Development of self-adhesive labels to fit a sustainable world

Finat Technical Seminar
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AVERY DENNISON

Our Businesses at a Glance

Label and Graphic Materials

- Label and Packaging Materials
- Graphics Solutions
- Reflective Solutions

Retail Branding and Information Solutions

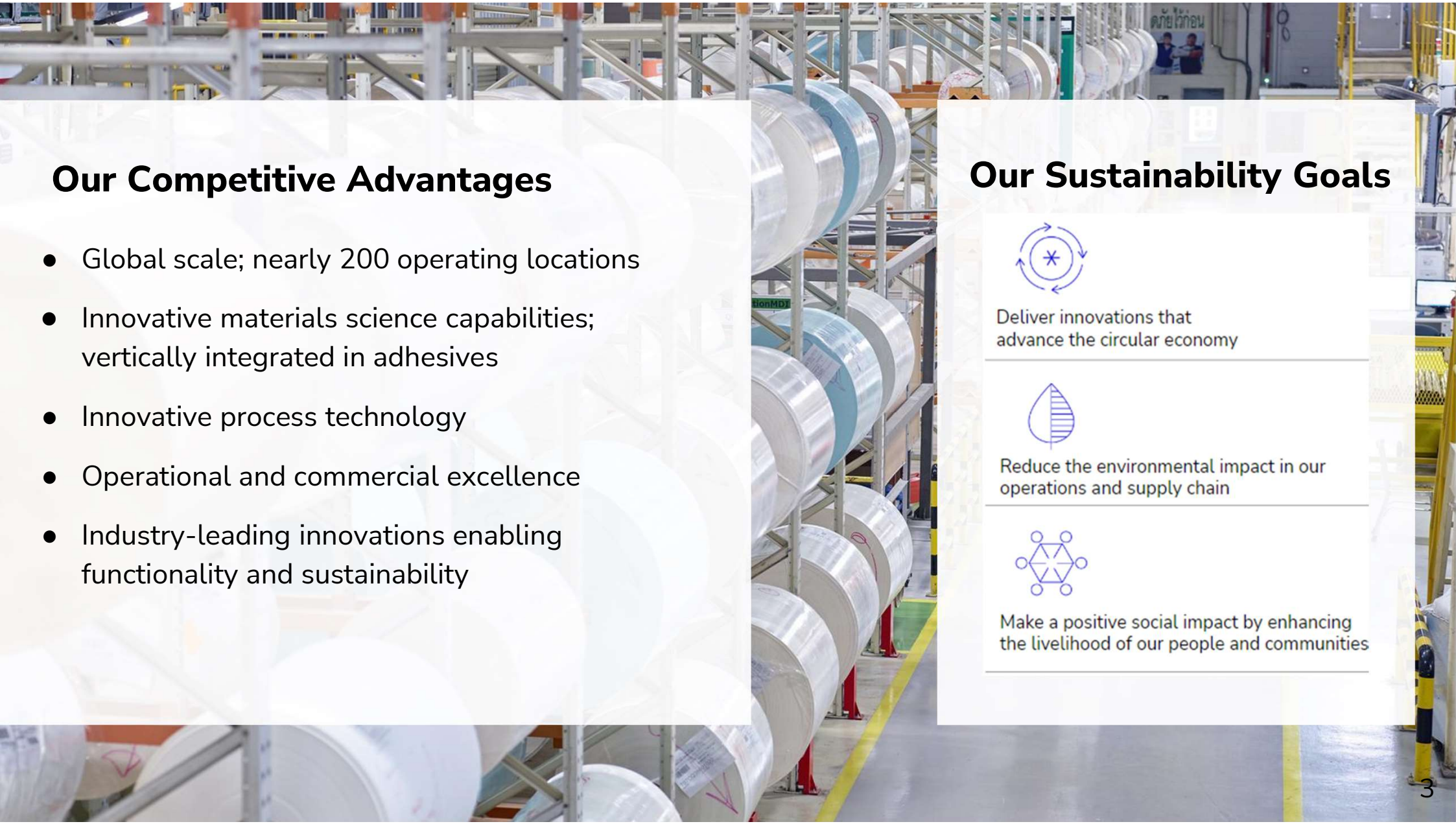
- Tickets, Tags, Labels, and Embellishments for Retail Apparel
- Pricing and Data Management Solutions
- RFID, Identification Solutions

Industrial and Healthcare Materials

- Performance Tapes
- Adhesives
- Fastener Solutions
- Medical Solutions

Total 2021 Net Sales $8.4 billion:

$5.4B	$2.2B	$776M



Our Competitive Advantages

- Global scale; nearly 200 operating locations
- Innovative materials science capabilities; vertically integrated in adhesives
- Innovative process technology
- Operational and commercial excellence
- Industry-leading innovations enabling functionality and sustainability

Our Sustainability Goals

Deliver innovations that advance the circular economy

Reduce the environmental impact in our operations and supply chain

Make a positive social impact by enhancing the livelihood of our people and communities

Advancing Circular Economy:

Material innovation centered around the 4 sustainability pillars

Reduction in the use of materials

AD RDX™

Enables reuse, recycling or compostability

CleanFlake™
HDPE Recycling
CleanGlass
Paper/Wine wash off adhesives

Contains recycled or renewable content

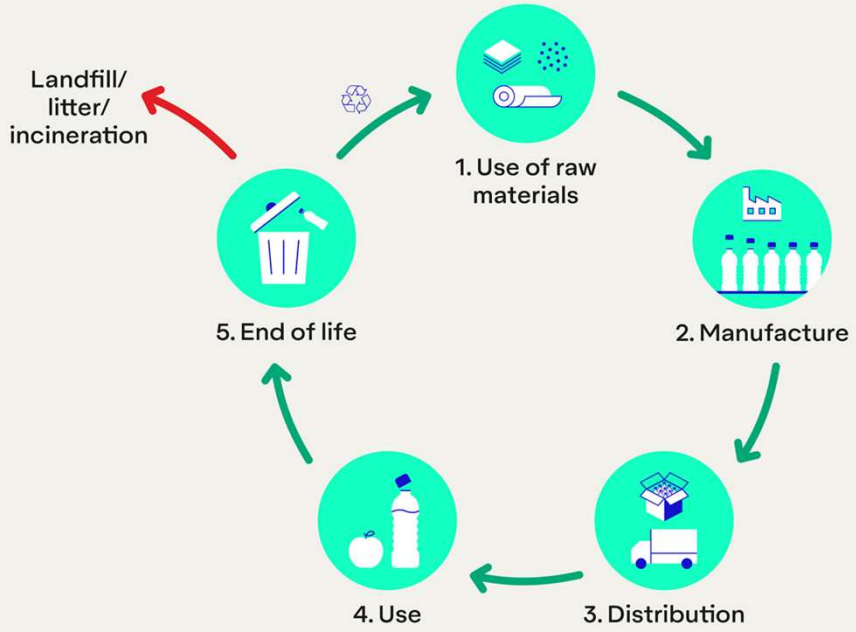
rMC, rDT
rPE, rPP
rCrush
PP, PE bio-circular ISCC

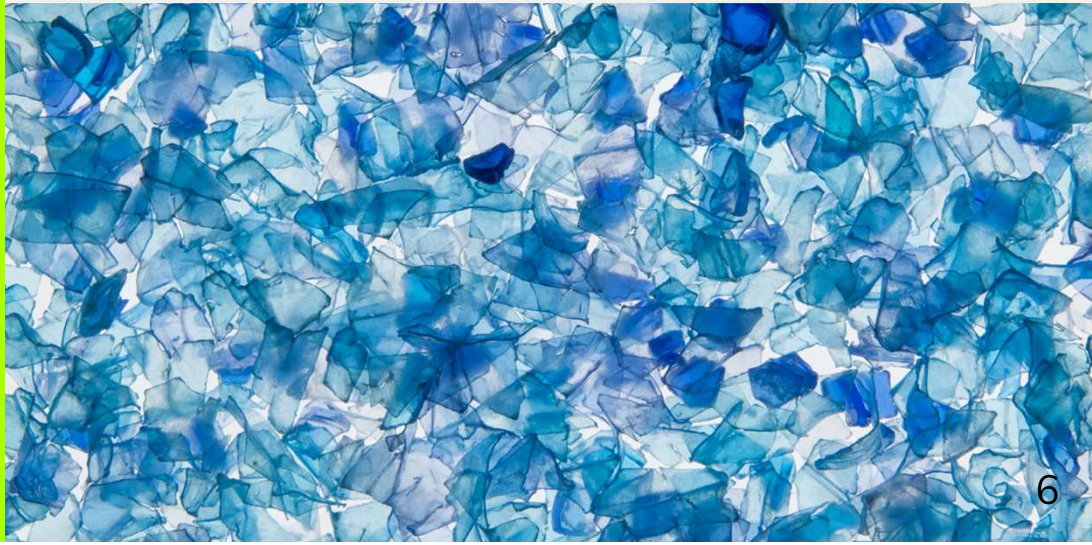
Responsibly sourced

MarbleBase
FSC® certified paper

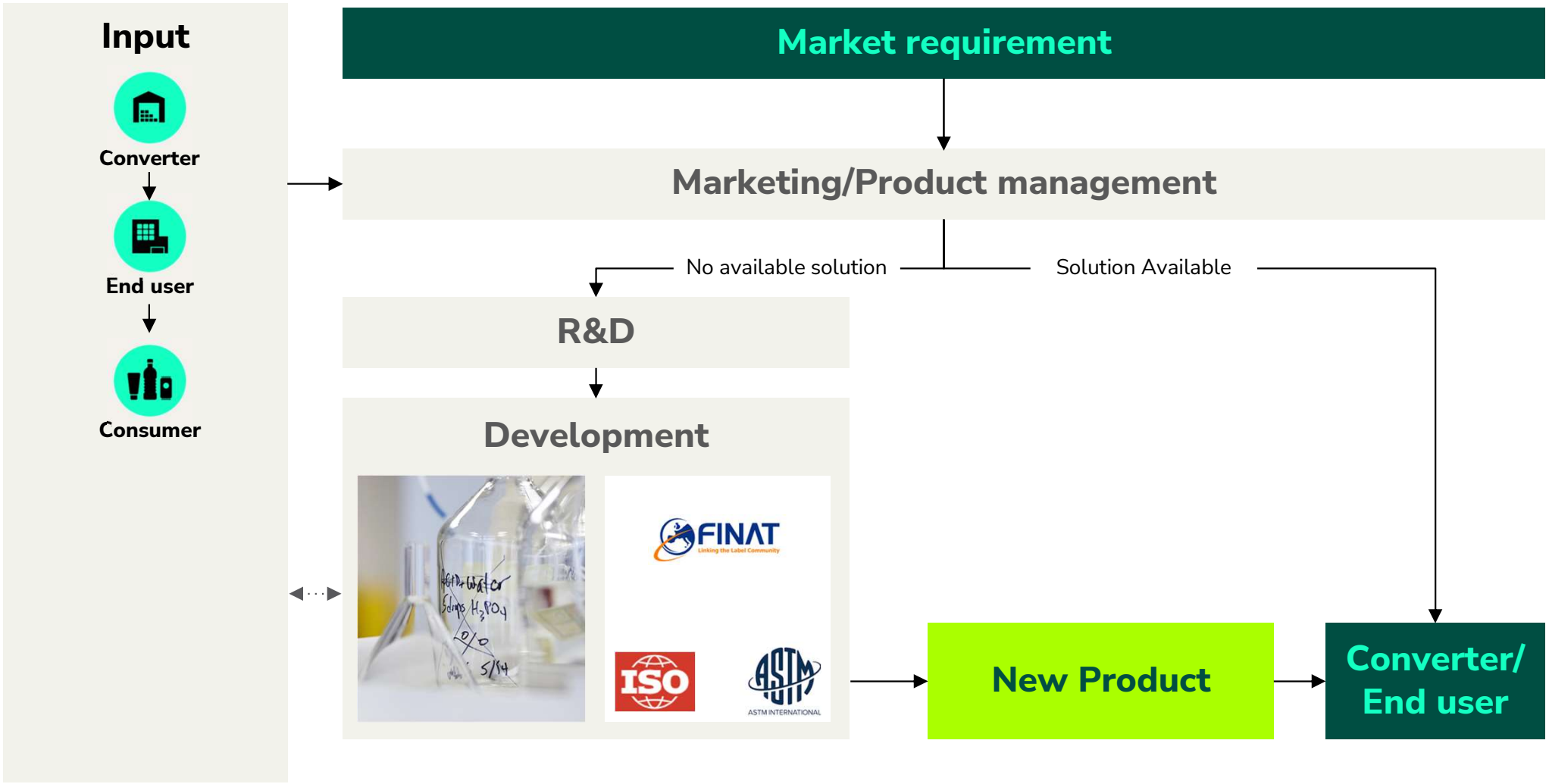
Design for recycling: Taking into account end-of-life collection from the design stage.

“80% of products’ environmental impacts are determined at the design phase” according to Ecodesign Directive.

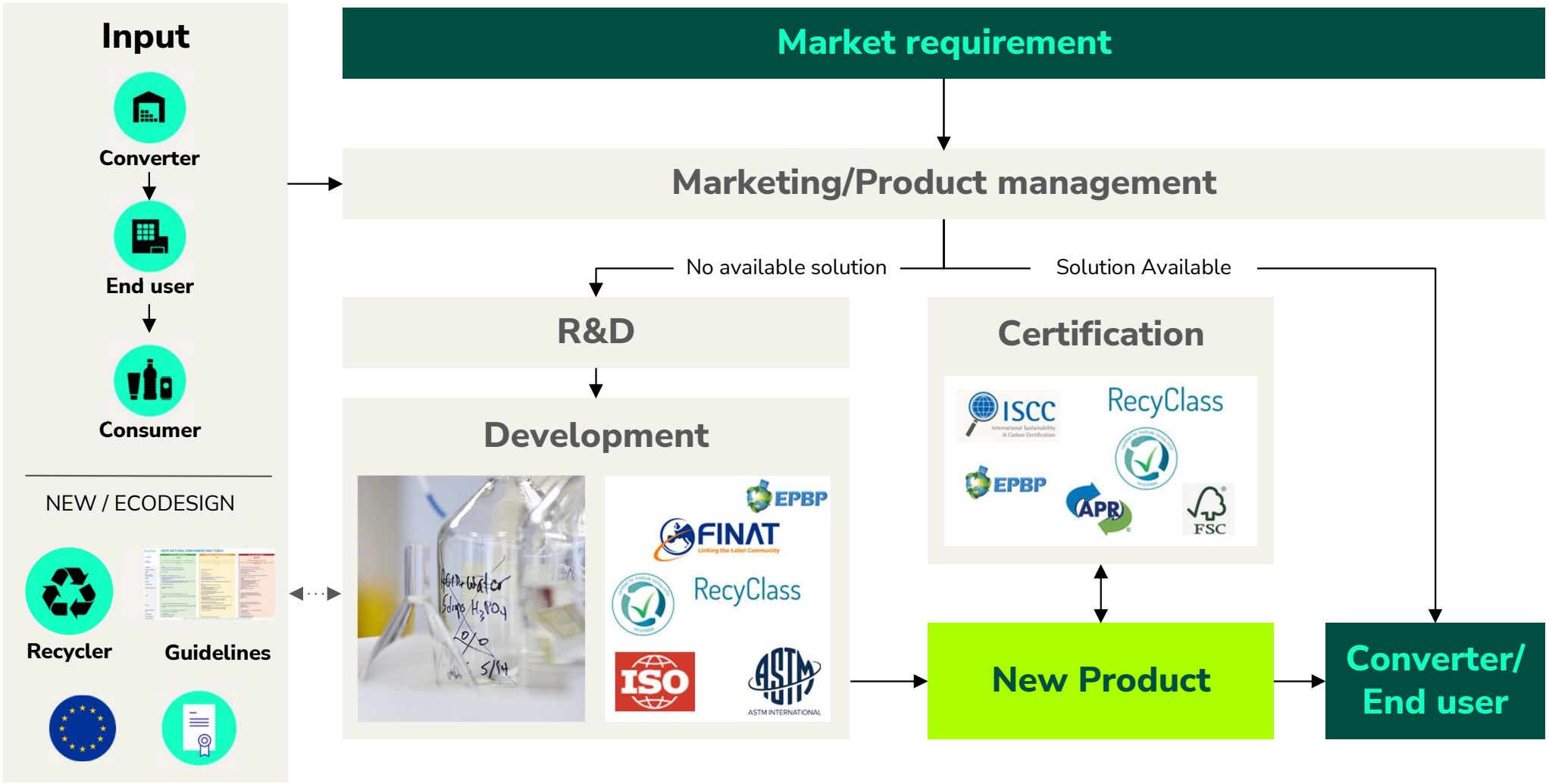




New Product Development



New Product Development - Eco design

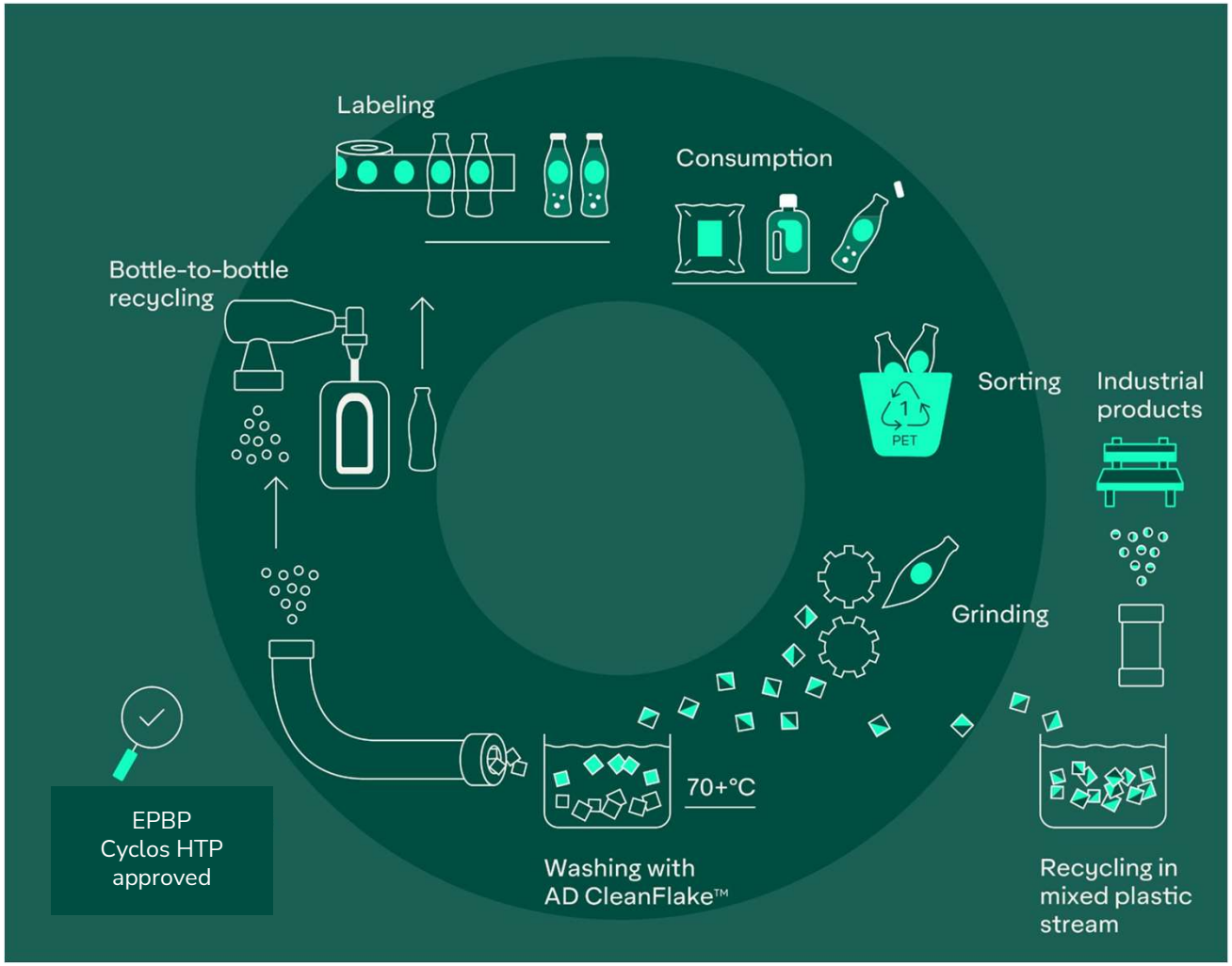


Label solutions - Sustainable ADvantage

							
Packaging Substrates	**PET**	**HDPE**	**PP**	**PS**	**Glass & Metal**	**Cardboard**	**Compostable Foil**
Key End-Use Segments	Beverage, Food, HPC	Food, Beverage, HPC	Dairy, HPC (minor)	Food, Beverage	Beverage, Food	Transport & Logistics	Food, Retail
Label Types & Technologies	- PP (Wrap around) - PP, Paper (PSL) - Sleeves	- Paper (Wet glue) - PE, MDO, Paper (PSL) - Sleeves	- Direct print - Paper (Wet glue) - PP (PSL)	- Direct print - Paper (Wet glue)	- Paper (Wet glue) - Paper, PP (PSL)	Paper DT/TT (PSL)	Paper/Film (PSL)
Current Avery Dennison solutions	CleanFlake ™	Monomaterial: RecyClass Approval rPE/ PE BioRenew	Monomaterial: rPP/ PP BioRenew Reclosure	Filmic label	CleanGlass, rPET	Paper/VI-labels rPaper	Monomaterial + Compostable Label

Label solution PET

PET RECYCLING → AD CleanFlake™



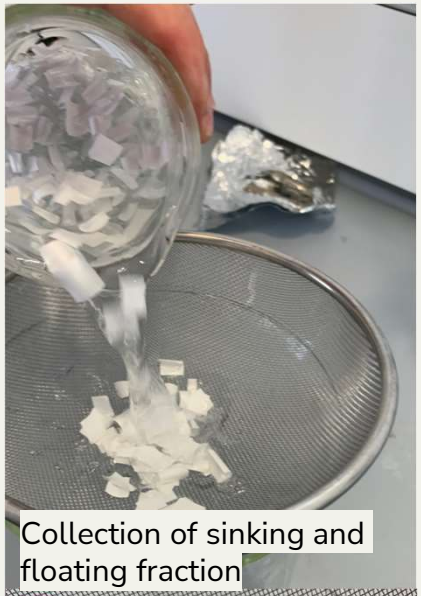
- Mature recycling process for bottle to bottle
- Label and adhesive removed from PET flakes during the hot wash process → **clean PET flakes**
- Sink-Float separation of PET flakes and label flakes by density

EPBP certification valued in the industry.
EPBP certification by result of the quick test (QT508).

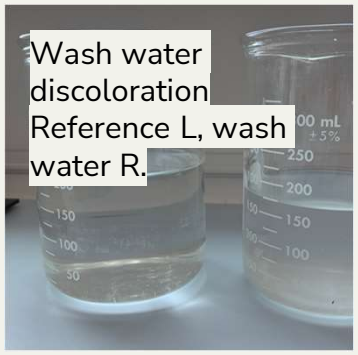
Wash testing - QT508

Addition of flakes 85°C/500rpm

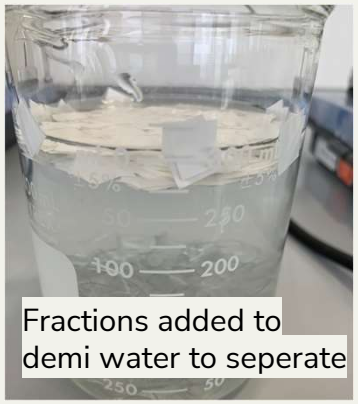
Washing @500rpm - 15 minutes



Collection of sinking and floating fraction



Wash water discoloration Reference L, wash water R.



Fractions added to demi water to seperate

Floating and Sinking fraction

AD CleanFlake™ → EPBP Endorsement

EPBP guideline	YES Full compatibility – materials that passed the testing protocols with no negative impact OR materials that have not been tested (yet), but are known to be acceptable in PET recycling	CONDITIONAL Limited compatibility – materials that passed the testing protocols if certain conditions are met OR materials that have not been tested (yet), but pose a low risk of interfering with PET recycling	NO Low compatibility – materials that failed the testing protocols OR materials that have not been tested (yet), but pose a high risk of interfering with PET recycling
Labels	PE; PP; OPP; EPS; foamed PET ; all with density <1 g/cm³	lightly metallised labels (density <1 g/cm³); paper	materials with density >1 g/cm³ (e.g. PVC; PS; PET; PETG; PLA); metallised materials; non-detaching or welded labels; foamed PETG (even with density <1 g/cm³); PET with washable inks
Adhesives	alkali/water releasable at 60-80 C without reactivation	hot-melts ; pressure-sensitive labels	alkali/water soluble

Quick test vs Semi Industrial - PET recycling

- For better understanding Cleanflake performance in recycling, (semi) industrial trial performed.

	Quick tests/Bench top tests (EPBP QT508)	Semi industrial tests
Additives in wash water	No	Yes
Label Removal	100%	100%
Adhesive	On label	(Partly) removed from label
Reactivation	Yes	No/slight

Certification protocols should represent or correlate with performance in industrial processes

Label solution HDPE

HDPE Recycling → Mono materials

- Not mature for bottle to bottle recycling
- Different process (settings) vs PET recycling
- Mono material: Label and adhesive recycled together with the bottle

RecyClass - Recyclability evaluation protocol for HDPE containers

PRE -TREATMENT

- Grinding - Washing - Floatation


Original bottle

Grinding


Flotation

EXTRUSION

- Blends of virgin + Innovation material
- Test properties of pellets/extrusion


Extrusion to pellets

CONVERTING

- Blends of extruded pellets
- Test properties of (injection) molded blends


Injection Molding


Sheet extrusion


Blow molding

HDPE Recycling → Mono materials

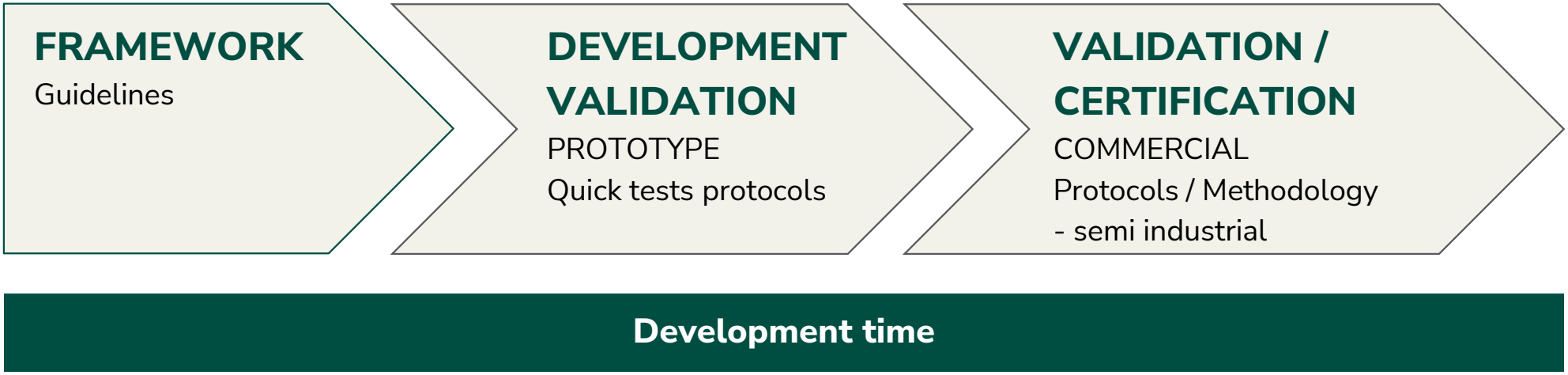
Guidelines: Recyclass

FULL COMPATIBILITY	LIMITED COMPATIBILITY	LOW COMPATIBILITY
Green column gathers the preferred design features, that guarantee the best recyclability and quality of the recyclate.	Yellow column lists the second choices for each packaging feature, that have been tested or are known to slightly impact the recycling process and/or the quality of the recyclate.	Red column classifies the detrimental and disqualifying features that should be avoided when designing packaging, as these strongly impact the recycling process and/or the quality of the recyclate.

Technology Approval, labels moved from “red” to “yellow” in Recyclass guidelines for colored stream

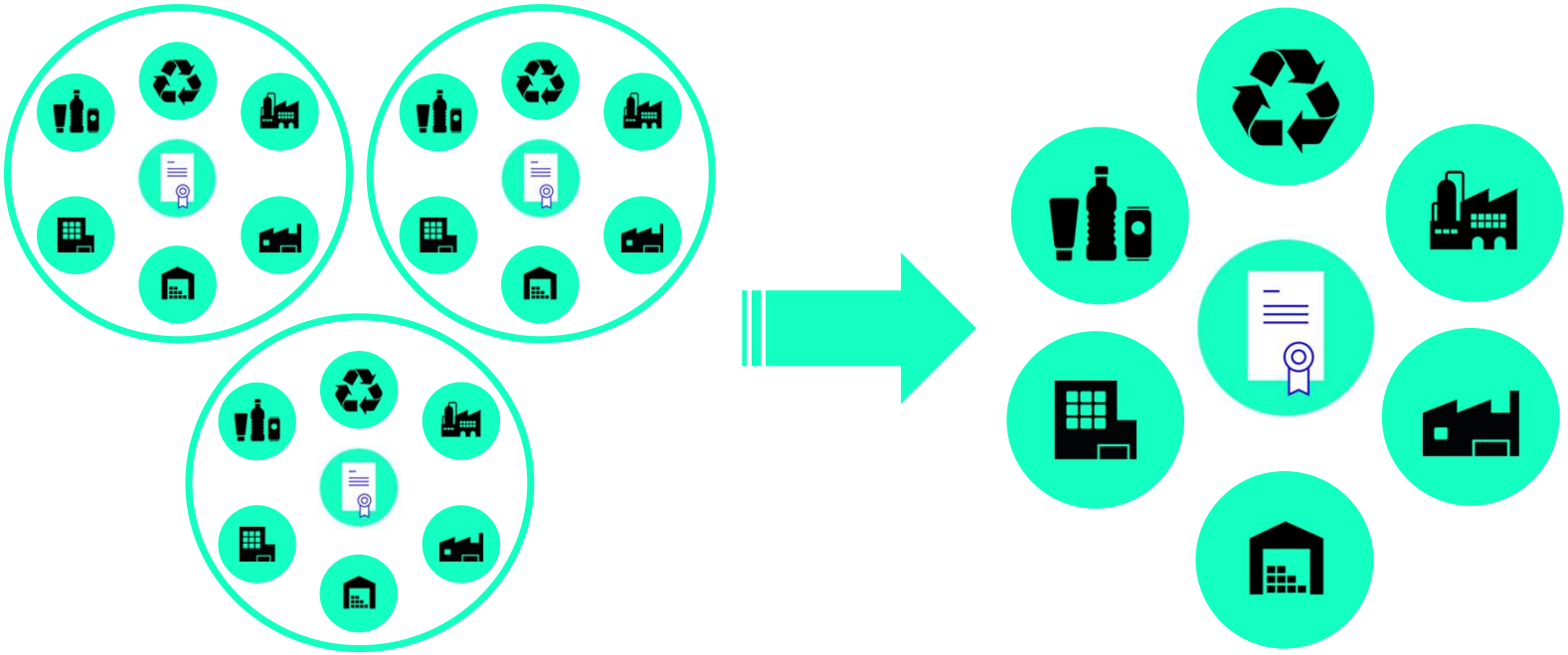
Wash temperature - limiting factor. Conflicting product CTQs versus recycling

Developing new label products - Ecodesign



Harmonisation

- Providing clarity to customers, end users, consumers
- Reducing product time to market
- Reducing costs and time of development
- Reducing cost and time of certification



Without standardisation and harmonisation, approvals will be fragmented resulting in unclarity

Thank you