins contains up to **60% recycled content by weight**
- LNP ELCRIN iQ **chemical upcycling process** can convert various post-consumer recycled PET sources, including both **ocean-bound** and **land-sourced** PET wastes
- **Social Responsibility Certification*** across the entire value chain
- **Global product strategy** to support regional growth and various market needs



UPCYCLED PORTFOLIO – KEY BENEFITS

UPCYCLED PORTFOLIO (DIRECT)



LNP™ ELCRIN™ iQ resin

- Potential drop-in solution
- Virgin equivalent properties
- May comply with certain regional food contact regulations
- PCR content certified by SCS Global
- Responsible Sourcing certified including social Responsibilities

COMPARED WITH CONVENTIONAL COMPOUNDS



Better carbon/energy footprint



Improved social impact and corporate image



Comparable properties



Potential drop-in solution (no need to change tooling and design)



REACH, RoHS and EPEAT compliant

COMPARED WITH MECHANICAL RECYCLING



Potential use in certain healthcare and food-contact applications



Better quality consistency



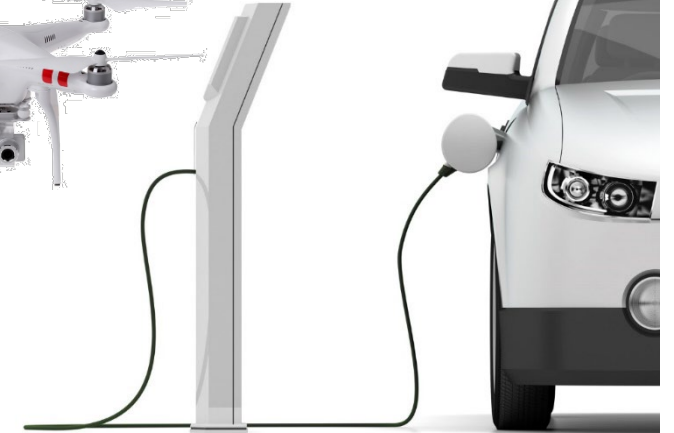
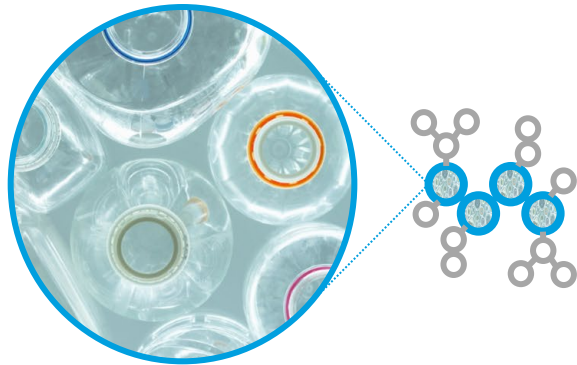
Better color space (all colors)



Virgin-quality achievable

UPCYCLED PORTFOLIO

CASE EXAMPLE



KEY PRODUCT FEATURES

- Compliance with REACH¹, RoHS², EPEAT
- Healthcare and Food-contact capable
- PCR content certified
- Verified* responsible source certificate
- Global Recycle Standard certification achieved (for fiber and textile applications)

POTENTIAL CUSTOMER BENEFITS

Mechanical performance **as close to virgin PBT** performance

Drop in solution with no tooling changes

Virgin-like color space

CONTRIBUTION TO #13 SDG CLIMATE ACTION

Compared to virgin resin, **LNP ELCRIN iQ** product has a smaller cradle-to-gate environmental footprint.

Compared to virgin PBT resin, **LNP ELCRIN iQ** resin has been shown through peer-reviewed life cycle assessment to reduce the energy and carbon footprint of the material by up to **43%** and **29%**, respectively**.

* Verified by SCS Global [Certified Green Products Guide | SCS Global Services](#)

** ELCRIN iQ resin and virgin PBT data from 2020 third-party critically-reviewed LCA Study per ISO 14040/14044 standards.

AWARD WINNING LNP™ ELCRIN™ iQ UPCYCLED PORTFOLIO

Winner of R&D 100 Award 2022



Ringier Technology Innovation Award 2022
Winner of Personal Care Technology



- ✓ Comparable mechanical properties
- ✓ FDA capability
- ✓ Contribute to carbon neutrality



Inaugurated by Ringier Tradeawarded each year in
Media in 2006



China



Acknowledge new
idea/product/technology



Focus on energy saving & clean
manufacturing

MECHANICAL RECYCLING

PROCESS | POTENTIAL BENEFITS | OFFERINGS

MECHANICAL RECYCLING : TYPICAL PROCESS

Post Consumer Recycle (PCR)

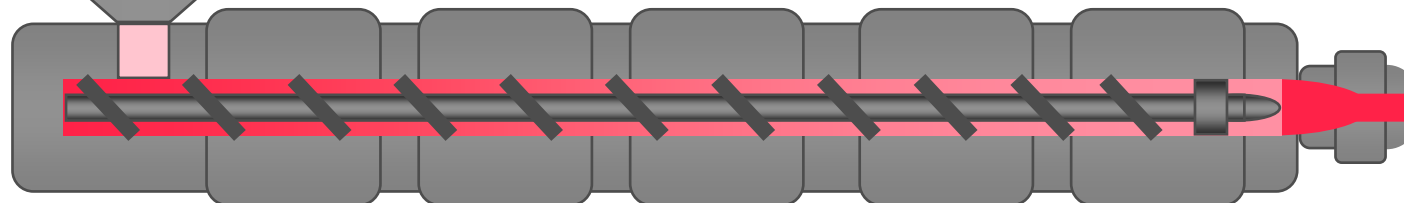
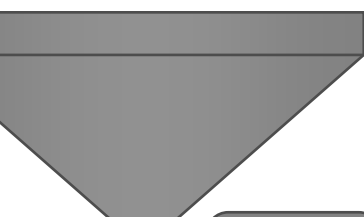


+

Virgin Resins



- Collection
- Sorting
- Grinding
- Metal Removal
- Washing & Drying
- Extrusion & Pelletization
- QC Inspection



PCR Compounds

Chain of Custody & Recycle Content Certifications



[SCS Global Services](https://www.scsrecycled.com/)

MECHANICAL RECYCLING : PCR PC PORTFOLIO



Up to 80% post-consumer recycled content



Lower carbon footprint & waste reduction compared to virgin PC



EPEAT¹ and RoHS² compliant



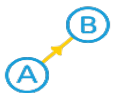
Non-brominated & non-chlorinated flame-retardant systems



Up to two extra EPEAT system points possible



Properties performance close to virgin grades



Potential drop-in solutions to existing processing process & tools

Typical Post Consumer Recycled PC Sources



Water bottle



Optical Disks



PC Sheet



Auto headlamp

MECHANICAL RECYCLING



KEY PRODUCT FEATURES

- Impact resistance to meet stringent drop and structural tests
- UL94 HB or V0 rated grades
- PCR content up to 80% - third party certification*
- Color match capable
- Non-halogenated flame-retardant grades compliant with UL94, REACH **, RoHS

POTENTIAL CUSTOMER BENEFITS

Mechanical performance **as close to virgin product** performance

Drop-in solution with no tooling changes

Brand styling with appealing **custom colors**

CONTRIBUTION TO #13 SDG CLIMATE ACTION

Mechanical recycling products can support customer sustainability goals by **diverting plastics waste from landfills** back into durable goods including consumer electronics

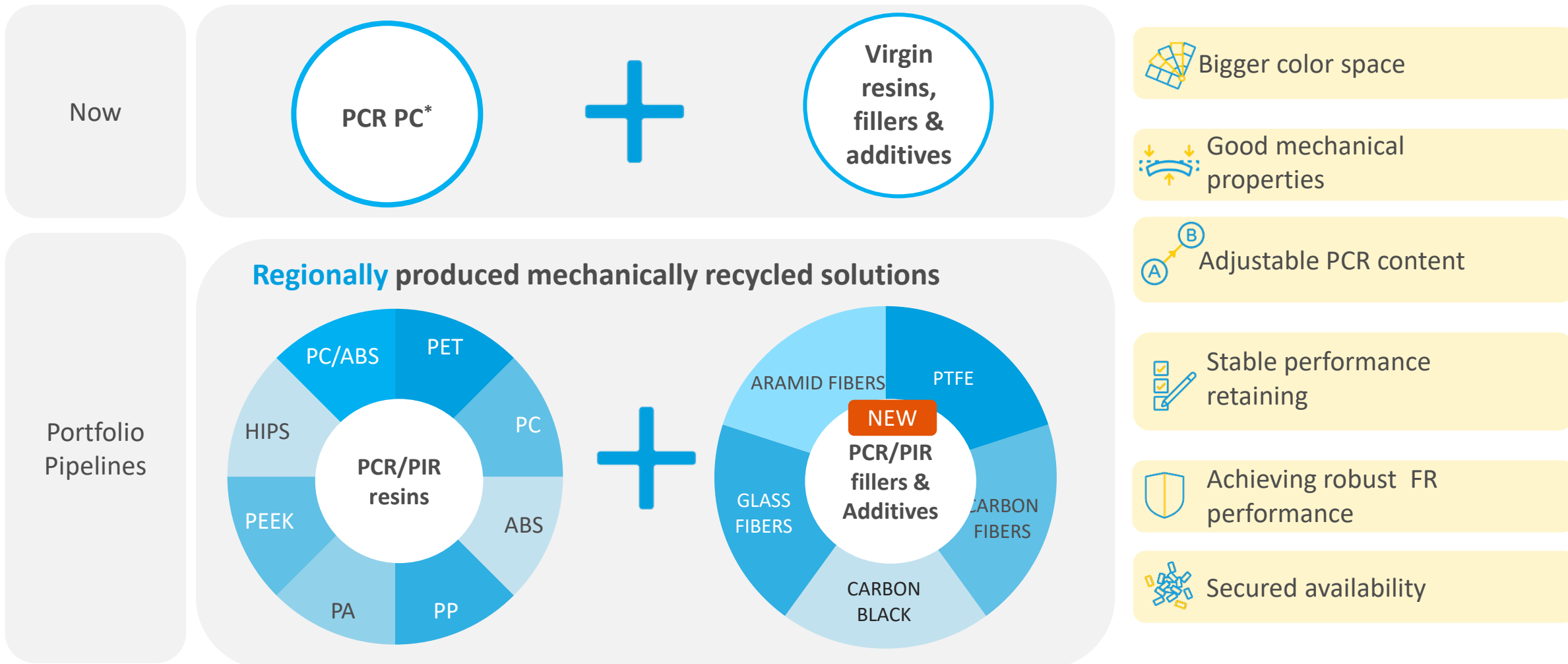
- Up to 60% lower carbon footprint
- Up to 69% lower energy footprint
- Up to 2 EPEAT points

* Verified by SCS Global [Certified Green Products Guide](#) | [SCS Global Services](#)

** REACH Regulation EC 1907/2006 and related ECHA list of restricted substances

MECHANICAL RECYCLED PORTFOLIO : POST- & PRE-CONSUMER PRODUCTS UNDER DEVELOPMENT

LNP™ is studying the potential expansion of its mechanical recycled portfolio investigating:



CIRCULAR PRODUCTS

BIO-BASED PORTFOLIO

PROCESS | POTENTIAL BENEFITS | OFFERINGS

ISCC+ CERTIFIED RENEWABLE FEEDSTOCKS



CRUDE TALL OIL

CRUDE TALL OIL

- Derived from [forestry residue](#)
- Replacing fossil-based feedstock (e.g., Naphtha)
- Second generation renewable feedstock not in competition with the human food chain
- Animal free feedstock
- Palm oil free feedstock
- Lower carbon footprint compared to fossil alternative
- ISCC Plus certified value chains



USED COOKING OIL

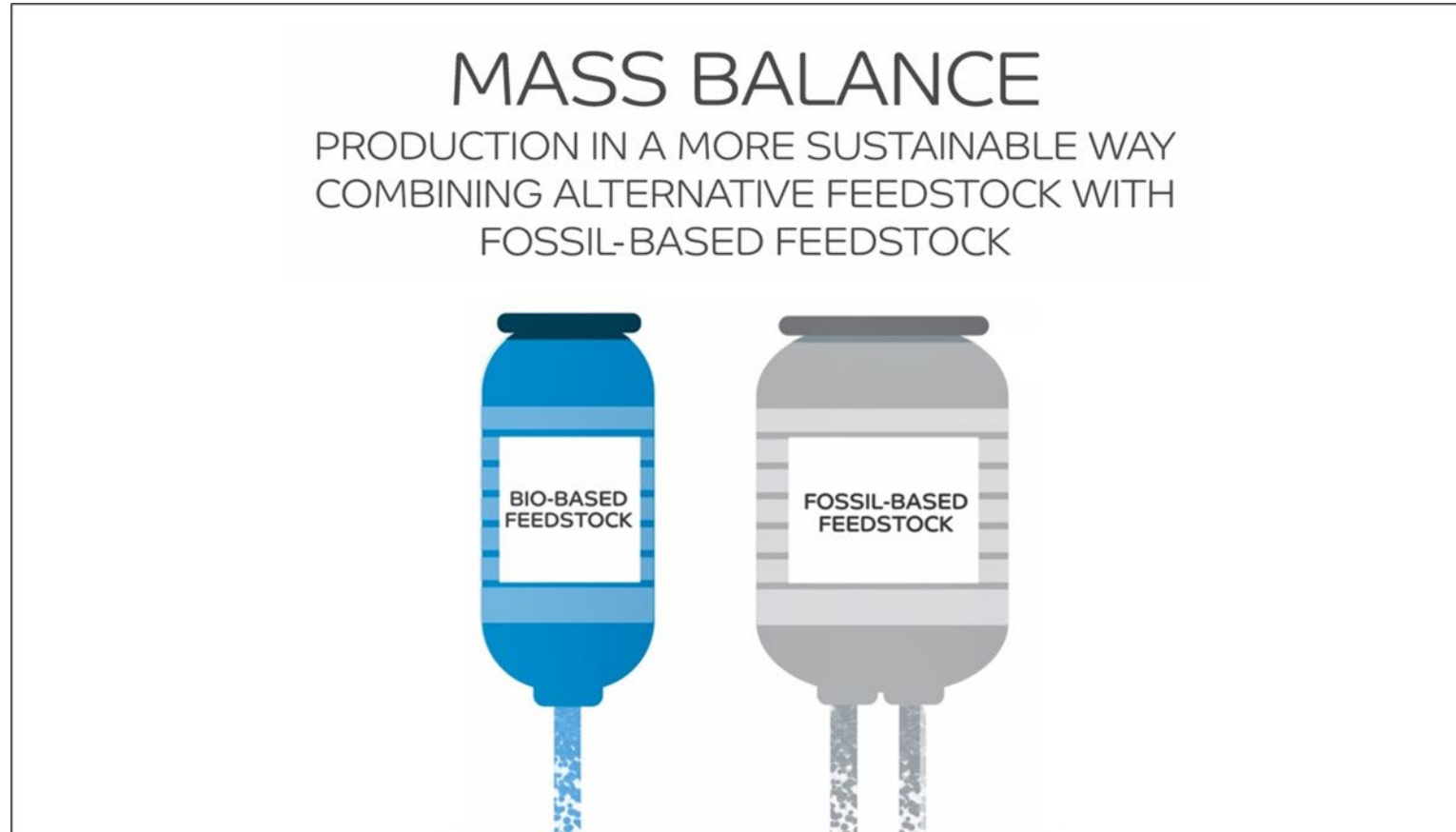
USED COOKING OIL (UCO)

- [Oils and fats](#) used for cooking or frying in the food processing industry (e.g., restaurants) or at consumer level (e.g., in households) that are [no longer fit for human consumption](#)
- Replacing fossil-based feedstock (e.g., Naphtha)
- Second generation renewable feedstock not in competition with the human food chain
- Lower carbon footprint compared to fossil alternative
- ISCC Plus certified value chains

NEW

CONTINUE EXPLORING NEW CERTIFIED RENEWABLE FEEDSTOCKS

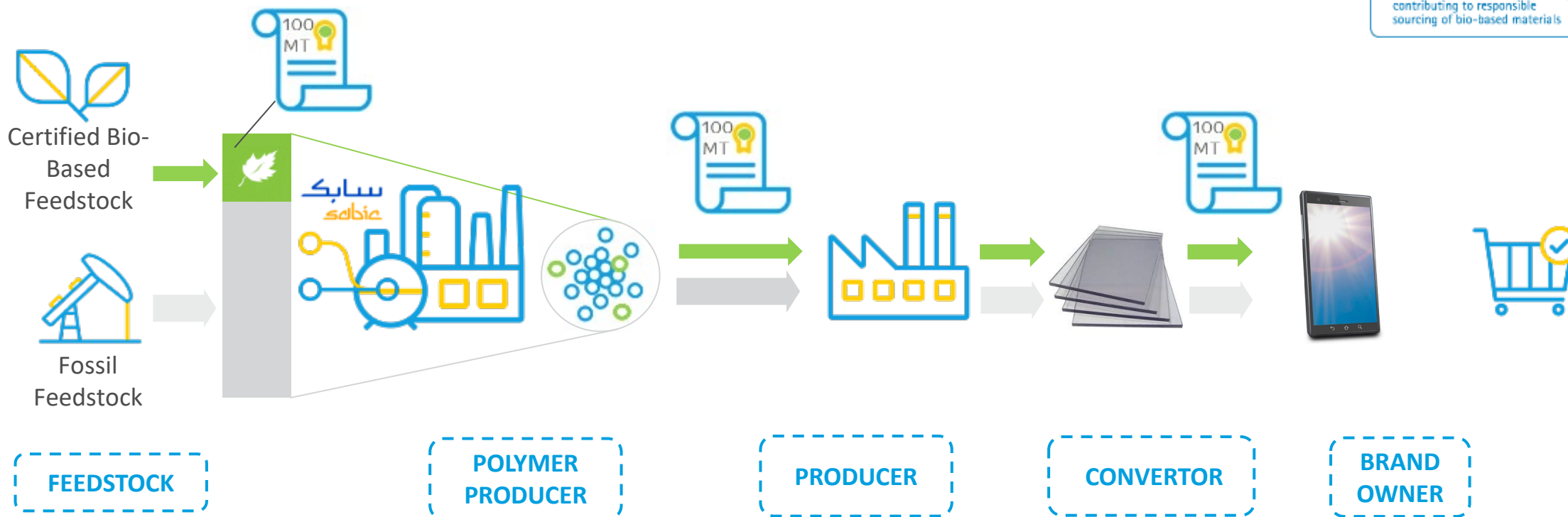
ACCEPTANCE OF THE MASS BALANCE CONCEPT IS A VITAL STEP



MASS BALANCE IS A SYSTEM WHERE THERE IS CERTIFIED BALANCE BETWEEN THE AMOUNT OF 'INPUT MATERIALS' INTO A PROCESS AND THE AMOUNT OF 'OUTPUT MATERIALS' FROM THE PROCESS

TRACEABILITY OF BIO-BASED OFFERINGS

MANUFACTURING SCHEME FOR BIO-BASED OFFERINGS



CERTIFICATION BY MASS BALANCE CHAIN OF CUSTODY

ISCC+ CERTIFIED LNP™ BIO-PC & COPOLYMER PORTFOLIO



KEY PRODUCT FEATURES

- Bio content certified by ISCC+ by Mass Balance approach
- Compliance with REACH¹, RoHS²
- Impact resistance that can meet certain stringent drop and structural tests
- UL94 HB or V0 rating
- Dimensional stability
- Color match capable

POTENTIAL CUSTOMER BENEFITS

Same mechanical performance as virgin material

Drop in solutions with no tooling changes -
Requalification not required

Equivalent color space as standard products

CONTRIBUTION TO #13 SDG CLIMATE ACTION

Renewable products can support customer goals to produce durable consumer goods in a more sustainable manner

- Up to 61% lower carbon footprint
- Up to 35% lower fossil depletion

¹ Regulation EC 1907/2006 and related ECHA list of restricted substances

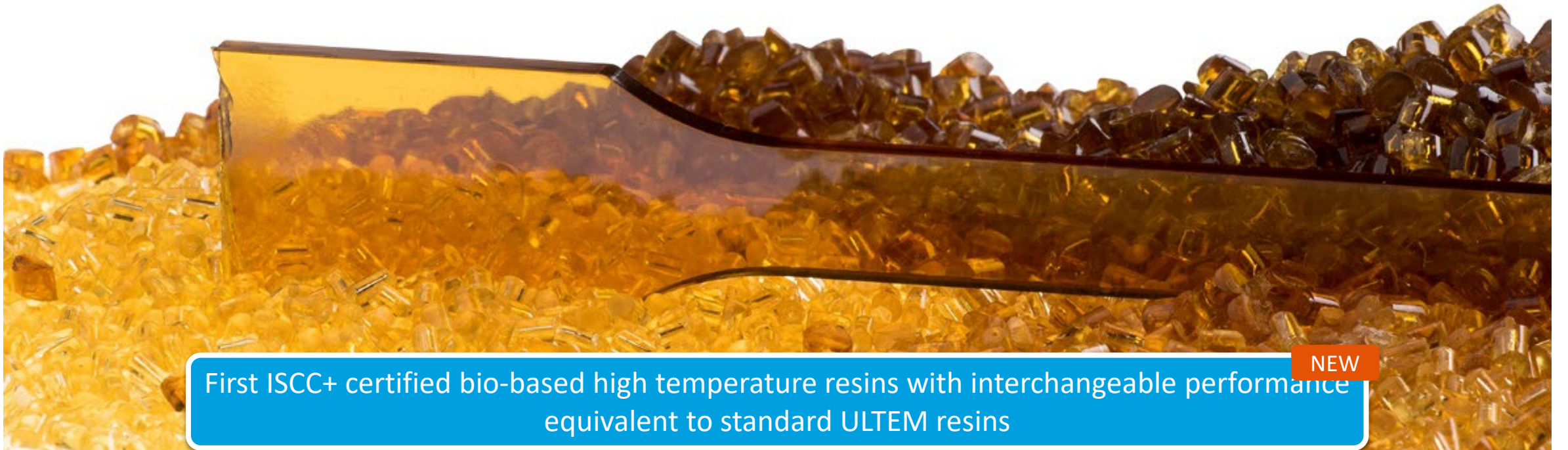
² Directives 2011/65/EU, 2015/863/EU, 2017/2102/EU and amendments

ISCC+ CERTIFIED BIO-BASED HIGH HEAT ULTEM™ RESINS

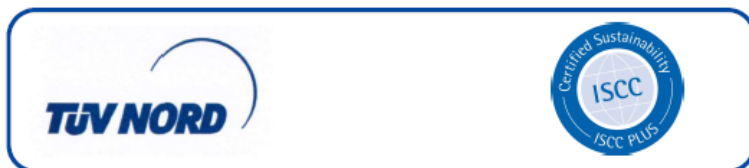
ULTEM
resins

Amorphous, transparent, amber, polyetherimide (PEI) resin:

- Long-term high heat capability
- Dimensional stability / tight tolerances
- Strength and modulus at high temperatures
- Inherent flame resistance
- Low smoke evolution and toxicity
- Hydrolytic and chemical stability



BIO BASED NORYL™ RESINS



ISCC PLUS Certificate

Certificate Number: ISCC-PLUS-Cert-DE129-35316473

TÜV NORD CERT GmbH
Am TÜV 1, 45307 Essen, Germany

certifies that

SHPP US LLC
Noryl Avenue 1
Selkirk, NY 12158-9765
United States

complies with the requirements of the certification system
ISCC PLUS
(International Sustainability and Carbon Certification)

This certificate is valid from 02.09.2022 to 01.09.2023

The site of the system user is certified as:
Polymerization plant, Compounding

The scope of the certificate includes the following chain of custody options:
Mass Balance

Essen, 02.09.2022
Place and date of issue



Stamp, Signature of issuing party

The Issuing Certification Body is responsible for the accuracy of this document.
Version / Date: 1 (no adjustments) / 02.09.2022



Annex to the certificate:

Sustainable materials handled by the certified site
(This annex is only applicable for material handled under the scopes: farm/plantation, point of origin, central office, (farm/plantation or point of origin) first gathering point, processing unit (any type) but not for material that is only traded and/or stored)

This annex is only valid in connection with the certificate:
ISCC-PLUS-Cert- DE129-35316473 issued on 02.09.2022

Input material	Output material	Add-ons (voluntary) ¹⁾	ISCC waste process applied ²⁾	SAI/ FSA ³⁾	FEFAC ⁴⁾
Bio-circular Styrene	Bio-circular PS resin (high impact polystyrene)	N/A	yes	N.A.	N.A.
Bio-circular Styrene	Bio-circular PPE (polyphenylene ether) blends	N/A	yes	N.A.	N.A.
Bio-circular Phenol	Bio-circular PPE resin (polyphenylene ether)	N/A	yes	N.A.	N.A.
Bio-circular Phenol	Bio-circular PPE (polyphenylene ether) blends	N/A	yes	N.A.	N.A.
Bio-circular Methanol	Bio-circular PPE resin (polyphenylene ether)	N/A	yes	N.A.	N.A.
Bio-circular Methanol	Bio-circular PPE (polyphenylene ether) blends	N/A	yes	N.A.	N.A.
Bio-circular PS resin (high impact polystyrene)	Bio-circular PPE (polyphenylene ether) blends	N/A	yes	N.A.	N.A.

The Issuing Certification Body is responsible for the accuracy of this document.
Version / Date: 1 (no adjustments) / 02.09.2022

Certification Pathway for:

- Bio-PPE powder
- Bio-NORYL™ Resins
- Bio-NORYL GTX™ Resins
- Bio-NORYL PPX™ Resins
- Bio-Flexible NORYL™ Resins

**Certified Renewable Containing
PPE Powder &
NORYL™ Resin
Available Now**

ENVIRONMENTALLY FOCUSED DESIGN

- DESIGN FOR NET-ZERO EMISSIONS

DESIGN FOR NET ZERO EMISSIONS

13 CLIMATE ACTION



NET-ZERO CARBON

Application development for enhanced durability, efficiency and recyclability

RECYCLABILITY

- Better recyclability versus thermosets
- Part simplicity (e.g., laser marking, mold-in-color)
- Integrate material & design supports for ease-of-recycling for the application
- Safer chemistry: Non-Br/Cl Flame Retardant, PFOA free, Green Screen Score 3 or above

PROCESS EFFICIENCY

- Elimination of secondary operations (paint, coating, labelling, etc.)
- Lower energy consumptions, reduced cycle times and reject material
- Reduced fuel/energy consumption during use phase via light weighting

DURABILITY

- Good thermal conductivity combined with light-weighting as an alternative to metal
- Better wear and friction performance
- Enhanced lifetime of parts and possible reuse

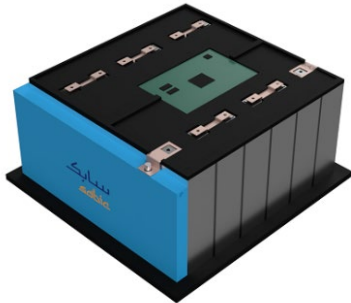
CASE EXAMPLE



SPECIALTIES' ENVIRONMENTALLY FOCUSED SOLUTIONS

New grades of **NORYL™ resin**

support demand for **lighter, thinner and more crash-resistant** EV battery modules and housings



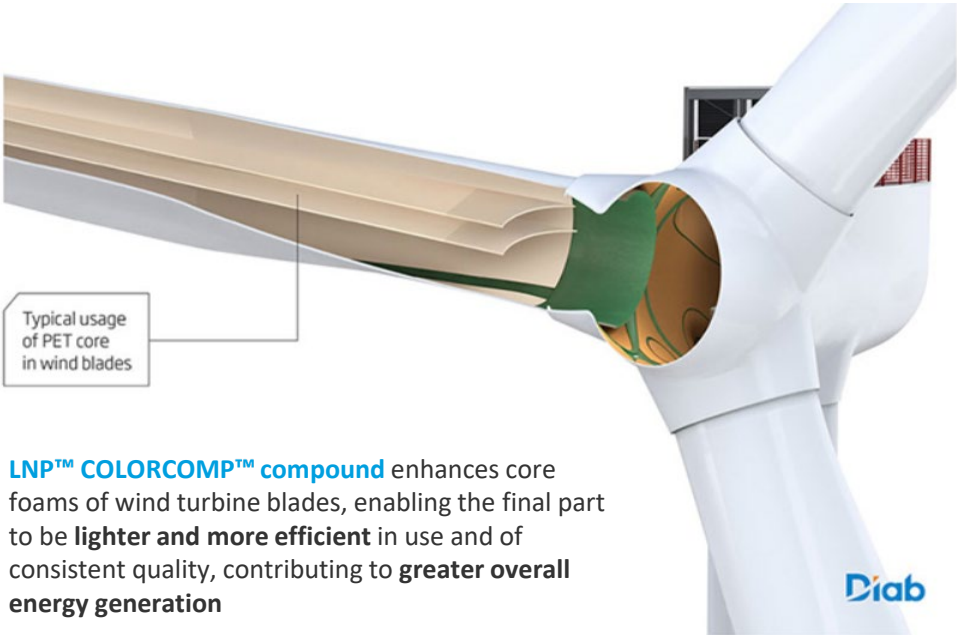
LNP™ SLX copolymer grades

deliver high gloss, weatherable **molded-in color as a paint-free solution** with potential lower carbon footprint associated with reducing secondary operations



ELCRES™ HTV150 dielectric films

Well-suited for high temp, high voltage applications support transition to new technologies based on silicon carbide to **improve the efficiency** of inverter modules in EVs



Typical usage of PET core in wind blades

LNP™ COLORCOMP™ compound enhances core foams of wind turbine blades, enabling the final part to be **lighter and more efficient** in use and of consistent quality, contributing to **greater overall energy generation**



EconCore's honeycomb cores made with SABIC's **NORYL GTX™ resin** can deliver **high heat** performance and potential for **recyclability** for EV batteries and photovoltaics structures

CIRCULAR PRODUCTS & APPLICATION DEVELOPMENT FOR E-MOBILITY

CASE EXAMPLE



DISPLAY

LNP™ SLX resins based on **RENEWABLE** feedstock (weatherability, impact, chemical resistance)

CONSOLE

LNP THERMOCOMP™ compounds based on **PCR** (low moisture, high modulus, hydrolytic stability, chemical resistance)

FASCIA

LNP SLX & EXL resins based on **RENEWABLE** feedstock (weatherability, impact, chemical resistance)



CONNECTOR & SOCKET

LNP CRX resins based on **PCR** (dimensional stability, chemical resistance, high surface finish)

CHARGE PORT COVER

LNP **ELCRIN™ iQ** upcycled compounds based on **PCR** (dimensional stability, chemical resistance, high surface finish)



CONNECTOR

LNP THERMOCOMP compounds based on **PCR** (low moisture, high modulus, hydrolytic stability, chemical resistance)

FRAME

LNP EXL resins based on **RENEWABLE** feedstock (weatherability, impact, chemical resistance)

VALUE CHAIN COLLABORATION AND INNOVATION

SABIC JOINS GLOBAL ALLIANCE TO HELP END PLASTIC WASTE IN THE ENVIRONMENT

17 PARTNERSHIPS FOR THE GOALS



INNOVATING THROUGH THE VALUE CHAIN

Alliances across the value chain

ALLIANCE TO END PLASTIC WASTE

Plastic waste in the environment, particularly the ocean, is a serious global challenge that calls for swift action and strong leadership. Despite the many benefits plastics bring to people and communities around the world, including improvements in living standards, health, safety, and sustainability, unmanaged plastic waste has become a challenge in some parts of the world.

- **SABIC** is a **founding member** of the Alliance to End Plastic Waste since January 2019, a not-for-profit organization consisting of 27 global companies to advance solutions to help reduce mismanaged plastic waste in the environment.
- The goal is for Alliance members to deploy \$1.5 billion over the next five years to help end plastic waste in the environment and a comprehensive strategy to make progress.

WE ADD TRANSPARENCY TO THE ENTIRE PRODUCT DEVELOPMENT CYCLE

- **> 50 grades of Recycle Content Certificates** available* for Specialties circular product grades
- **Verified responsible source certificate*** available for ELCRIN iQ grades & supply chain
- **Global Recycled Standard (GRS) certifications*** for textile and fiber applications for iQ-PBT
- **ISCC+ Mass balance certification**** for bio-based products
- **Lifecycle Assessment (LCA) and carbon footprint data** across portfolios available to support customers



* Recycle Content certification, GRS certification and Responsible Sourcing certifications are available at: [Certified Green Products Guide | SCS Global Services](#)

** ISCC+ Certifications available at: [Valid Certificates › ISCC System \(iscc-system.org\)](#)

LET'S WORK TOGETHER TOWARDS CIRCULARITY & NET ZERO EMISSIONS

13 CLIMATE ACTION

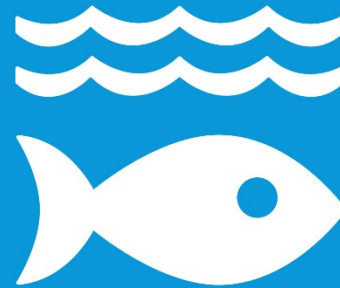


NET-ZERO CARBON

Specialty material performance with lower carbon footprint

Application development for longer life and enhanced recyclability

14 LIFE BELOW WATER



10 BY 10

Our market ambition is to divert 10 Billion PET single-use bottles in 10 years

17 PARTNERSHIPS FOR THE GOALS



INNOVATING THROUGH THE VALUE CHAIN

Alliances across the value chain

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THANK YOU

