

CHEMISTRY THAT MATTERS™



OVERVIEW OF SABIC SUSTAINABILITY

TRUCIRCLE™ PROGRAM
MGMC, AUG 14, 2024

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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

*Brand Finance, 2024.

OUR GLOBAL PRESENCE



POLYMERS: PRODUCT PORTFOLIO



SABIC® PE POLYETHYLENE

- SABIC® HDPE, High Density Polyethylene
- SABIC® LLDPE, Linear Low Density Polyethylene
- SABIC® LDPE, Low Density Polyethylene
- SABIC® LDPE Powder, Low Density Polyethylene Powder

HIGH PERFORMANCE METALLOCENE POLYETHYLENE

- SUPEER™, Metallocene Linear Low Density Polyethylene (mLLDPE)
- COHERE™, Metallocene Polyolefin Plastomer (POP)
- FORTIFY™, Polyolefin Elastomer (POE)

PVC, PET, PMMA, POLYSTYRENE AND POLYURETHANE

- SABIC® PET, Polyethylene Terephthalate
- SABIC® SPVC, Suspension Polyvinylchloride
- SABIC® EPS, Expandable Polystyrene
- SABIC® PS, Polystyrene

ELASTOMERS (SYNTHETIC RUBBERS)

- SABIC® BR, Polybutadiene Rubber
- SABIC® EPDM, Ethylene Propylene Diene Rubber
- SABIC® Carbon Black

POLYURETHANE

- SABIC® MDI 2031
- SABIC® TDI 0380
- SABIC® Polyols
- SABIC® Propylene Glycols (PG)
- SABIC® Propylene Oxide (PO)

POLYMERS: PRODUCT PORTFOLIO



SABIC® PP POLYPROPYLENE

- SABIC® PP Polypropylene includes impact, homo and random PP grades
- SABIC® PP RELY copolymer
- SABIC® PP compounds
- HAPSOFT™ glass fiber reinforced PP compounds
- STAMAX™, long glass fiber reinforced polypropylene
- SABIC® PP FLOWPACT impact copolymers
- SABIC® VESTOLEN™ P random copolymers
- SABIC® PP QRYSTAL random copolymers
- SABIC PURECARES™ Personal Hygiene Portfolio
- SABIC® PP-UMS, polypropylene ultra melt strength

ENGINEERING THERMOPLASTICS

- CYCOLAC™ resin (ABS)
- CYCOLOY™ resin (PC/ABS)
- CYCOLOY™ FR resin (PC/ABS)
- GELOY™ resin (ASA)
- SABIC® PC resin (PC)
- VALOX™ resin (PBT)
- VALOX™ FR resin (PBT)
- XENOY™ resin (PBT/PC)
- XYLEX™ resin (PC/POLYESTER ALLOY)
- SABIC® POM, polyoxymethylene or polyacetal
- SABITAL™ glass fiber compounded POM
- SABIC® PMMA, Polymethylmethacrylate

SABIC'S GLOBAL HEALTHCARE APPLICATIONS

Patient Testing



Surgical tools



Respiratory and sleep therapy



Monitoring and Imaging



Hospital Beds



Drug delivery



Drug packaging



Fluid and Blood handling



Cardiovascular



Blood tubes



IV Bags



Mobile healthcare



Drug delivery



Pharma packaging



Diagnostics and Blood management



SABIC'S HEALTHCARE PRODUCT POLICY

- Easily identifiable healthcare product nomenclature
 - CYCOLACT™ HM resins
 - VALOX™ HX resins
 - SABIC® HDPE PCG resins
 - CYCOLOY™ HC resins
 - XENOY™ HX resins
 - SABIC® LDPE PCG resins
 - LEXAN™ HP resins
 - XYLEX™ HX resins
 - SABIC® PP PCG resins
 - SABIC® PET PCG resins
- Biocompatibility assessed (according to [ISO 10993](#) or [USP Class VI](#))
- Food contact compliance according to [FDA](#) and/or EU Reg. No. 10/2011 for most healthcare grades
- [FDA Drug Master File](#) and/or Device Master File listing (letter of authorization provided as needed)
- SABIC healthcare products are subject to formula lock and stringent management of change process. SABIC healthcare products are manufactured under GMP rules (No.2023/2006 (Commission Regulation EC, 22 December 2006) or FDA 21CFR174.5).
- Long-term supply options available



SABIC does not knowingly support or supply materials which remain implanted in the human body beyond 29 days

SABIC'S BROAD MATERIALS PORTFOLIO FOR THE HEALTHCARE INDUSTRY

Manufactured by SABIC

HIGH PERFORMANCE

ENGINEERING THERMOPLASTICS

COMMODITY

	PEI PES	PPSU	LCP PPS	PEEK
		PSU		PPA
	PC		PC/PBT PC/PET	PBT
	PC/ABS ABS	PC/ASA ASA		POM PA
		PS PVC	PP PET	HDPE LDPE

AMORPHOUS

CRYSTALLINE



LEXAN™ HP (PC) resin

- Excellent processability
- Transparency
- Excellent impact resistance



CYCOLOY™ HC (PC/ABS) resin

- Excellent processability
- Colorability and aesthetics
- Good impact resistance



CYCOLAC™ HMG (ABS) resin

- Cost effective offering good mechanical properties
- Colorability and aesthetics



PCG PET resins

- Thin wall
- processability

VALOX™ HX (PBT) resin

- Good dielectric strength
- Excellent chemical resistance



XYLEX™ HX (PC/PET) resin

- Good processability
- Good chemical resistance
- Transparency

SABIC® PCG (PP and PE) grades

- Cost effectiveness
- Versatility
- Processability



TRUCIRCLE™ SOLUTIONS

SABIC'S SUSTAINABILITY SOLUTION

SABIC'S CARBON NEUTRALITY & CIRCULAR COMMITMENTS

“ Sustainability aligns with our core values and ambitions to be the preferred global leader in petrochemicals. It provides a way to meet our economic growth targets while maintaining sensitivity to environmental and social needs. ”



COMMITTS TO ACCELERATING A CIRCULAR ECONOMY
SABIC CEO
Abdulrahman Al-Fageeh


SABIC'S CARBON NEUTRALITY ROADMAP

CARBON NEUTRALITY
by **2050**
in line with the Paris Agreement goals

20% REDUCTION
by **2030**
interim Scope 1&2 emissions target compared to 2018

SABIC's COMMITMENT TO CIRCULAR PLASTICS

To meet the growing sustainable material demands, we have committed to process one million metric tons of TRUCIRCLE™ products annually by the year 2030

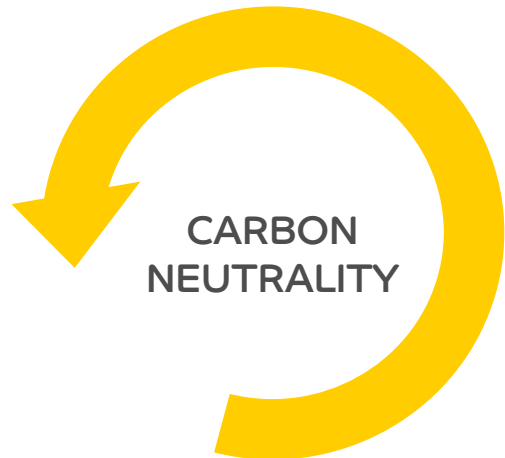
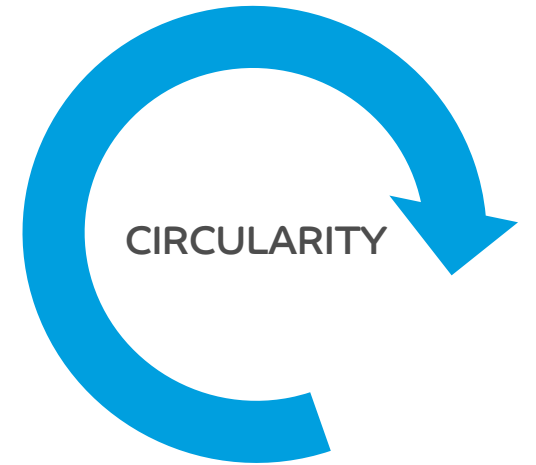


1 million
Annual volume over next 8 years

MEGA DRIVERS CIRCULARITY & CARBON NEUTRALITY

KEEPING CARBON IN THE LOOP

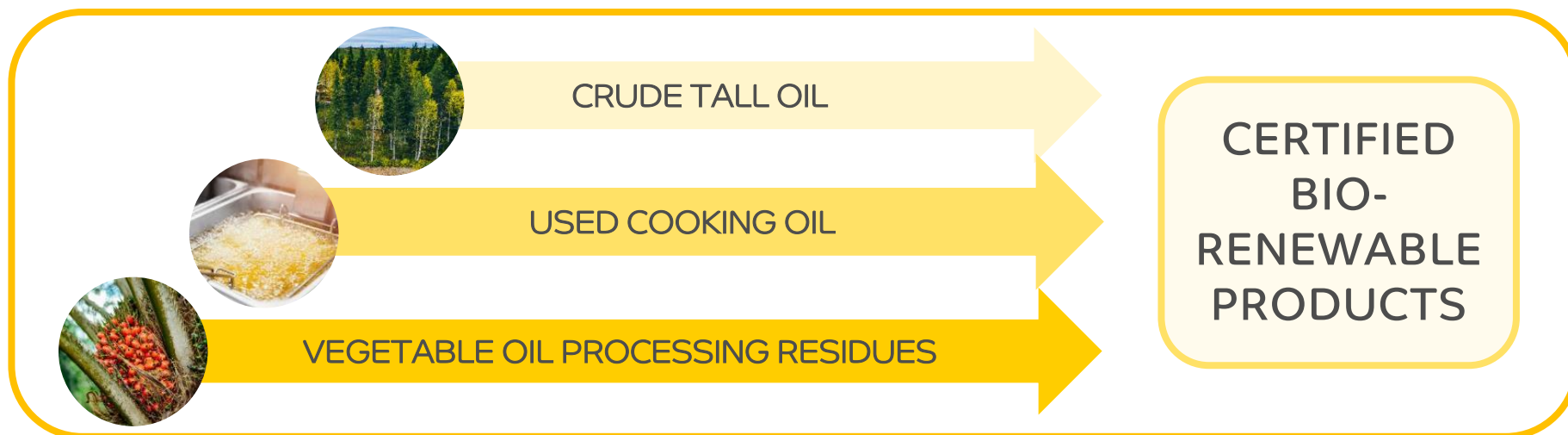
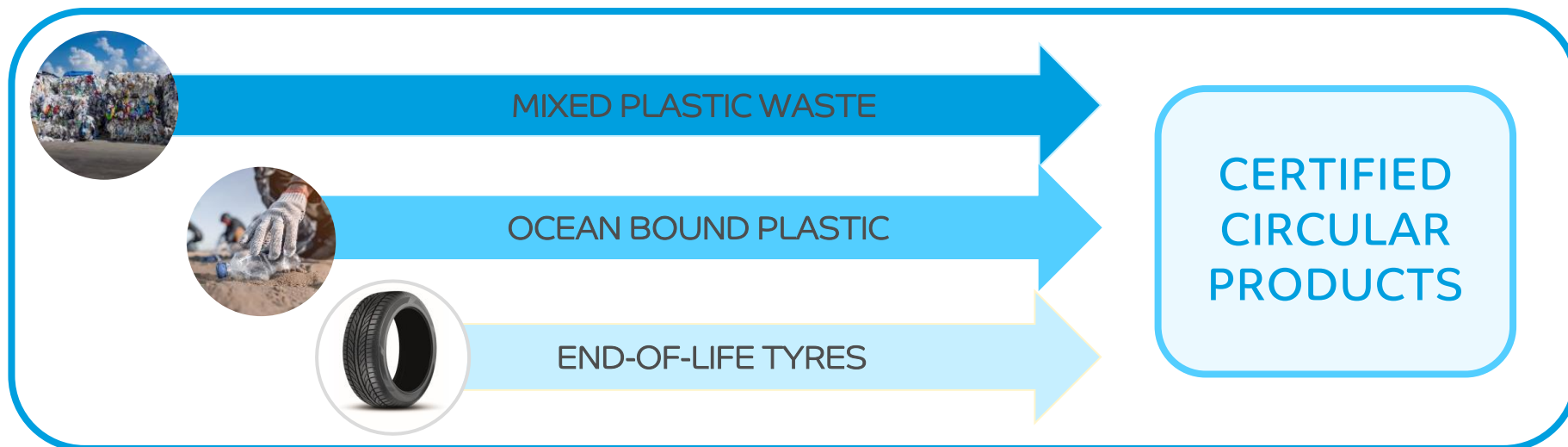
- Decreasing our dependence on finite resources
- Closing material loops with recycling
- Reducing plastics pollution
- Optimizing reusability
- Avoiding the carbon emissions from incineration at End of Life of plastics



TRANSITION TO A CIRCULAR CARBON ECONOMY

- Achieving carbon neutrality across the whole life cycle
- Reducing greenhouse gas emissions

THINK OF ...



OUR JOURNEY SO FAR ...

PROVEN SOLUTIONS

MASS BALANCE chain of custody for polymers



2014

2014



D4R WITH TF-BOPE
Mono-material solutions to overcome limits of conventional PE film



2019

2019



CERTIFIED BIO-RENEWABLE CHEMICALS
supporting launch of new renewable value chains

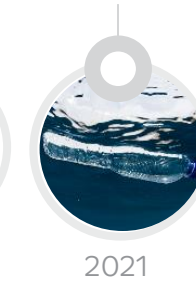


2019

2020



CIRCULAR PRODUCTS based on OCEAN BOUND PLASTIC



2021

2021

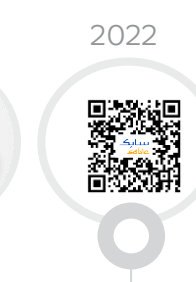


CIRCULAR PRODUCTS based on OCEAN PLASTIC



2021

2022

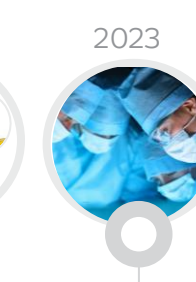


CERTIFIED BIO-RENEWABLE PRODUCTS
from 'Vegetable oil processing residues'



2022

2023



CERTIFIED BIO-RENEWABLE PE & PP
from second generation bio-based feedstock

CERTIFIED CIRCULAR PE & PP
from advanced recycled feedstock

CLOSED LOOP
with Tesco, Plastic Energy & Partners

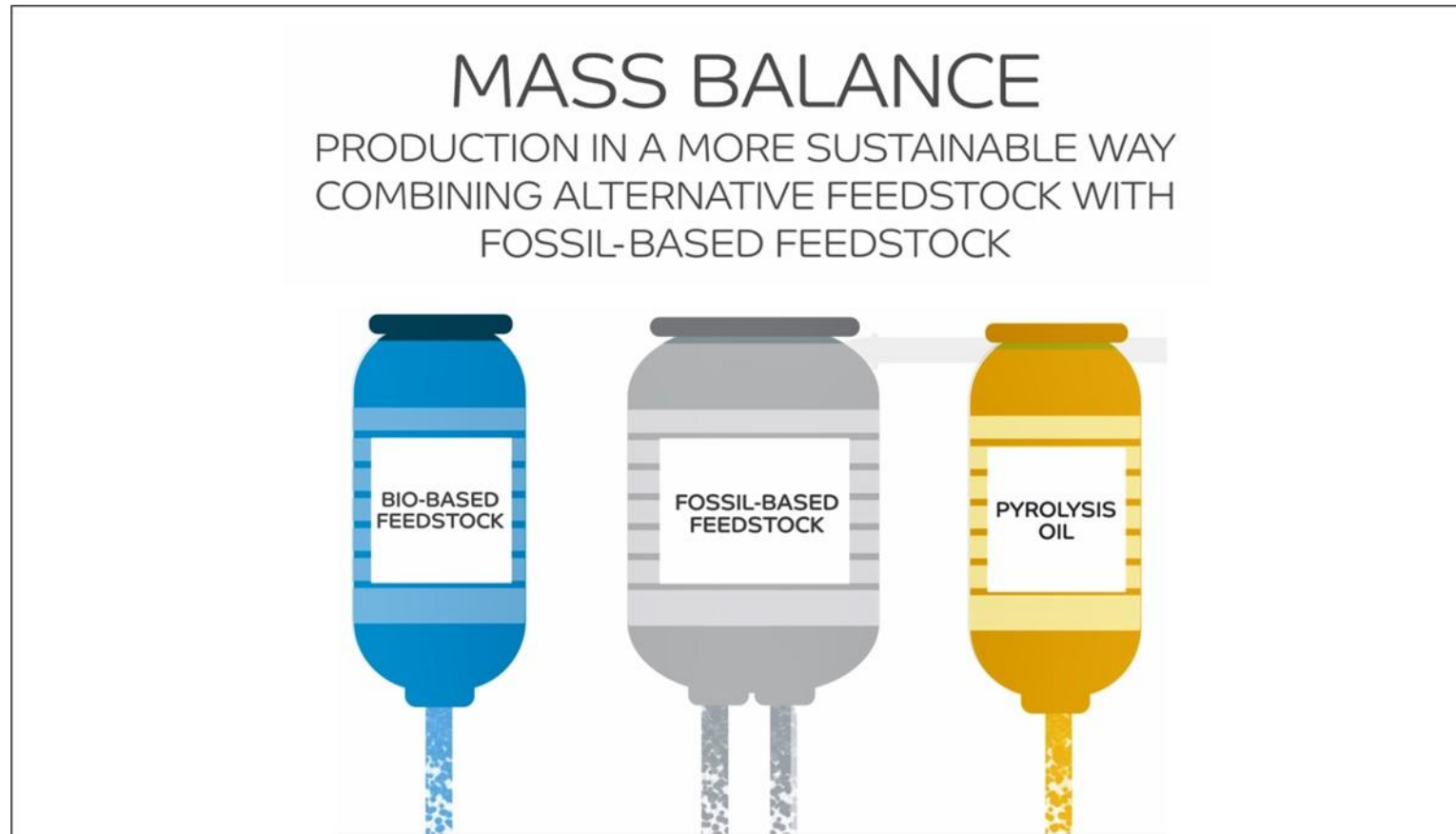
PCR COMPOUNDS
up to 70% mechanically recycled content

BLOCKCHAIN PILOT PROJECT
for digital traceability and additional transparency

CLOSED LOOP PROOF-OF-CONCEPT
for used medical plastic

MASS BALANCE CONCEPT

ACCEPTANCE OF THE MASS BALANCE CONCEPT IS A VITAL STEP



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

WHY MASS BALANCE APPROACH ?



Picture: Naphtha Cracker 4 (Geleen, the Netherlands)



- A **CRUCIAL BRIDGE** between today's linear economy and the sustainable circular plastics economy of the future
- The **RELATIVELY SMALL VOLUMES** of alternative feedstock have to be **MIXED with conventional fossil-based feedstock**
- An innovative & **CRUCIAL INSTRUMENT** to stimulate the **FULL TRANSITION TO NEW FEEDSTOCK** in SABIC's current world-scale production units
- The **MASS BALANCE & CERTIFICATION CONCEPT** allows us to **USE EXISTING COMMERCIAL ASSETS** to convert our products
- **TRACEABILITY / VERIFICATION OF CORRECT MASS BALANCE HANDLING OF INFORMATION**; incoming alternative feedstock and outgoing product

'ISCC PLUS' CERTIFICATION

INTERNATIONAL SUSTAINABILITY AND CARBON CERTIFICATION PLUS



ACTIVITIES

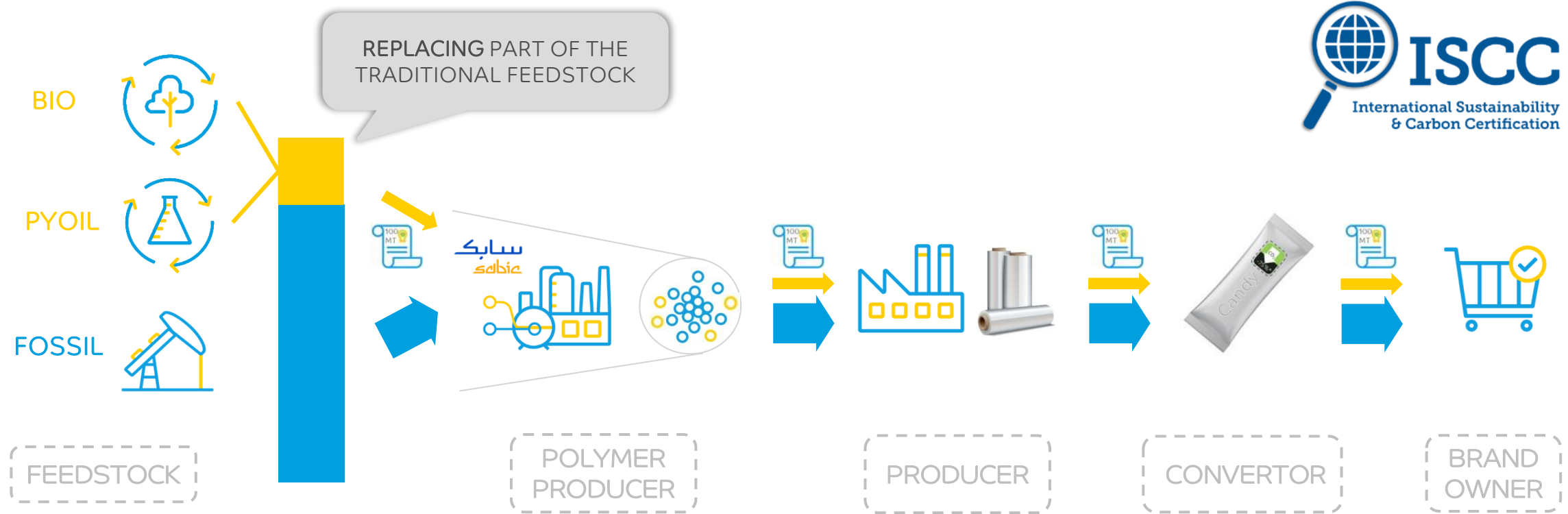
- supports the circular and bio-based economy by offering a [certification that promotes an environmentally, socially and economically sustainable production](#)
- provides credible sustainability certification [for all types of agricultural and forestry raw materials, waste and residues, non-bio renewables, recycled carbon materials and the respective supply chains](#) and is a leading global certification scheme for the bio-based and circular economy

INDEPENDENT 3rd PARTY CERTIFICATION BODIES accredited by ISCC

- ensure [compliance with the mass balance chain of custody](#)
- certification process can be completed in [3 months](#)

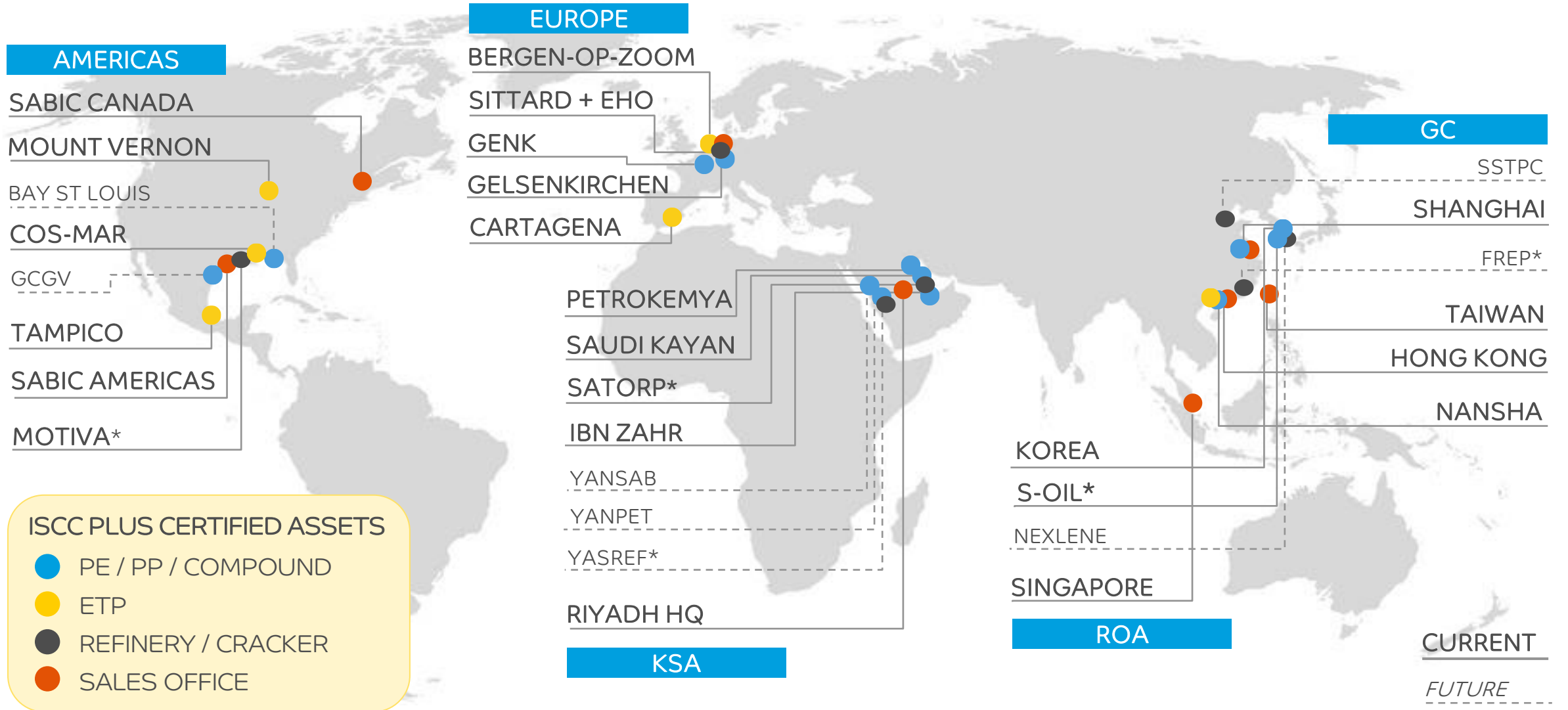
→ SABIC will send a [sustainability statement](#) along with its certified bio-renewable / circular polymers

CERTIFICATION BY MASS BALANCE CHAIN OF CUSTODY



CERTIFICATION BY INDEPENDENT 3RD PARTY CERTIFICATION BODIES TRACEABILITY IN A FULLY TRANSPARENT & AUDITABLE WAY

ISCC PLUS CERTIFICATION OF SABIC ASSETS

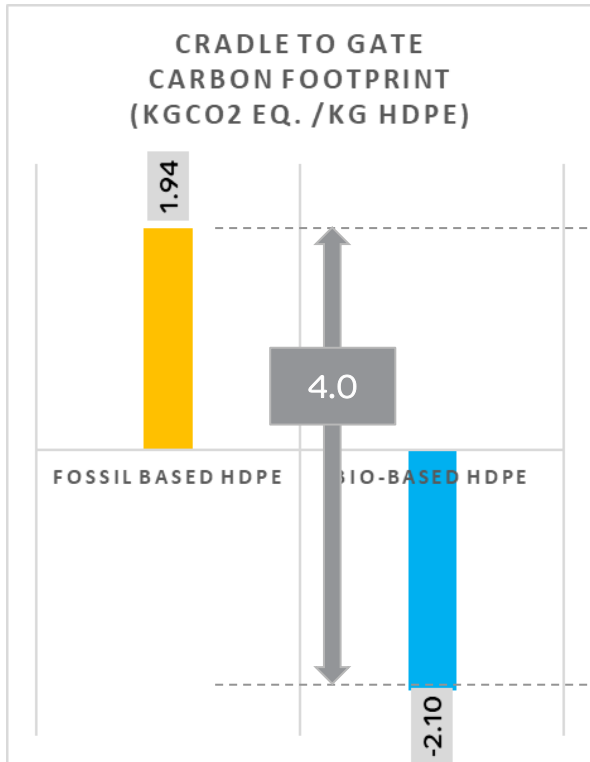


* SAUDI ARAMCO JV's

Future: timeframe of max. 2 years

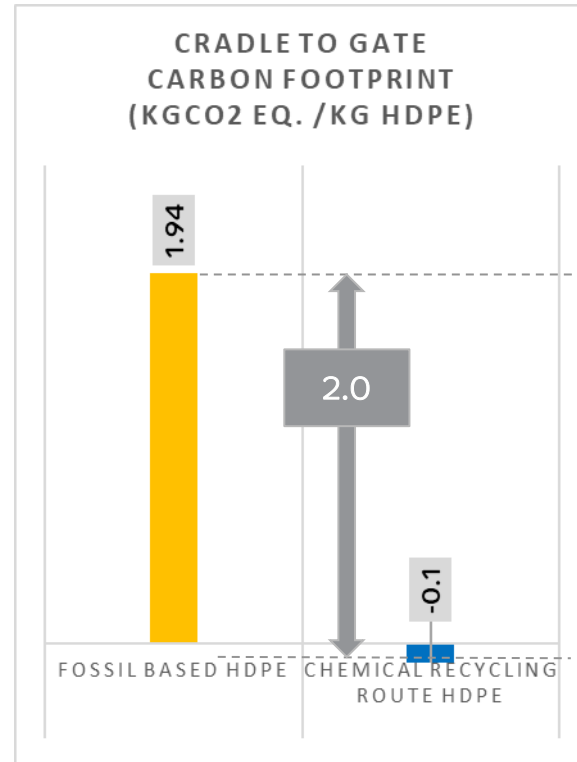
LCA CONSIDERATIONS

CERTIFIED BIO-RENEWABLE POLYMERS



Based on results of “Cradle to Gate” study on **SABIC certified bio-renewable polymers**, carbon footprint reduction is about 4 kilograms of CO₂ per kilogram of resin in comparison to fossil route to HDPE*.

CERTIFIED CIRCULAR POLYMERS



Based on results of “Cradle to Gate” study on **SABIC certified circular polymers**, carbon footprint reduction is about 2 kilograms of CO₂ for every kilogram of polyolefins produced via chemical recycling route in comparison to fossil route*.

This reduction includes the benefit realized from avoidance of mixed plastic waste diversion to energy recovery.

➤ Other polyolefins show the same relative effect, but with slightly different absolute footprints

* The above studies have successfully passed ISO Critical Review

TRUCIRCLE™ PROGRAM

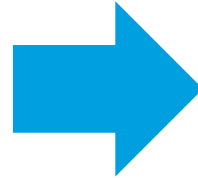
CERTIFIED CIRCULAR POLYMERS

THINK OF ...

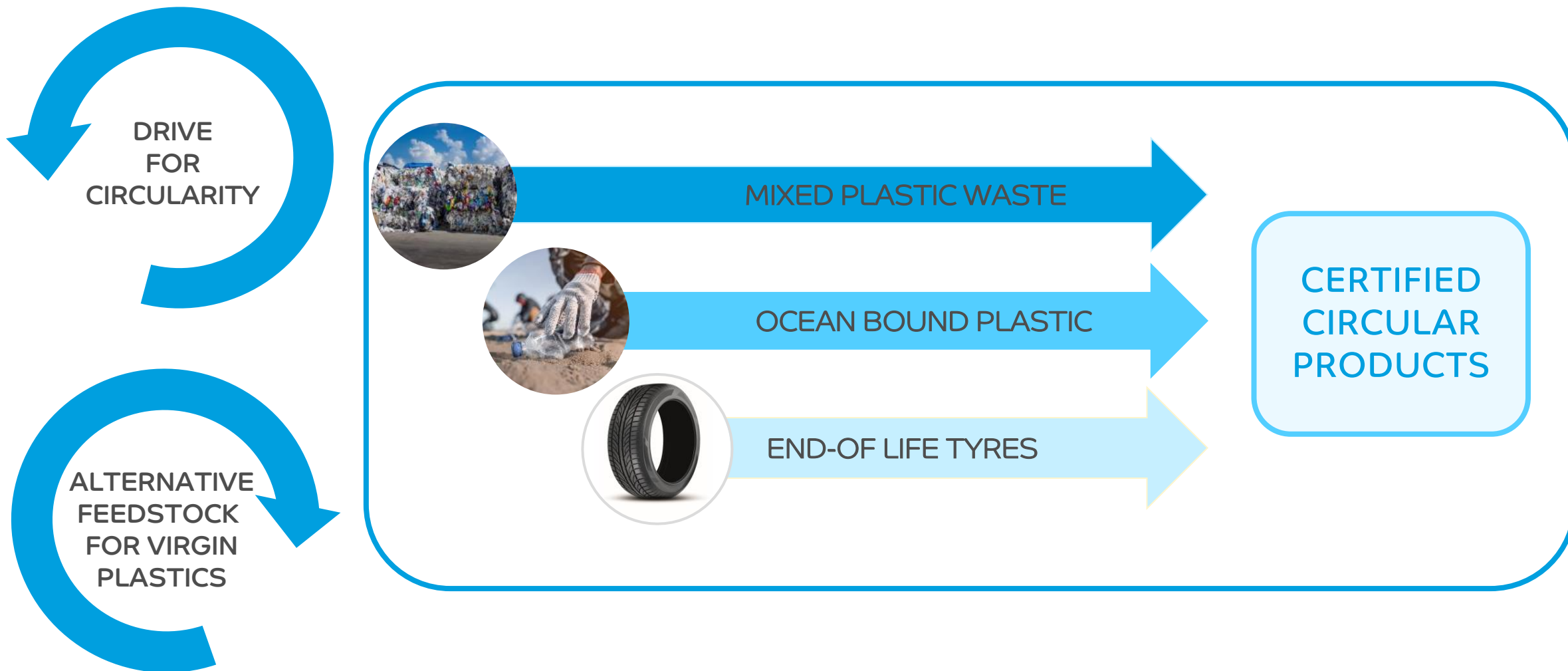
PREVENTING PLASTIC PACKAGING



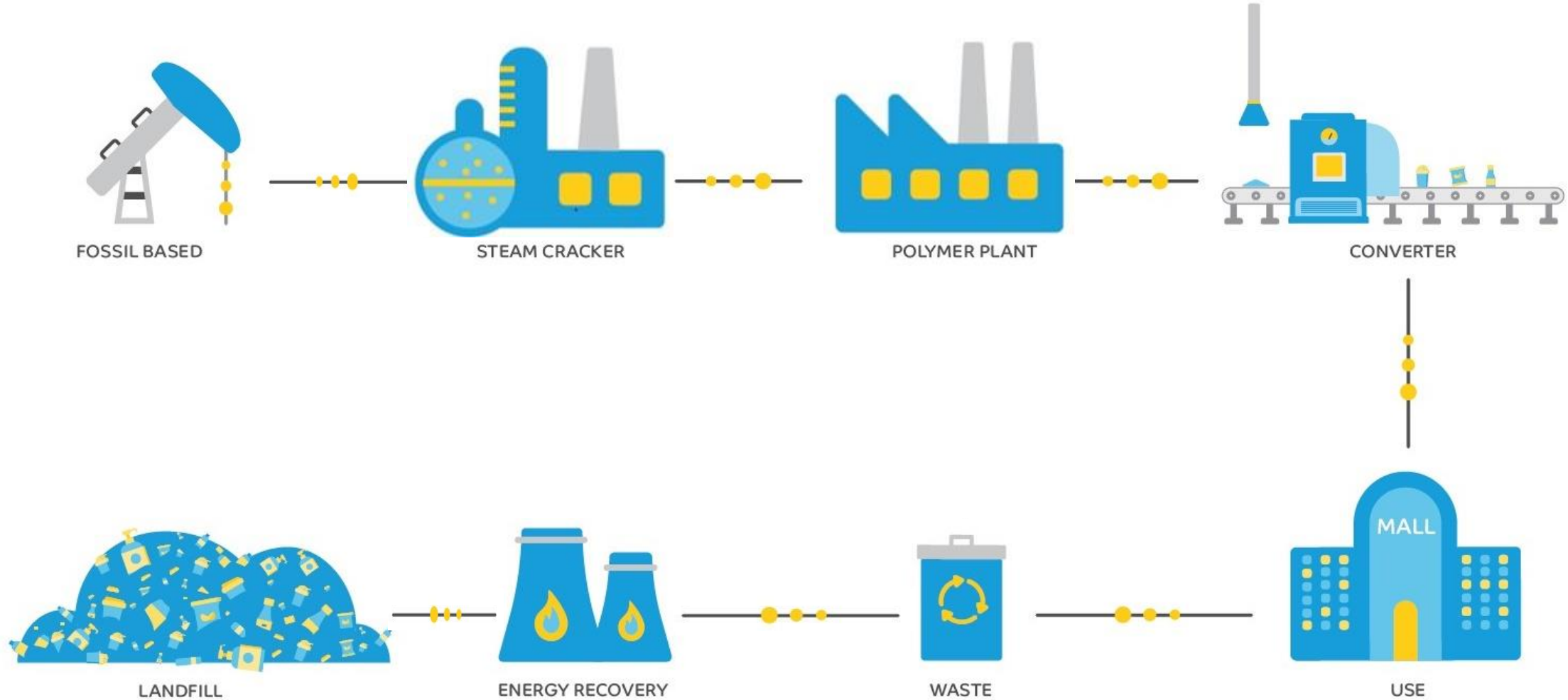
FROM BECOMING WASTE



THINK OF ...

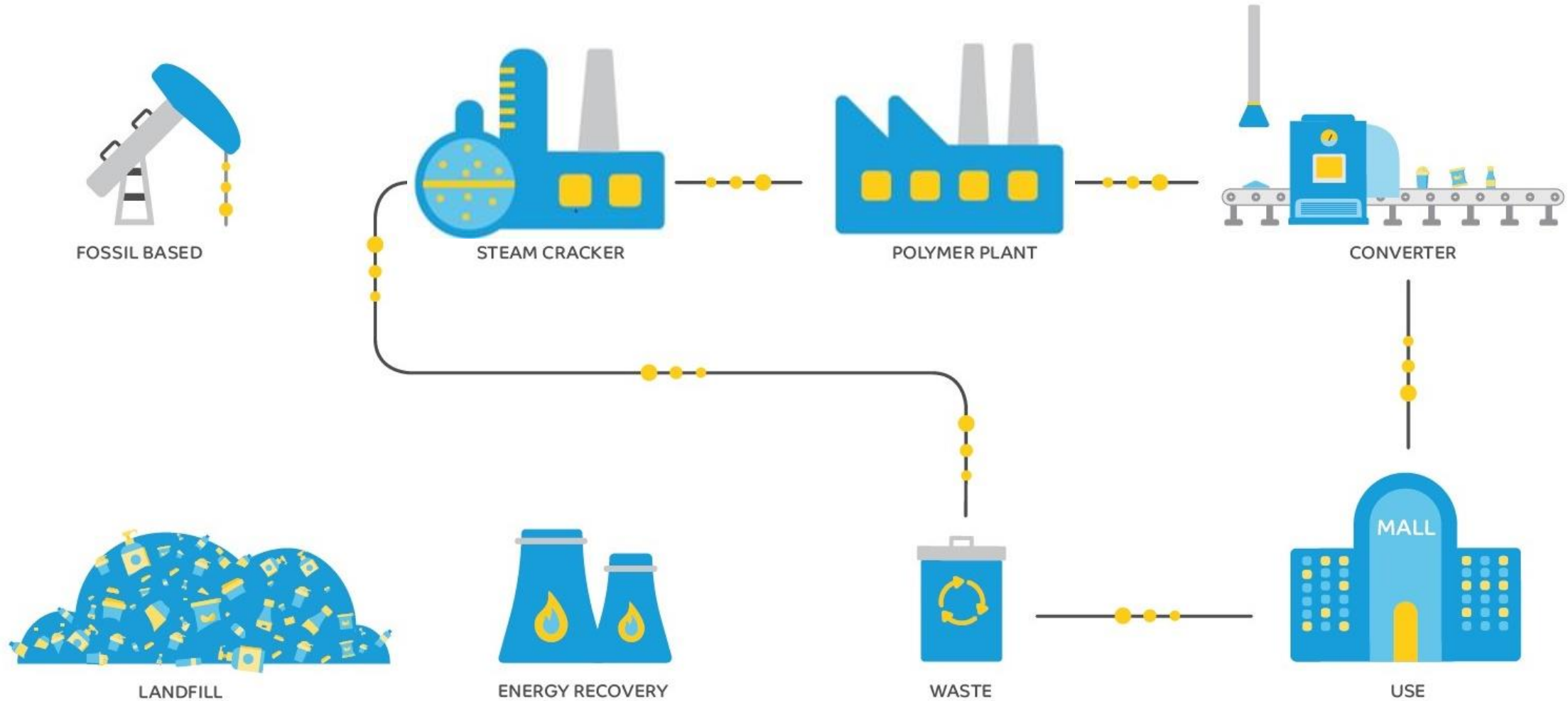


PLASTIC WASTE TO FEEDSTOCK FOR POLYMERS: FROM LINEAR TO CIRCULAR



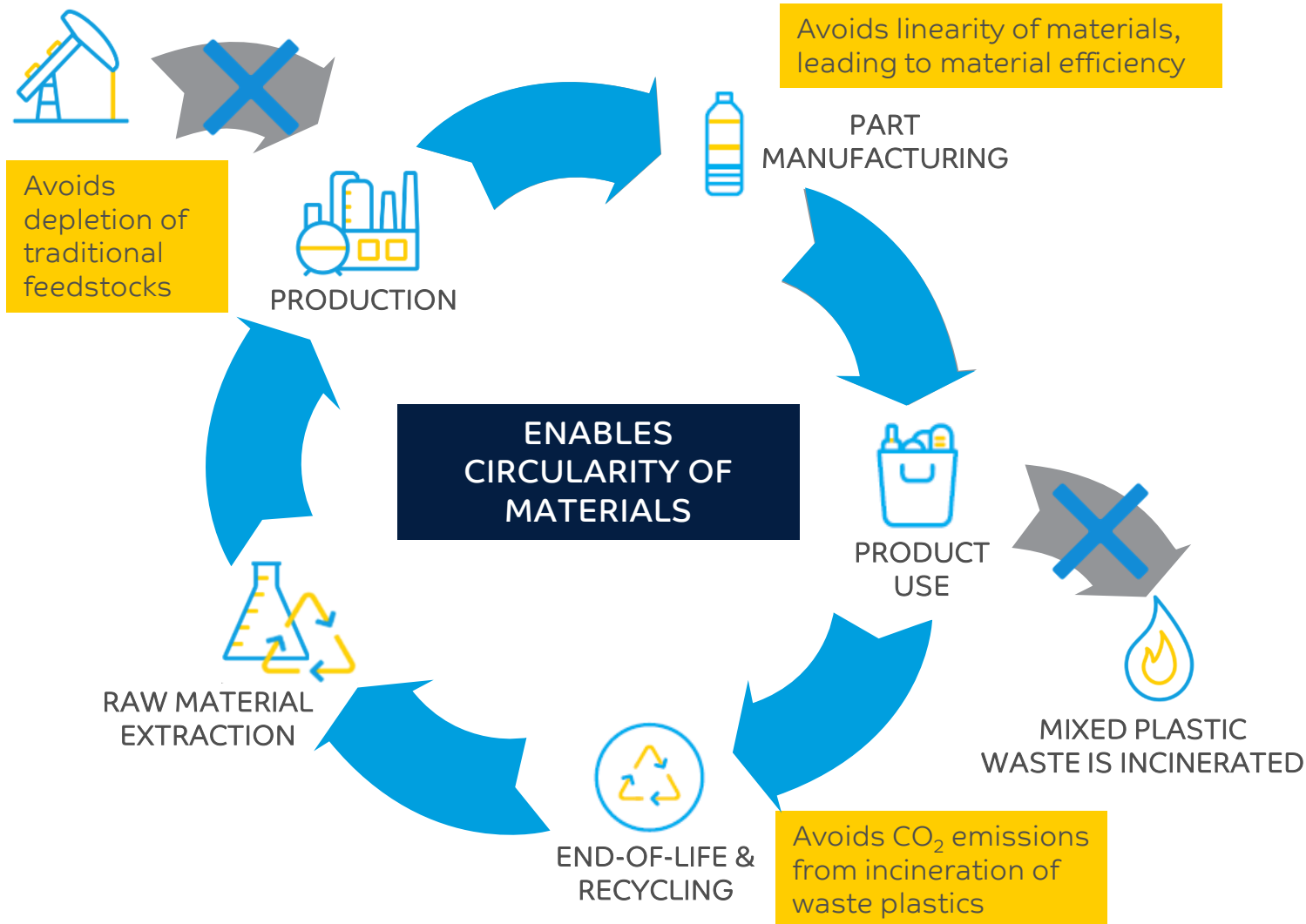
THE CURRENT MODEL CAUSES MOST OF OUR NATURAL RESOURCES TO END UP IN LANDFILL

PLASTIC WASTE TO FEEDSTOCK FOR POLYMERS: FROM LINEAR TO CIRCULAR



ADVANCED RECYCLING CREATES FEEDSTOCK FROM DIFFICULT-TO-RECYCLE-PLASTICS

THE BEAUTY OF ADVANCED RECYCLING



As part of SABIC’s TRUCIRCLE™ portfolio of circular solutions, SABIC has commercialized the advanced recycling of mixed plastic waste.

LCA* findings on the **environmental impact of our advanced recycling route** vs the fossil route demonstrate that **advanced recycling has a smaller carbon footprint**:

➤ SABIC circular polymers could **save about 2 kg of CO₂ emissions** for every kg of advanced-recycled polyolefins

In addition,

- 
 - Fossil Depletion
 - Energy Demand
- 
 - Water Usage




Virgin-quality resins[^] from advanced recycling has the potential to contribute the most to the implementation of circular economy for plastics.

* This LCA study has successfully passed 3rd-party ISO (14040 / 14044) critical review. [^]Suitable for all applications including food contact applications.

BENEFITS OF ADVANCED RECYCLING



SUPPORTING CUSTOMERS IN ADDRESSING CORPORATE SUSTAINABILITY GOALS SABIC'S CERTIFIED CIRCULAR POLYMERS

-  **VERSATILE**
NO COMPROMISE ON PRODUCT PROPERTIES
BIG WINDOW OF APPLICATIONS, INCLUDING F&B CONSUMER PACKAGING, E&E, PERSONAL CARE, AUTOMOTIVE, ...
-  **DROP-IN SOLUTION**
IDENTICAL PRODUCT SPECIFICATIONS TO OUR CURRENT POLYOLFIN GRADE PORTFOLIO
PROCESS ON EXISTING EQUIPMENT WITHOUT MODIFICATIONS
DOWN GAUGING OPPORTUNITIES (COMPARED TO MECHANICAL RECYCLING)
-  **TRULY RECYCLABLE**
NO LIMITATIONS IN NUMBER OF RECYCLING STEPS

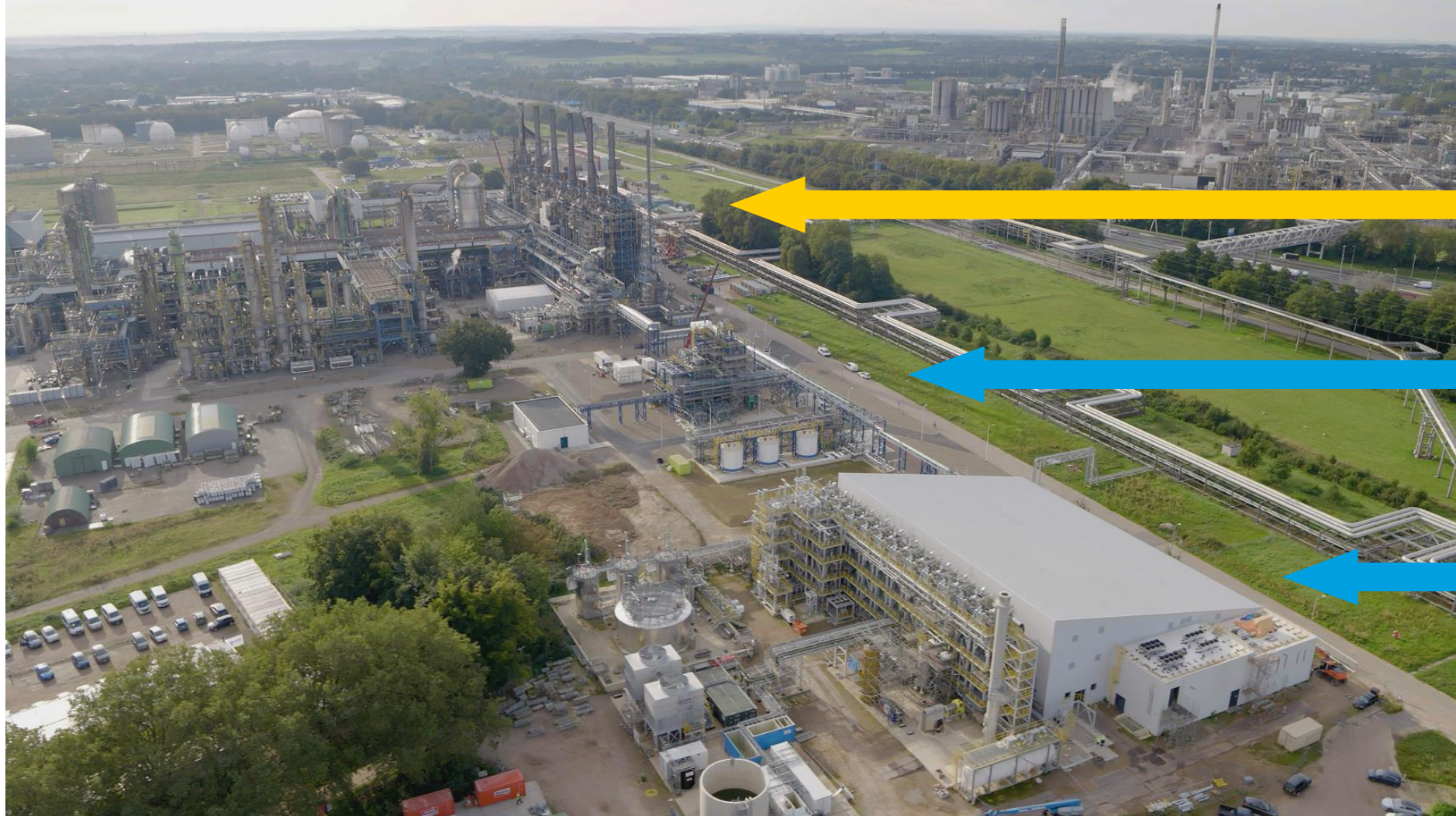
ADVANCED RECYCLING UNIT

WORLD'S FIRST COMMERCIAL UNIT FOR THE ADVANCED RECYCLING OF USED PLASTIC

- SABIC and Plastic Energy are in the final stages of construction of world's first commercial unit to significantly upscale production of **SABIC's certified circular polymers** derived from used plastic.
- Considerable milestone on the journey towards **closing the loop** and creating a **circular economy for plastics**



PIONEERING PROJECT ADVANCED RECYCLING UNIT - GELEEN (NL)



POLYMER PLANTS



STEAM
CRACKER



HYDRO-
TREATER



SABIC PLASTIC ENERGY ADVANCED RECYCLING B.V.

PYROLYSIS PLANT



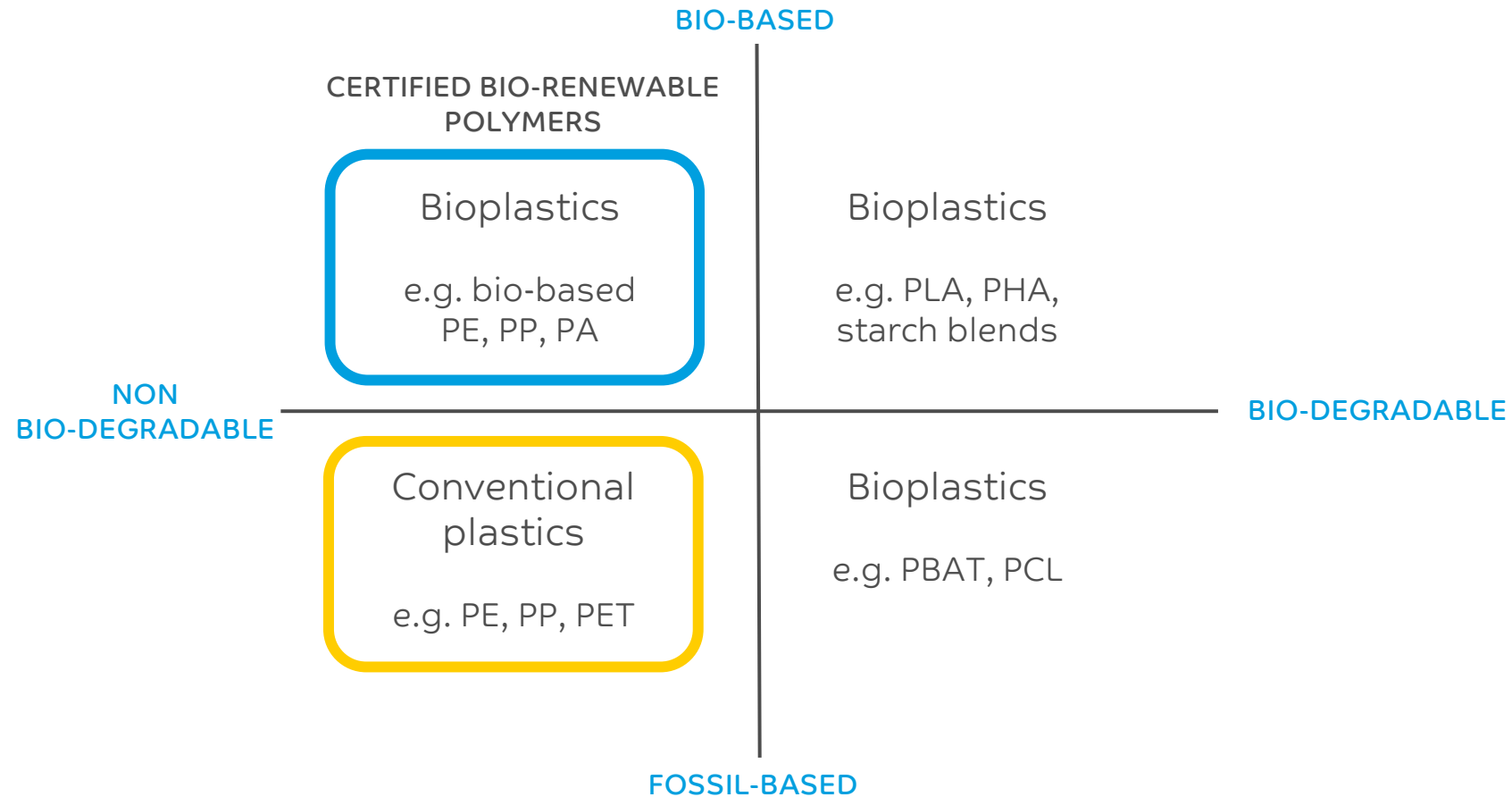
MIXED PO WASTE

TRUCIRCLE™ PROGRAM

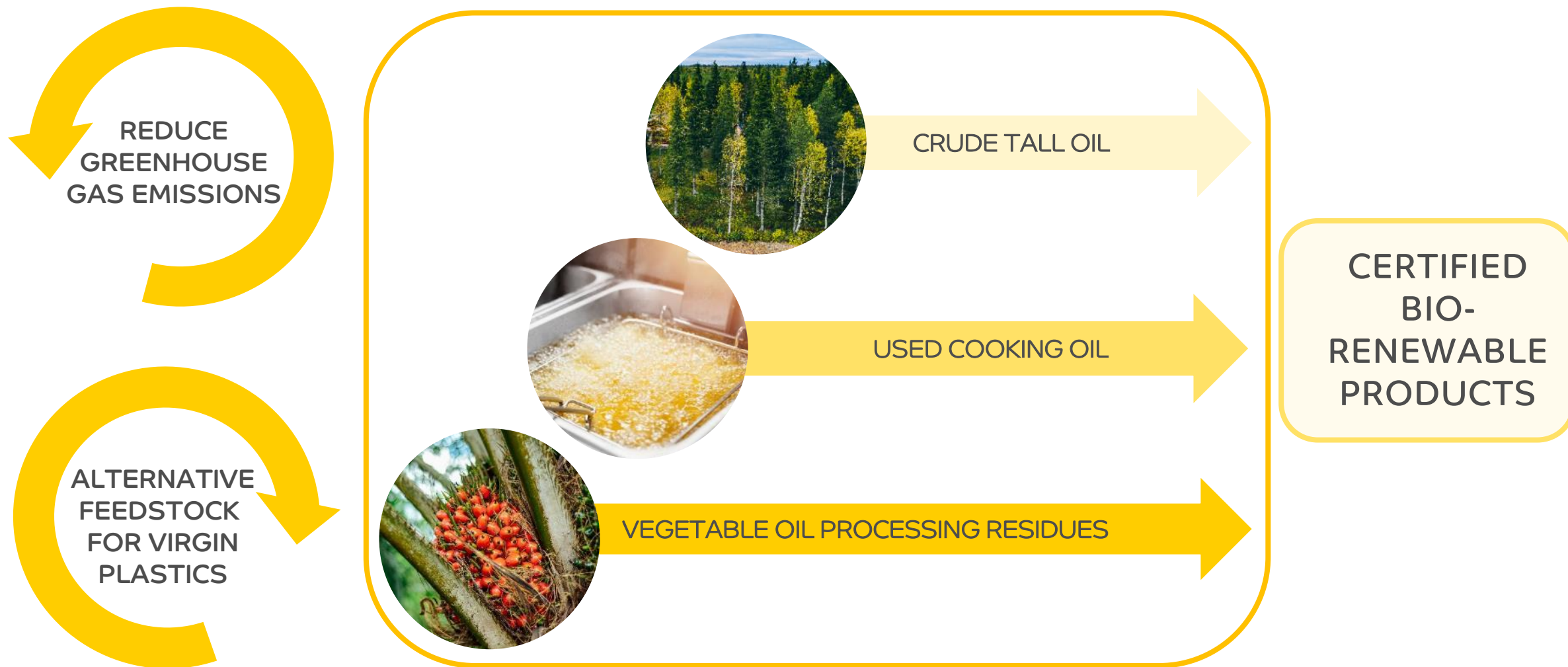
CERTIFIED BIO-RENEWABLE POLYMERS

WHAT ARE BIOPLASTICS?

BIOPLASTICS = PLASTICS THAT ARE BIO-BASED, BIO-DEGRADABLE, OR BOTH



THINK OF ...



SABIC'S BIO-BASED FEEDSTOCK ALTERNATIVES

2ND GENERATION FEEDSTOCK



CRUDE TALL OIL

Wood-based residue of the pulp making process



USED COOKING OIL

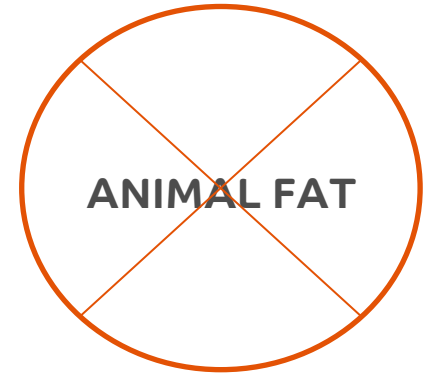
Oils & fats previously used by the food industry, restaurants, households to cook food for human consumption and which no longer fit for human consumption for food hygiene reasons.



VEGETABLE OIL PROCESSING RESIDUES

E.g. Palm Fatty Acid Distillate (PFAD), spent bleaching earth oil (SBEO), ...

PFAD is a processing residue derived from the refining of food-grade palm oil for the food & chemical industry uses.



ANIMAL FAT

From food industry waste



PALM OIL



RAPSEED OIL



SOYBEAN OIL

1ST GENERATION FEEDSTOCK



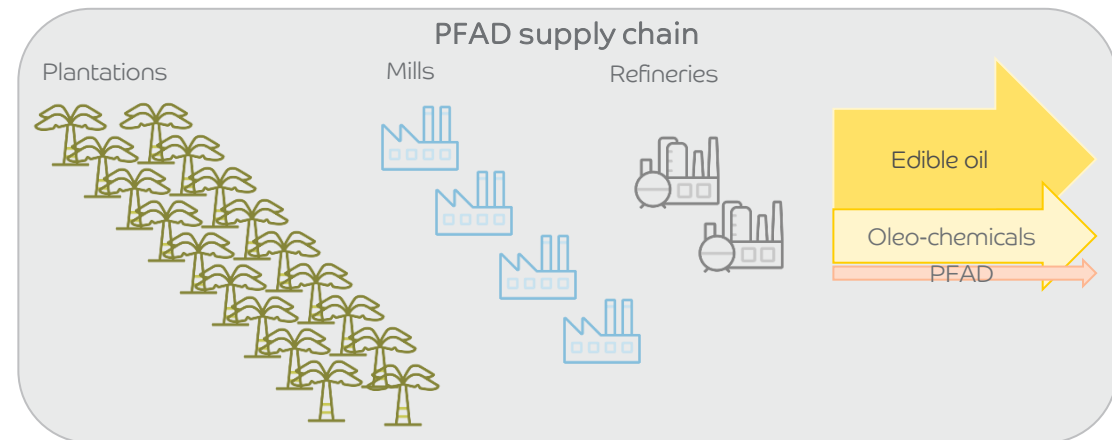
ALGAE

3RD GENERATION FEEDSTOCK

DETAILS BIO-BASED FEEDSTOCK ALTERNATIVE

VEGETABLE OIL PROCESSING RESIDUES

- Incl. Palm Fatty Acid Distillate (PFAD)
- PFAD is a **processing residue** that results from palm oil refining for the food & chemical industry (about 3.5-5.0%)
- The fat in the oil palm fruit will start degrading when normal bruising occurs while oil palm fruits are handled during harvest and transportation. The **refining process removes these degraded fats (free fatty acids)** as they are undesirable from the food industry perspective
- **Efficient** way to use waste generated through the palm oil refining process, **preventing PFAD from going to literal waste**
- **Animal-free solution** to position in **vegan market**






CERTIFIED BIO-RENEWABLE POLYMERS

- **Alternative** feedstock
- Feedstock source has a **lower carbon footprint** compared to traditional alternative
- **Second generation** renewable feedstock **not in competition with the human food chain**
- **No direct/indirect change in land use**
- **Derived from waste or residue**
 - Crude tall oil
 - Used cooking oil
 - Vegetable oil processing residues
- **No compromise** on product properties
- **Identical product specifications** to our current SABIC polymers (PE / PP), chemicals and LEXAN™ resin PC portfolio
- **Externally certified chain of custody by ISCC Plus** *
- Can be **recycled**



* through mass balance approach through ISCC Plus certified value chains

COMPARISON OF ALTERNATIVE BIO-BASED FEEDSTOCK

FEEDSTOCK ORIGIN	CRUDE TALL OIL 	USED COOKING OIL 	VEGETABLE OIL PROCESSING RESIDUES 
Generation feedstock	2 nd	2 nd	2 nd
Origin of feedstock	EU	EU & non-EU (e.g. US, China, Singapore)	EU & non-EU (e.g. ROA)
Not in competition with	Human food chain & feed chain	Human food chain	Human food chain
Land use	No direct/indirect change	No direct/indirect change	No direct/indirect change
Lower carbon footprint (*)	+++++	++++	++++
Stage	Pre consumer	Post consumer	Pre consumer

OUR AMBITION: CREATING VALUE FOR THE VALUE CHAIN

- Different offerings that responds to different customer needs
- Transparency reg. feedstock origin

SUCCESSFUL INTRODUCTION OF CERTIFIED BIO-RENEWABLE PP IN ROA

CJ CHEILJEDANG

CERTIFIED BIO-RENEWABLE PP FOR READY-TO-EAT RICE PACKAGING BOWLS

SABIC & CJ Cheiljedang collaborate on world-first ready-to-eat rice packaging bowls made with 25% certified renewable PP

- *Instant white rice packaged in thermoformed food-contact polypropylene bowls with 25% renewable content offering high dimensional stability and heat resistance for microwaving.*
- *ISCC PLUS certified renewable polymers from SABIC's TRUCIRCLE™ portfolio, sourced from second-generation feedstock not competing with food production.*

The rice bowls are manufactured by sheet extrusion and subsequent thermoforming. The PP polymer from SABIC's TRUCIRCLE portfolio has a certified renewable content of 25% and provides the critical attributes of dimensional stability and heat resistance required when microwaving the rice directly in the cup. In addition to this, the used bowls can be returned into the rigid PP recycling stream to recover their material value and enable a more circular packaging industry. CJ has already started to introduce the new Hetbahn rice bowls in E-Mart stores, one of the largest grocery chains in South Korea.



CERTIFIED BIO-RENEWABLE POLYCARBONATE - PROCESS



➤ ALL PLAYERS IN THE VALUE CHAIN HAVE TO BE ISCC PLUS CERTIFIED

SABIC'S CERTIFIED BIO-RENEWABLE POLYCARBONATE



73% CO₂ FOOTPRINT REDUCTION
FOR EACH KG OF POLYCARBONATE
BASED ON CERTIFIED BIO-RENEWABLE FEEDSTOCK
WITH FOSSIL DEPLETION REDUCTION POTENTIAL OF UP TO 43%



Collaboration in the **lighting industry**
with Elkamet GmbH (Germany)



Collaboration with POLYRAY
(Xiamen Hongtai Optical Co., Ltd.)
in the **eyewear lens industry**

BENEFITS OF BIO-BASED FEEDSTOCK ALTERNATIVES

SUPPORTING CUSTOMERS IN ADDRESSING CORPORATE SUSTAINABILITY GOALS

SABIC'S CERTIFIED BIO-RENEWABLE PRODUCTS



VERSATILE

No compromise on product properties
Big window of applications, including Food & Beverage consumer packaging, E&E, Personal Care, Automotive, ...



DROP-IN SOLUTION

Identical product specifications to our current grade portfolio
No modifications to production processes down-stream

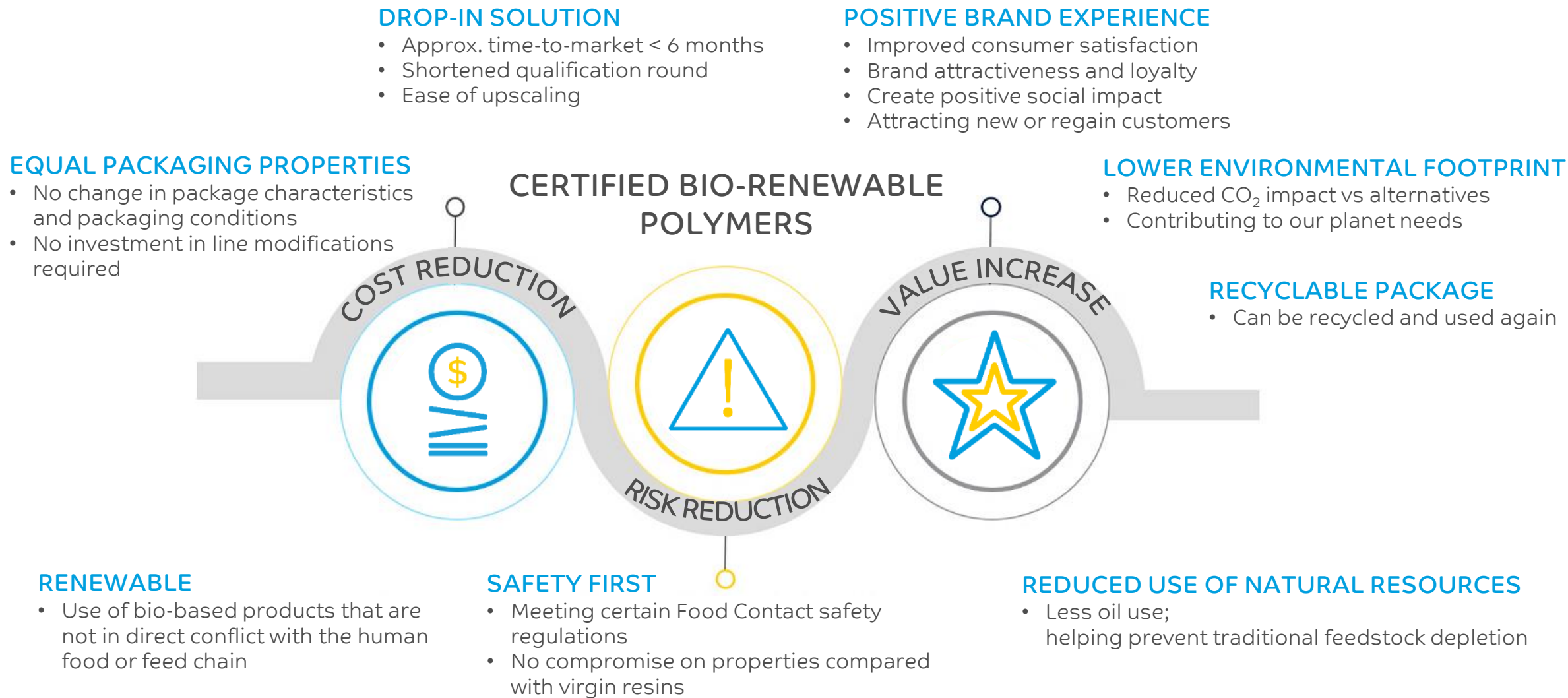


CARBON FOOTPRINT REDUCTION

Up to 4 kg of CO₂ per kg of resin



VALUE DRIVERS OF CERTIFIED BIO-RENEWABLE POLYMERS



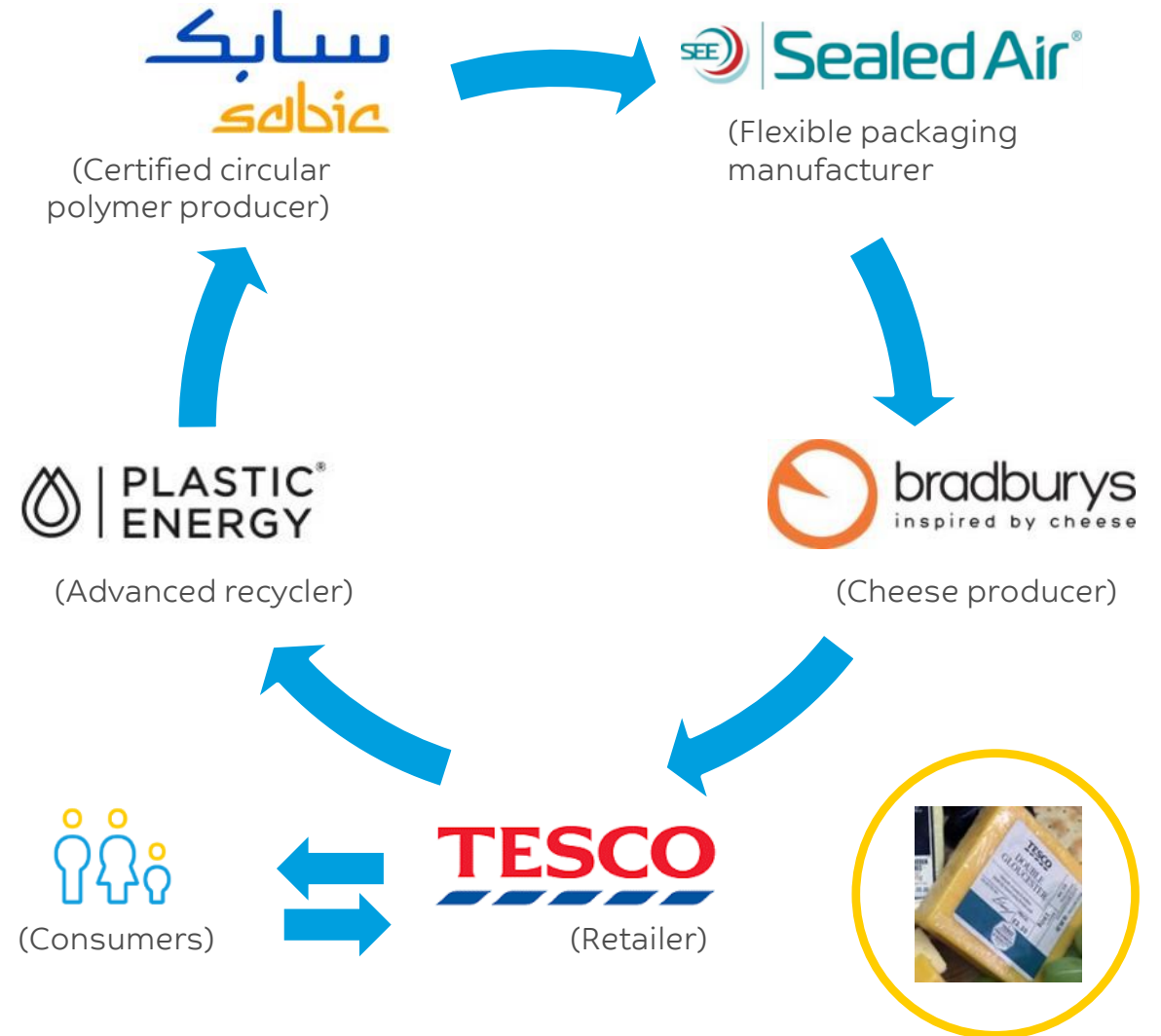
CLOSED LOOP INITIATIVES

SABIC COLLABORATION RESULTS IN INDUSTRY FIRST CLOSED LOOP PROJECT

CIRCULARITY FOR PLASTICS is achievable through VALUE CHAIN COLLABORATION.

COLLABORATION PARTNERS of this closed loop recycling system:

- TESCO collected post-consumer flexible packing in ten stores in the UK
- PLASTIC ENERGY converted the packaging into pyrolysis oil
- SABIC used the alternative feedstock to produce certified circular polymers
- SEALED AIR produced the film for cheese producer BRADBURY'S



“First produce in food-grade recycled flexible packaging hits Tesco shelves”

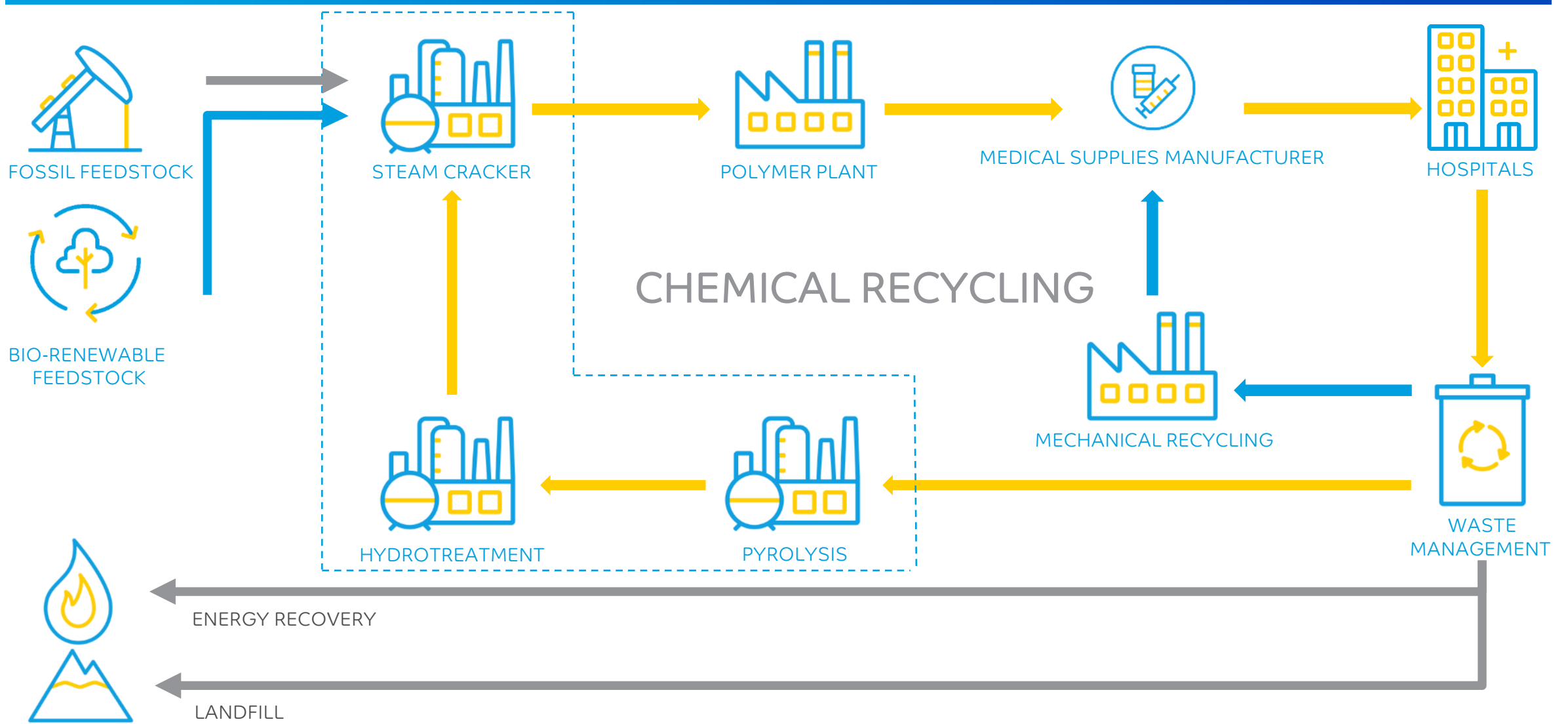
British Plastics and Rubber Magazine, 8 September 2020

CAN YOU IMAGINE HEALTHCARE WITHOUT PLASTICS?

EXAMPLE OF
PLASTIC MEDICAL SUPPLIES
USED
DURING A 24 HOUR PERIOD
IN AN INTENSIVE CARE WARD



HOSPITALS - THE CONCEPT "FROM LINEAR TO CIRCULAR"



COLLABORATE FOR CIRCULARITY IN THE MEDICAL INDUSTRY

SABIC & JESSA HOSPITAL

- Successful demonstration of the feasibility of **recycling used medical plastic** back into the medical materials stream
- **Pilot project:** collaboration with **Jessa Hospital, Belgium** to prove the concept
- **Non-contaminated used medical plastic can be re-purposed** for circular feedstock for SABIC's TRUCIRCLE™ polymers in medical grade quality with same performance, purity and physiological safety as virgin-based medical grade polymers



TRUCIRCLE™ PROGRAM

TRUCIRCLE™ - WHAT'S NEXT?

FEEDSTOCK OPTIONS – ADDING A NEW CATEGORY



CERTIFICATION BY MASS BALANCE CHAIN OF CUSTODY

EXISTING FEEDSTOCK

BIO FEEDSTOCK



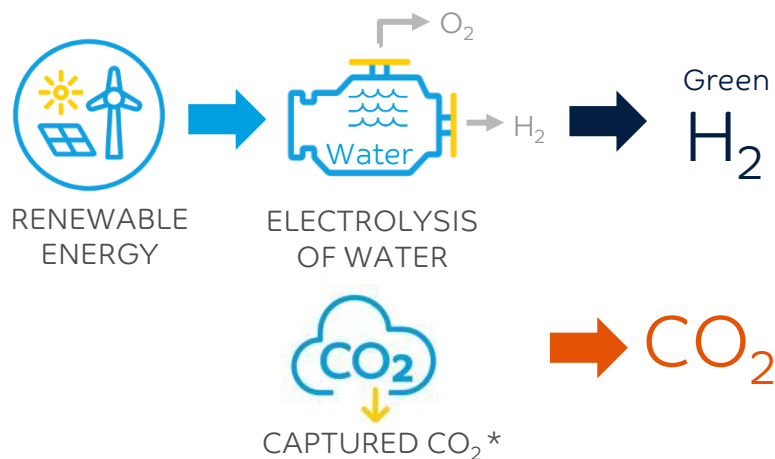
FOSSIL FEEDSTOCK



RECYCLED FEEDSTOCK



POWER GENERATION & H₂ SOURCES



CO₂ SOURCE



NEW

E-NAPHTHA FEEDSTOCK



SABIC's cracker



SABIC's polymerisation

* from industrial emissions

WE BELIEVE ...

THE FUTURE IS BUILT ON

INNOVATION COLLABORATION

WILL DELIVER STRONGER SOLUTIONS

