

SAINT-GOBAIN



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ENHANCING MULTI VALUE-CHAIN CATALYST CARRIERS REVALORIZATION: KEY ASSETS AND CHALLENGES

SAINT-GOBAIN NORPRO



01

SAINT-GOBAIN GROUP

Enhancing multi value-chain catalyst carriers revalorization:
key assets and challenges

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catalyst carriers: assets
and challenges

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We are the worldwide leader in light and sustainable construction.

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46.6

In euro billion / 2024 sales

161,000

employees

80

countries ^(a)

Worldwide leader in light and sustainable construction, Saint-Gobain designs, manufactures and distributes materials and services for the construction and industrial markets. Its integrated solutions for the **renovation** of public and private buildings, **light construction** and the **decarbonization of construction and industry** are developed through a continuous innovation process and provide sustainability and performance.

New and lightweight
construction

Energy efficient
renovation

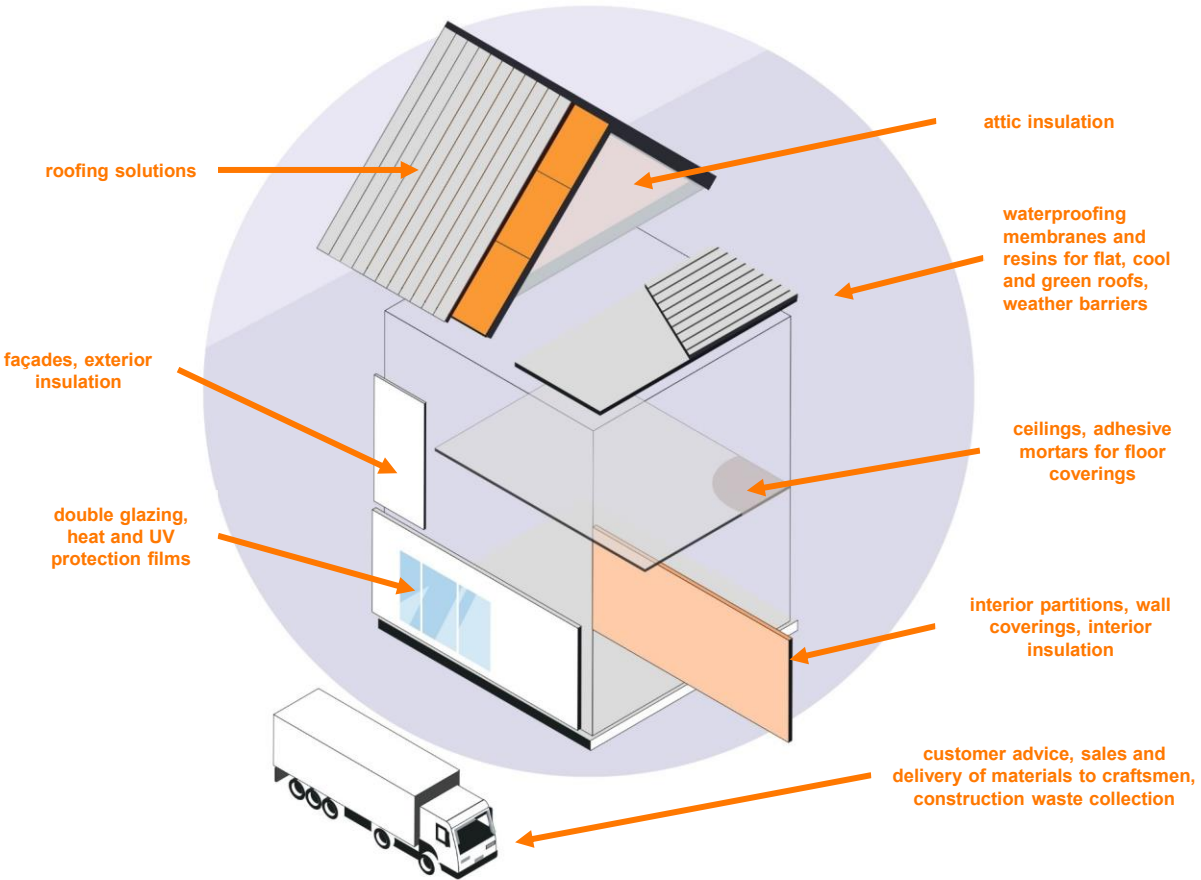
Decarbonization of construction
and industry

Our **corporate purpose** (Making the World a Better Home), our **vision** (to be the worldwide leader in light and sustainable construction) and our **strategic plan** (Lead & Grow 2030) are fully aligned.

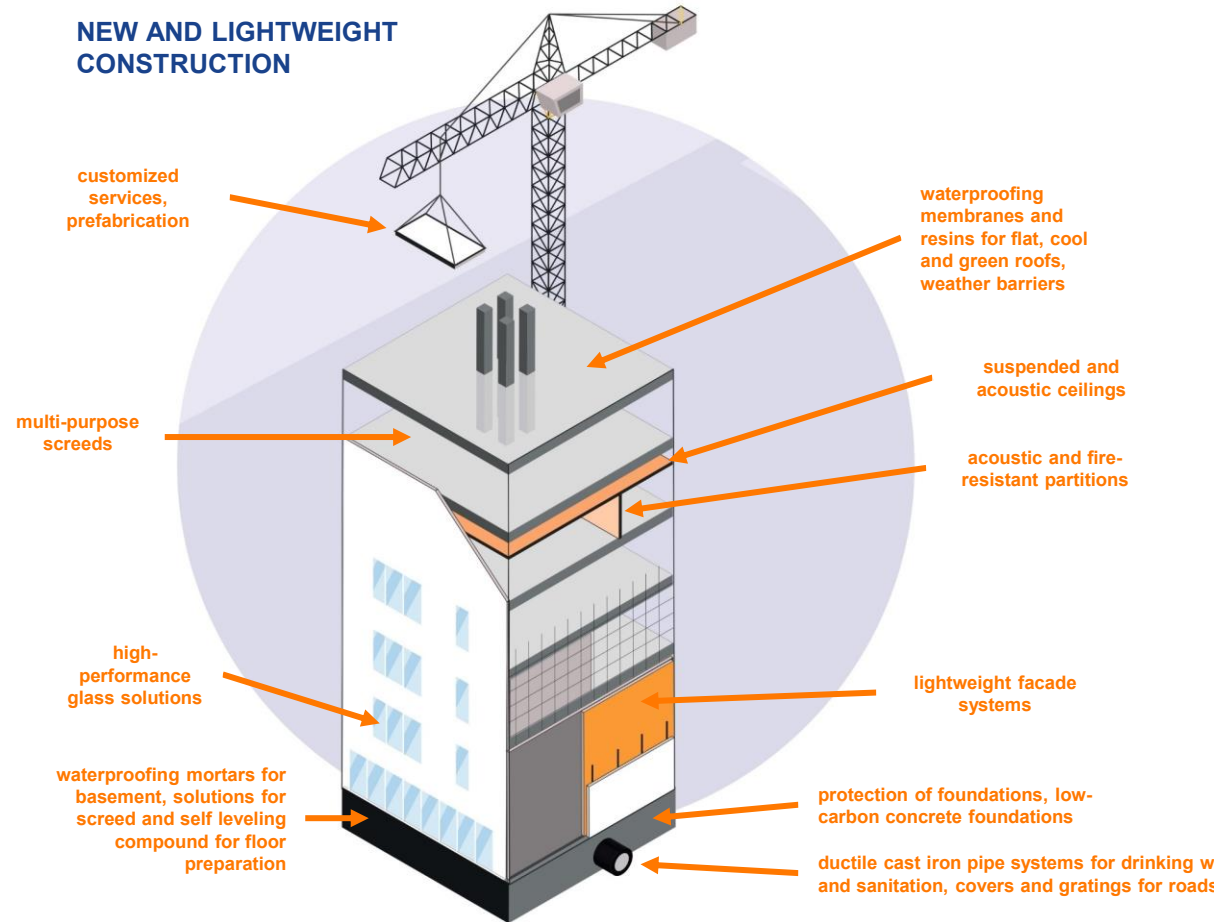
(a) countries with manufacturing facilities as of March 2025

SAINT-GOBAIN OFFER FOR LIGHT AND SUSTAINABLE COSTRUCTION

RENOVATION



NEW AND LIGHTWEIGHT CONSTRUCTION



Group corporate presentation

SAINT-GOBAIN – THE GROUP

GLOBAL CHALLENGES AND OPPORTUNITIES FOR SAINT-GOBAIN

Decarbonization of Construction Industry & Mobility

Resource preservation

Rapid urbanization



A UNIFYING PURPOSE:

MAKING THE WORLD A BETTER HOME



Commitment to achieve **carbon neutrality in 2050**



World or European leader in most of our businesses

High Performance Solutions (HPS)

Cutting-edge combinations of **Glass, Ceramics, Composites, Glassfiber & Plastics** – Co-developed with our customers for:

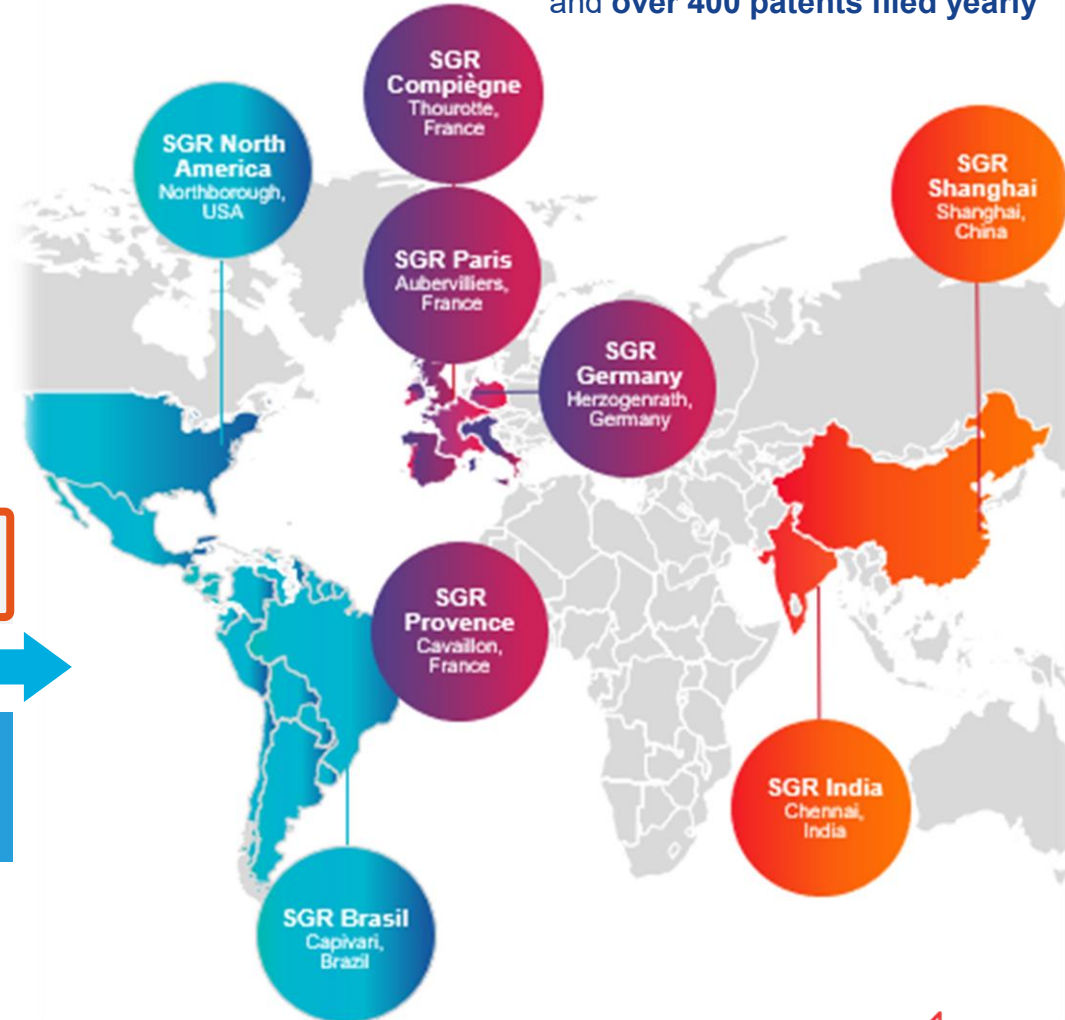
Sustainable Construction

Sustainable Mobility







Sustainable Industry

Saint-Gobain Global Research (SGR) Centers SUPPORTING INNOVATION ACROSS ALL OUR KEY MARKETS

with more than **3,600 Researchers**,
and over **400 patents** filed yearly



GLOBAL ACTIVITIES

CONSTRUCTION INDUSTRY	CONSTRUCTION CHEMICALS	MOBILITY	SURFACE SOLUTIONS	CERAMICS	LIFE SCIENCES
VETROTEX	PERFORMANCE ADDITIVES - CEMENT	SEKURIT ORIGINAL EQUIPMENT MANUFACTURER (OEM)	ABRASIVES	SEFPRO	BIOPROCESS SOLUTIONS
INDUSTRIAL FABRICS EUROPE	PERFORMANCE ADDITIVES - CONCRETE	AUTOMOTIVE GLASS REPLACEMENT	Europe, Middle-East, Africa	ZIRPRO	MEDICAL COMPONENTS
CONSTRUCTION PRODUCTS EUROPE	Precast	SEKURIT TRANSPORT	North America	PERFORMANCE CERAMICS AND REFRACTORIES	INDUSTRIAL AND CONSUMER SOLUTIONS
CONSTRUCTION INDUSTRY AMERICAS	Ready-mix concrete	AEROSPACE	South America	ADVANCED CERAMIC COMPOSITES	ELECTRONICS
GLOBAL THERMAL INSULATION	Decorative concrete	ENGINEERED COMPONENTS	Asia-Pacific	NORPRO	
ROAD REINFORCEMENT	Screed	Bearings	India	SPECIALTY GRAINS AND POWDERS	
	Gypsum	Automotive Seals Polymer Solutions	ADHESIVES & SEALANTS	VALOREF	
	SPECIALTY BUILDING MATERIALS	Omniseal Solutions	TAPE SOLUTIONS		
			PERFORMANCE FILM SOLUTIONS		
					

...WITH INTER-BU SYNERGIES / COLLABORATIONS

We provide our clients with solutions that deliver both sustainability and performance.

environmental impacts

SUSTAINABILITY

impacts on **health and well-being**



Increased **economic value**

PERFORMANCE

better **quality**

Saint-Gobain's solutions for renovation, new and lightweight construction and the decarbonization of construction and industry.
Around 75% of the Group's sales are generated with sustainable solutions.

02

SAINT-GOBAIN NORPRO

Enhancing multi value-chain catalyst carriers revalorization:
key assets and challenges



WHO WE ARE

At NorPro, we design & manufacture high-performance ceramics that drive the efficiency and sustainability of chemical processes at scale.





AT A GLANCE

5 Global Sites



50+ YEARS

Leading Catalyst Carrier
Development & Innovation

100+ YEARS

of Leadership in
Process Ceramics

NorPro

1859



1966



1990


U. S. STONEWARE

NORTON


SAINT-GOBAIN

USA

Stow, Ohio (Headquarters, R&D)

Soddy-Daisy, Tennessee (Mfg)

Bryan, Texas (Mfg)

Wheatfield, New York (Mfg, coming soon)

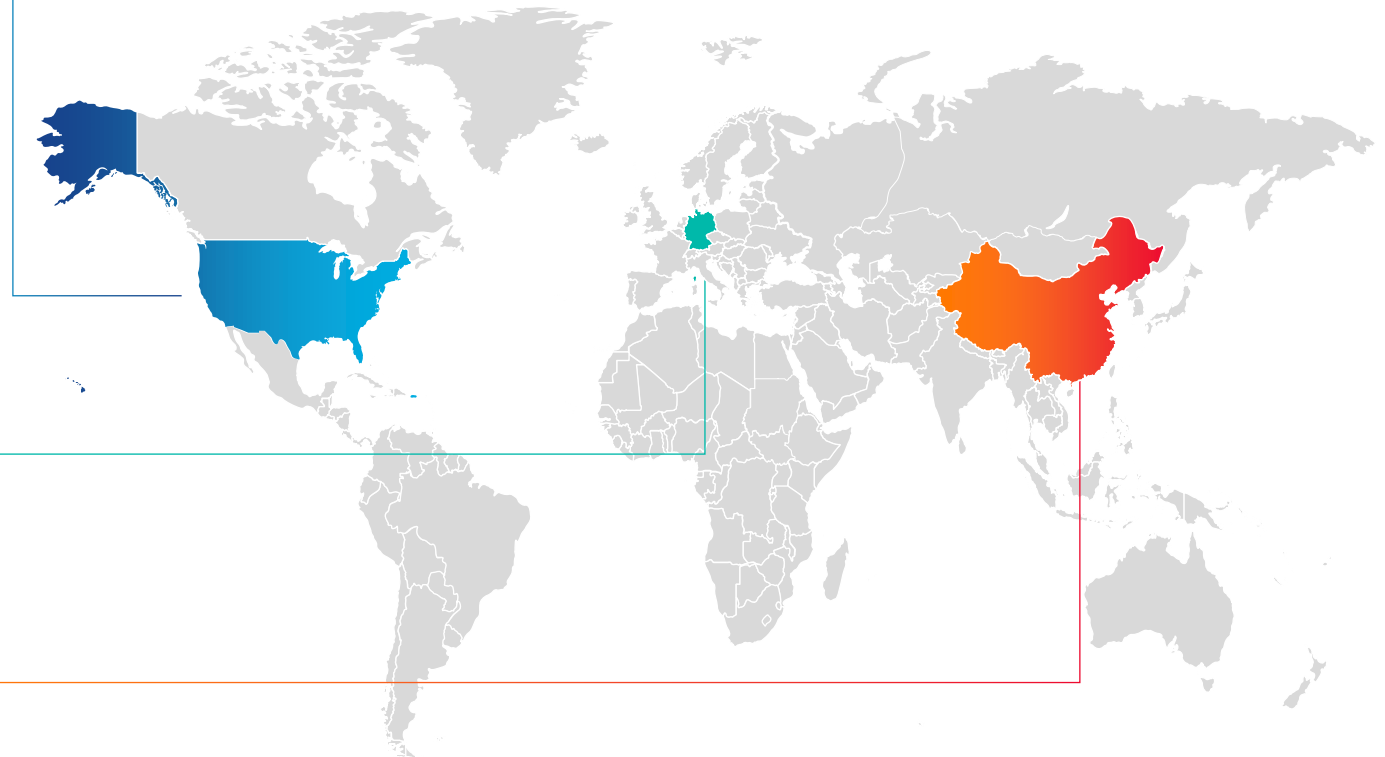
GERMANY

Steinefrenz (Sales, Mfg)

CHINA

Guanghang (Mfg)

Beijing (Sales)



A WIDE RANGE OF PACKING MATERIALS FOR REACTORS

CATALYST CARRIERS

Wide **design capabilities** to develop tailored catalyst carriers with **engineered surface** and **porosity**.

- «**A to Z**» materials: from Alumina to Zirconia, different crystal structure, blends and more...
- **Shapes:** spheres, pellets, rings, n-lobes
- **Porosity:** which and how much?
- **Surface:** chemistry, amount
- **Unique solutions:** customized engineered carriers

Our products help customers to **optimize** their **catalytic systems** – life, activity, selectivity, ...



TOP BED

PENTARING – hold-down media for consistent **flows distribution** and high selectivity. High void fraction

MACROTRAP – bed **guard** which traps contaminating agents from the feedstock to extend the catalyst's activity

RASHIG RINGS – high surface area materials with or w/o catalyst

TOP BED
/HOLD
DOWN

CATALYST
CARRIERS

BED
SUPPORT

BED SUPPORTS

DENSTONE – chemical inert, resistant to chipping and spilling, outstanding crush strength and resistance to pressure variations and excellent hydrothermal stability

DENSTONE DeltaP – reduces pressure drops and allows to reduce the bed height of the support media to enhance higher efficiency or activity

CUSTOMIZED CATALYST CARRIERS



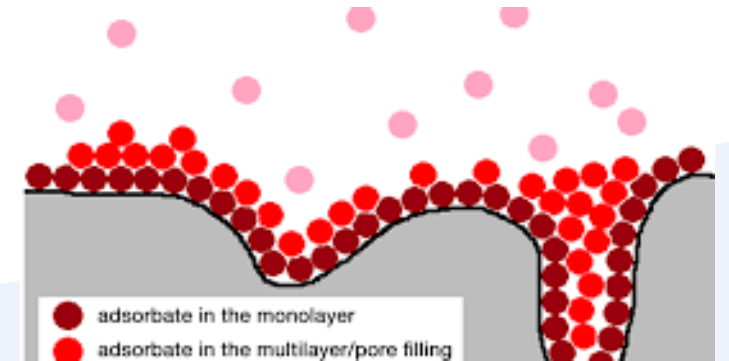
“A to Z” MATERIALS

- Alumina, Silica
- α and β silicon carbide
- Titania
- Zircona
- Steatite
- Blends and custom materials



Standard SHAPES

- Spheres
- Pellets
- Rings
- Tri/Quadri-lobes
- Spheronized balls
- Pentarings



PROPERTIES

- Surface Area
- Porosity: size, amount and modality
- Bulk and surface chemistry
- Abrasion resistance and crush strength

PROCESS CERAMICS PRODUCT RANGES

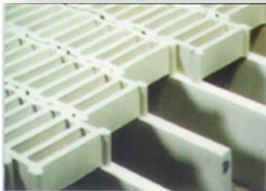
Fixed Bed **SUPPORT & TOP BED** Media



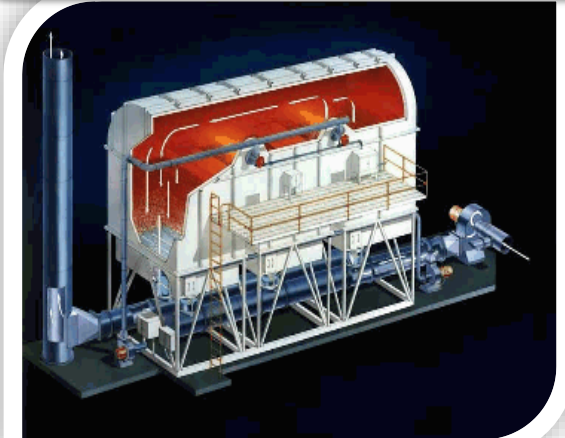
DENSTONE
SUPPORT MEDIA



Mass Transfer Applications
(i.e. Sulfuric Acid Production)



Environmental Applications
(i.e. Regenerative Thermal Oxidizers)



NorPro | KEY INDUSTRIES

NorPro solutions power performance and sustainability in industries where reliability, efficiency, and innovation are non-negotiable. For over 150 years, we've been a trusted partner to high-stakes industries where small margins impact success.



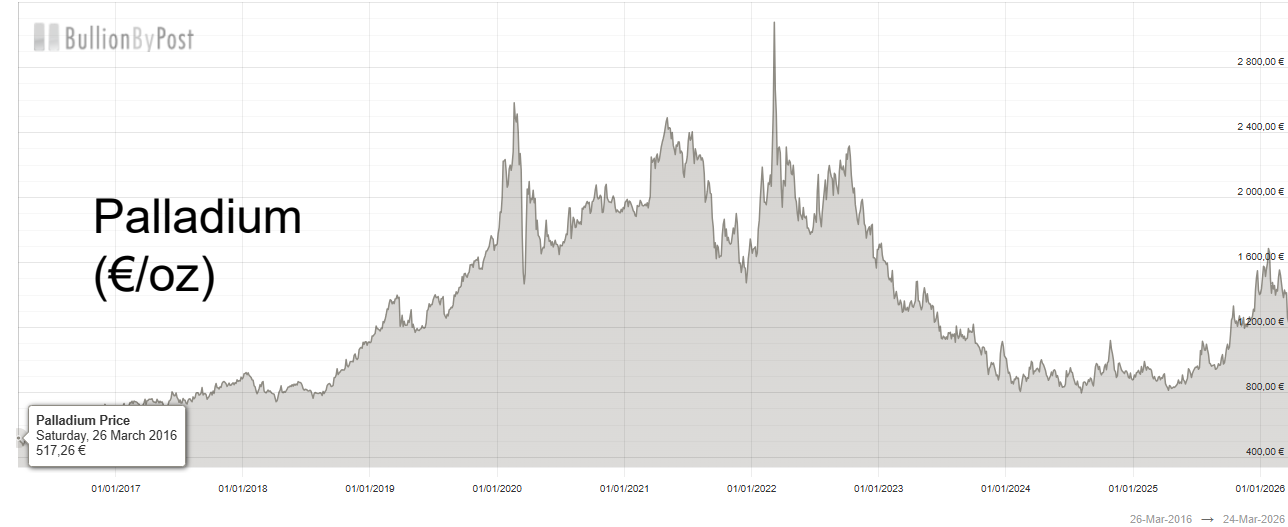
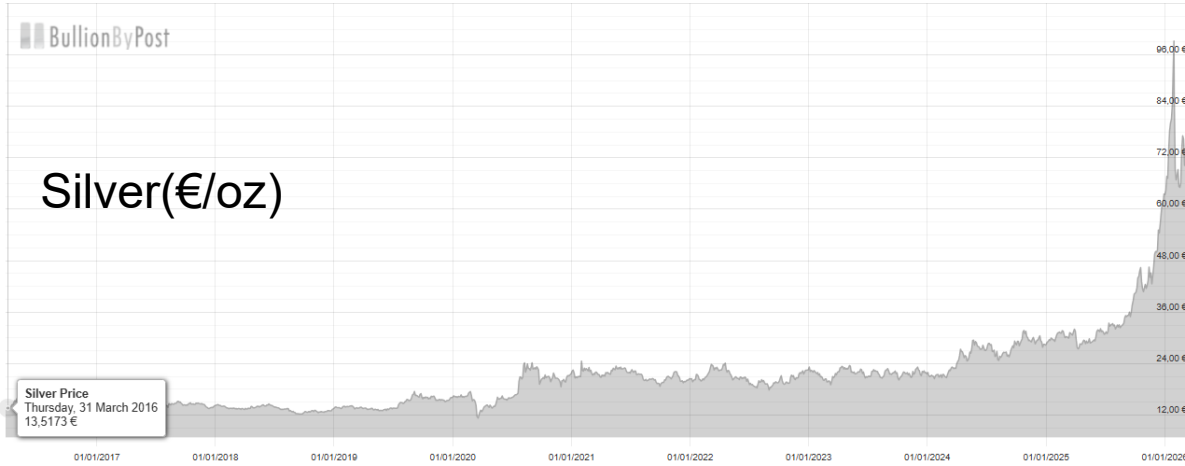
03

CIRCULAR ECONOMY FOR CATALYST CARRIERS: ASSETS AND CHALLENGES

Enhancing multi value-chain catalyst carriers revalorization:
key assets and challenges

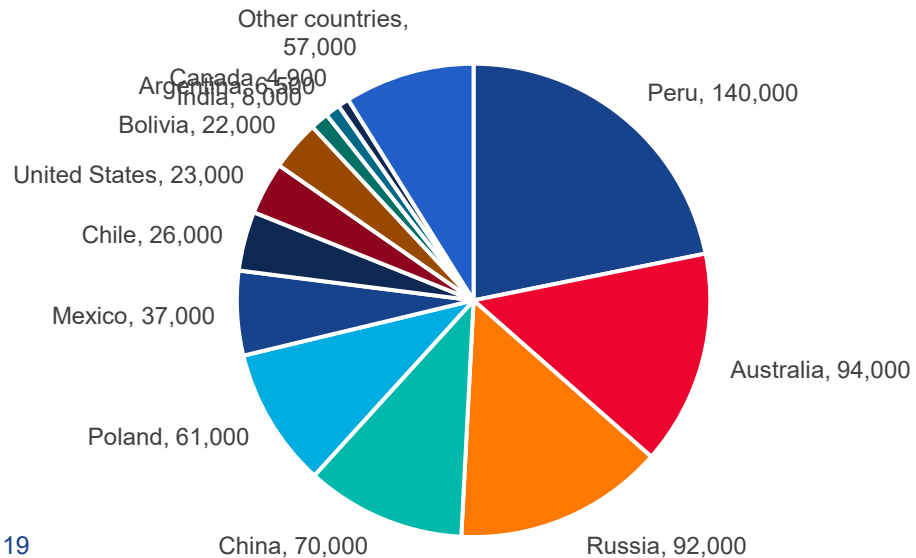
WELL ESTABLISHED CATALYSTS RECYCLING PRACTICES

HIGH VALUE IN THE ACTIVE PHASE OF CATALYSTS



SOURCE: <https://www.bullionbypost.eu/silver-price/10-year-silver-price/#show-chart>

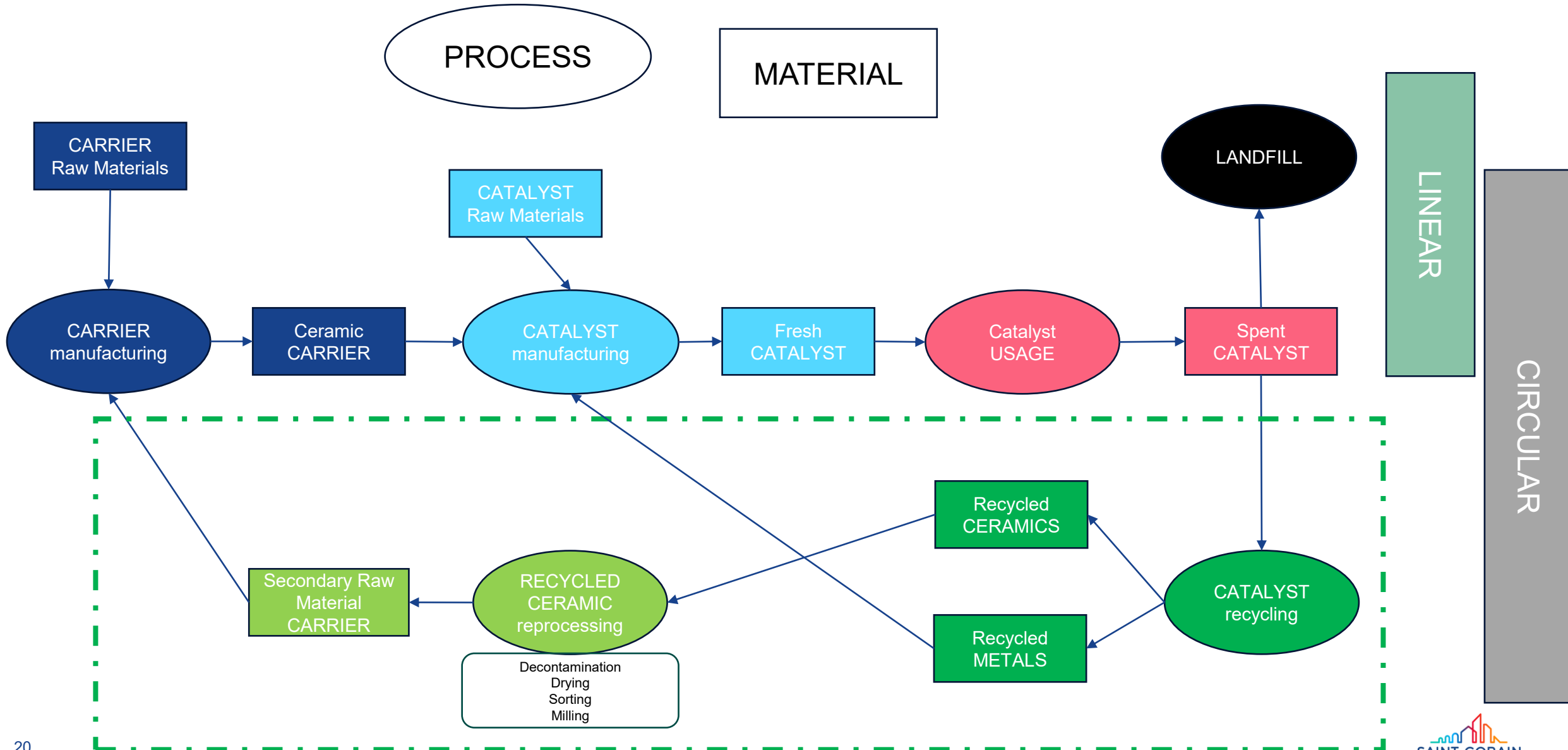
Silver Reserves (metric tons)



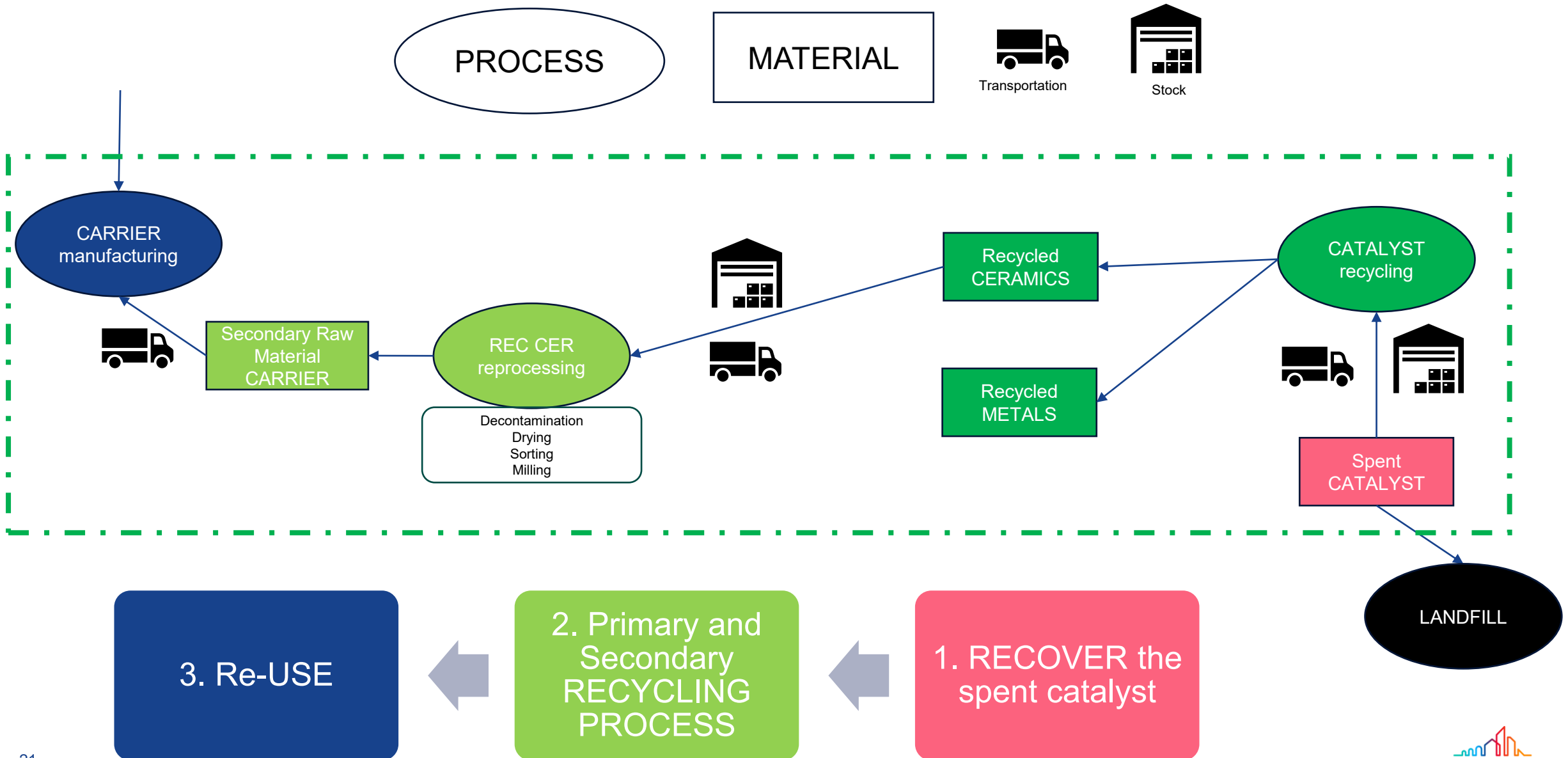
Increasing pressure to recover metals:

- Geopolitics
- Scarse reserves
- Competitive technologies (AI)

CIRCULAR ECONOMY FOR CATALYST CARRIERS



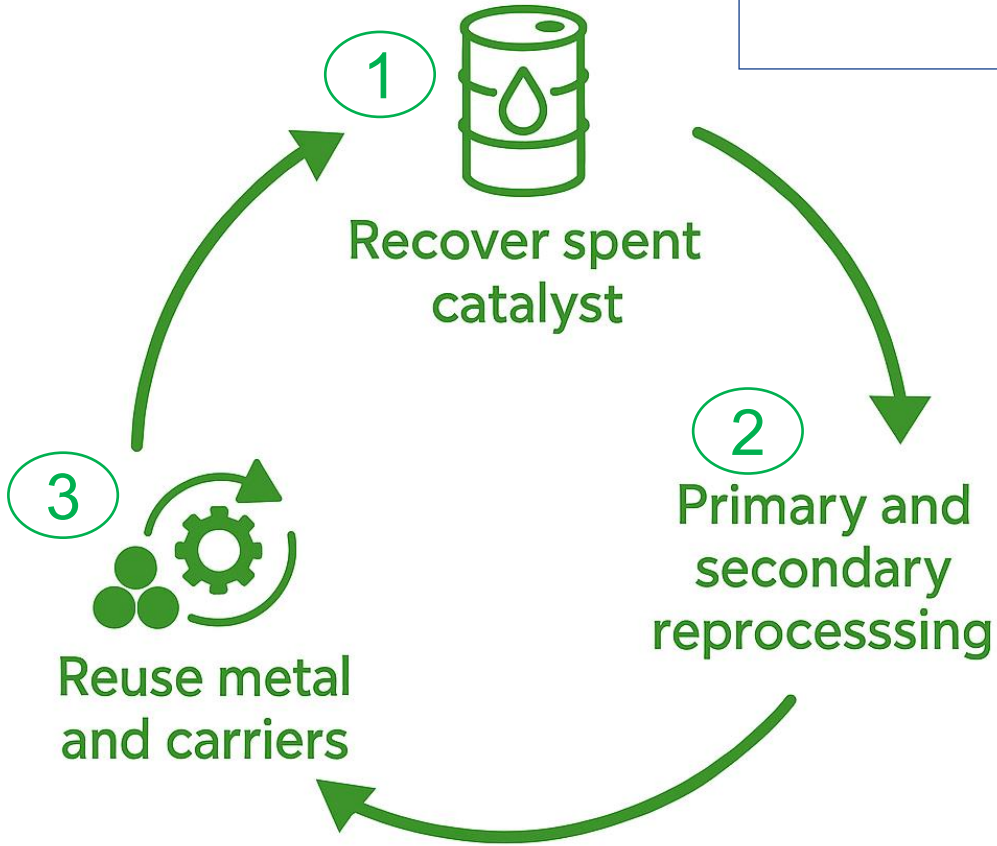
ADDITIONAL COMPLEXITY IN THE VALUE CHAIN



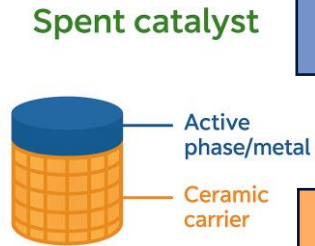
3 CRITICAL ENABLERS

- Labor+logistics vs value
- Geographical footprint
- Hazards management

- Key parameters for USAGE*
- Economics
 - Net Environmental Impacts
 - Strategic fit



- PRIMARY reprocessing**
- Leaching
 - Smelting
 - Extractions



- SECONDARY reprocessing**
- Fine extractions
 - Oxydations/burn out
 - Crushing/milling

SAINT-GOBAIN VALUE CREATION

Waste management services

Broad market (and value chain) access

FROM REFRACTORY MARKET:

- Glass industry (container glass, flat glass, insulation glass, reinforcement fiberglass, specialty glass)
- Cement, chemical & incineration industries

MATERIALS:

- Zircon
- Alumina
- Chrome
- Or magnesia-based materials mainly

FROM TECHNICAL CERAMICS MARKET:

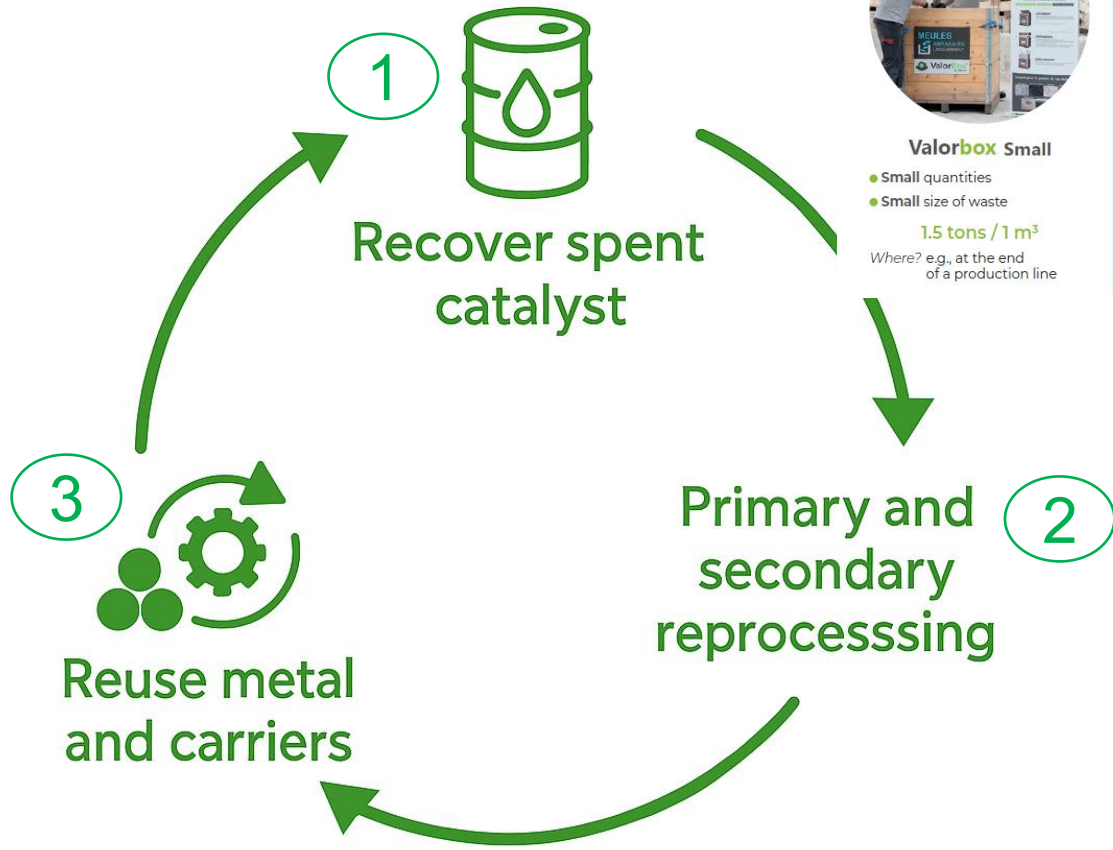
- Structural and Functional Ceramics markets
- Kiln furniture, medical, kitchenware, aerospace, electronics, chemical & petrochemical...

MATERIALS:

- High alumina
- and zirconia mainly

FROM ABRASIVES MARKET:

- Zircon & alumina beads from sand blasting or shot blasting
- Abrasive wheels



Valorbox Small

- Small quantities
- Small size of waste
- 1.5 tons / 1 m³**
- Where? e.g., at the end of a production line

Valorbox Medium

- Medium quantities
- Medium size of waste
- 1.2 tons / 1.5 m³**
- Where? Storage space limited, several boxes needed for on-site sorting

Valorbox Large

- Large quantities
- Large size of waste
- 10 tons / 10 m³**
- Where? For everyday operations and reparations

Internal capabilities for ceramic waste valorization Partnership with specialized partners

ASSETS AND CHALLENGES

KEY RELEVANT ASSETS

Global industrial foot-print to minimize the distance travelled by materials after EOL

Broad **diversification** of business and activities

Presence in **several value chains** beyond the construction market

CHALLENGES

The **NET** balance matters, both for economics and environmental impacts

Revalorization path to be determined based on each specific business case

Carriers CO₂ emissions factors are not as high as for metals, but their **w/w amount are high**

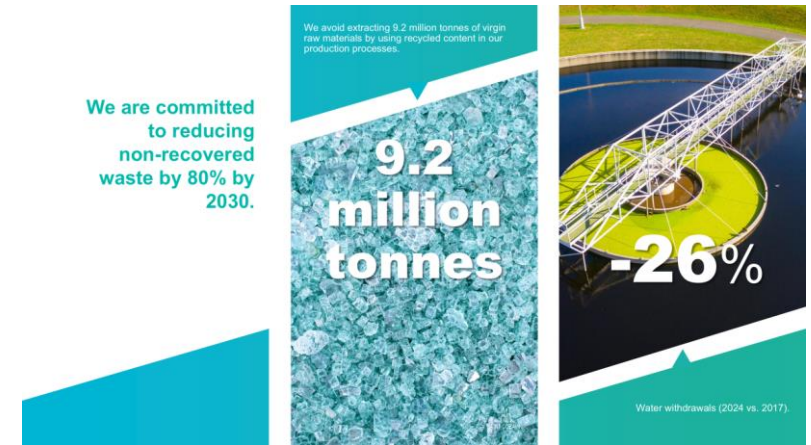
04

CONCLUSIONS

Enhancing multi value-chain catalyst carriers revalorization:
key assets and challenges

SAINT-GOBAIN NORPRO AND CIRCULAR ECONOMY

- Sustainability is a built-in core value for the Saint-Gobain group at all levels (Scope 1,2 and 3)... and same applies to NorPro (i.e.: ECCO2)
- Complexity and intensity of each task in the revalorization path are critical
 - **Short paths** with less tasks are preferred
 - “Broad-acceptance-tolerance” processes are preferred for second usage
- Assessment for NET impacts (financials and CO₂) for **carrier** recycling processes are critically linked to:
 - The value of the **carrier**
 - The intensity (cost and energy) of **secondary** processing activities
- Freights emissions (and costs) can be sometime critical to get a **net positive balance**.
 - Saint-Gobain multi-local model helps to reduce travelled distances for reprocessing and usage after EOL
 - Saint-Gobain technical skills (mainly from ceramics business), are key for secondary reprocessing activities



...WITH INTER-BU SYNERGIES / COLLABORATIONS

8 | Saint-Gobain



$$\text{NET impacts} = (\text{virgin}) \text{ RM impacts} - (\text{primary} + \text{secondary}) \text{ processing impacts}$$



THANK YOU

