Comparative LCA Analysis

PETCORE Annual Conference
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Brussels, June 15th, 2022

Performance through Understanding

Sidel

Agenda

1. Why Life cycle analysis?
2. Application to packaging
3. Key Factors
4. Full picture
5. Conclusion

Why using Life cycle analysis?

- **Holistic approach**
- **A science based and standardized method:**
  - **ISO 14040** : Principles and framework
  - **ISO 14044** : Requirements and Guidelines
  - **ISO 14067** : Principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product"
  - **ISO 14020, ISO 14021, ISO 14024, ISO 14025, and ISO 14026** on environmental labels
- **EU New green deal:**
  - **Avoidance of Green washing**
  - **ESG reporting and taxonomy**
- **Environmental Labeling**
  - International Reference Life Cycle Data System(ILCD)
  - PEF 2019*
- **Eco design tool**

* PEF 2019= Product Environmental Footprint, European Commission recommendations

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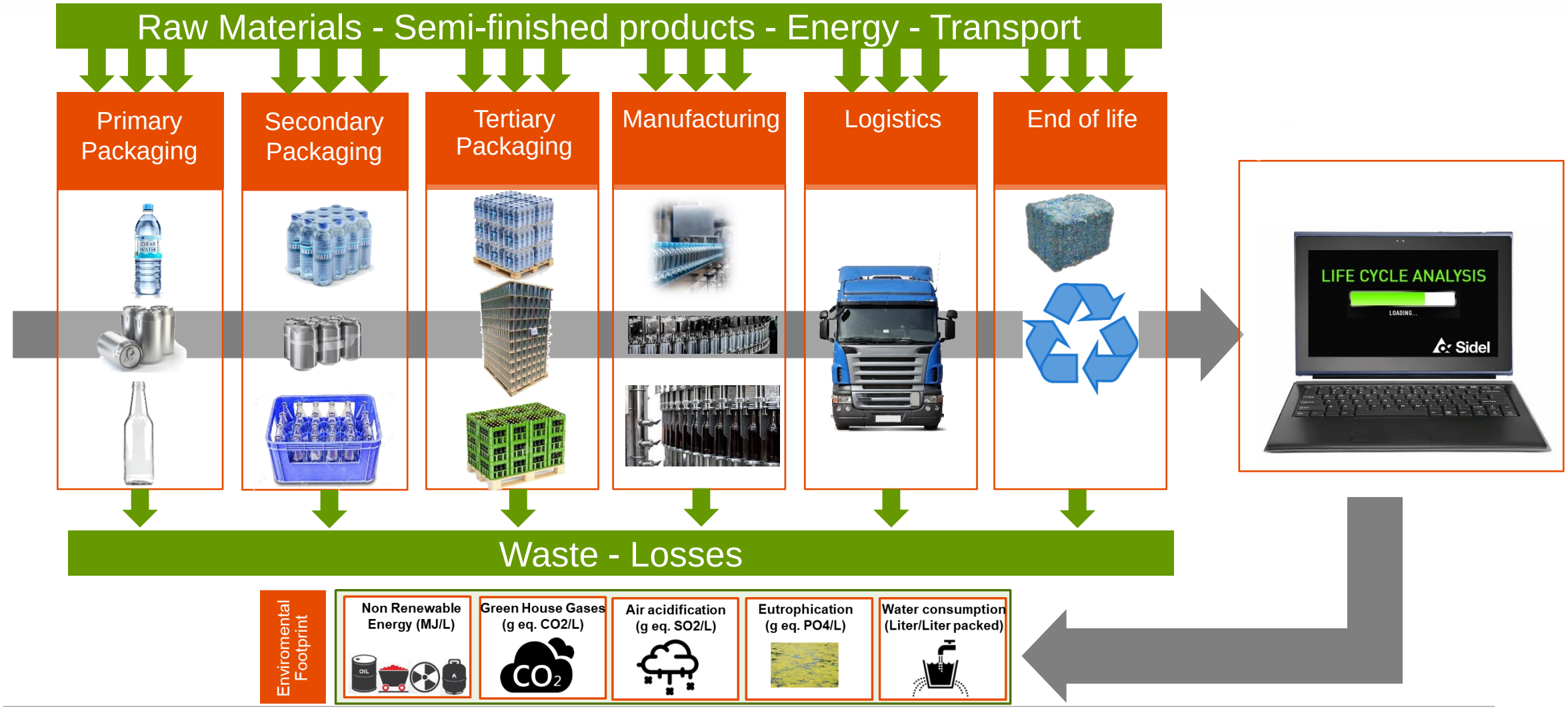
Application to packaging

Holistic approach



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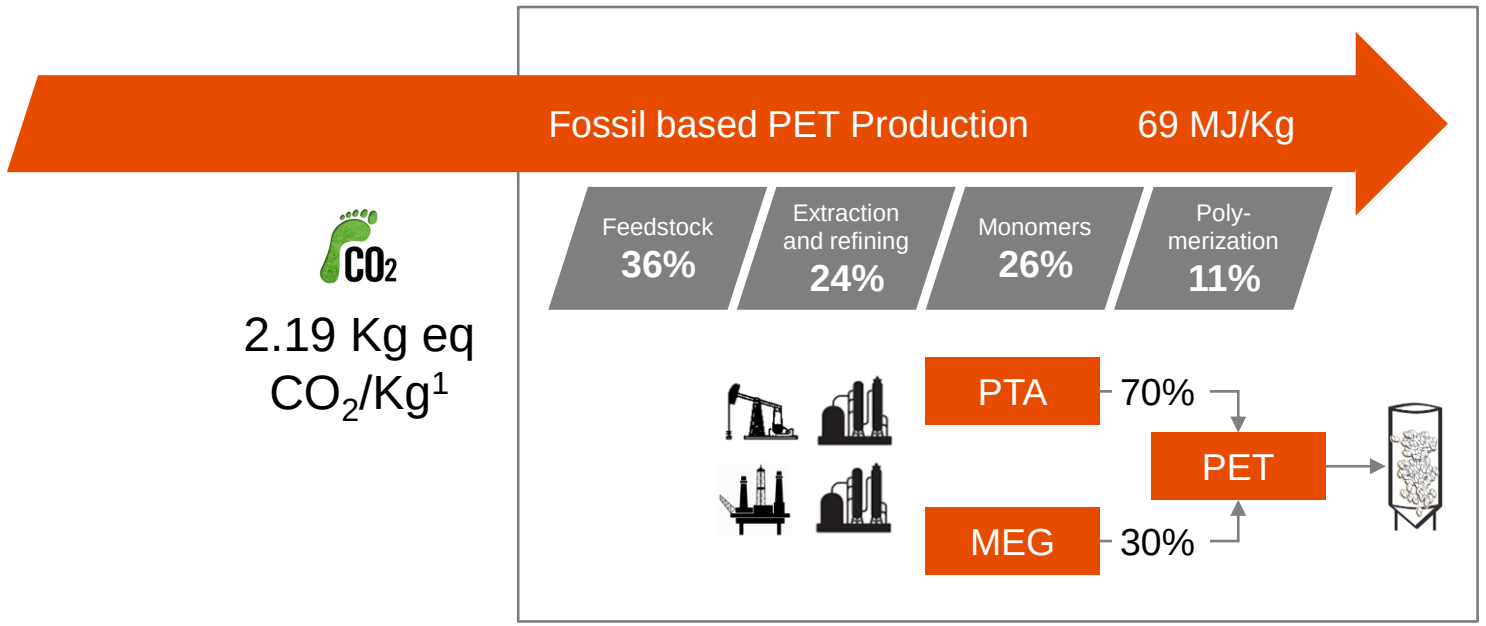
Critical areas in LCA

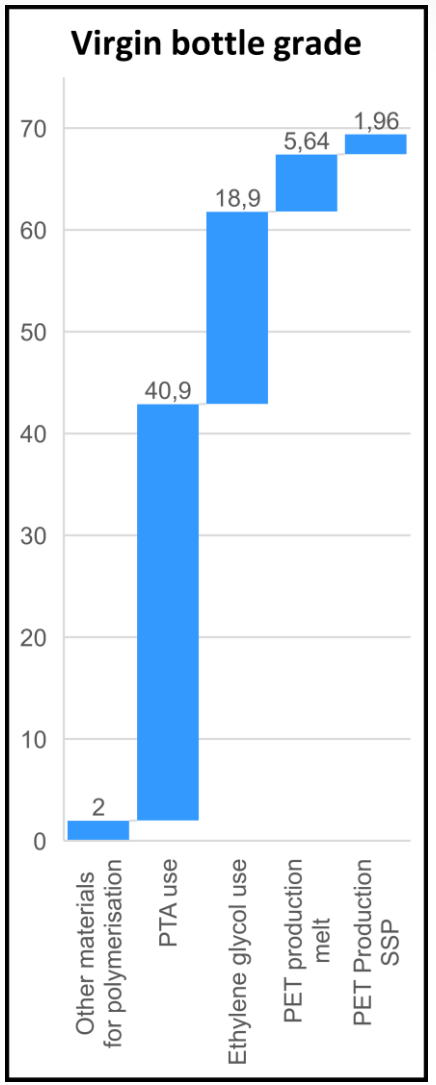
- **Raw material extraction (Life Cycle inventory)**
  - Fossil (Oil, Gaz)
  - Minerals
- **Recycle content**
- **Functional unit**
  - Volume
  - Weight
  - Shelf life
  - Number of uses
- **Energy mix at each stage**
- **Transport and Logistics**
  - At each stage
  - Single use vs re-usable
- **End of life**
  - Collection logistics
  - Incineration / Land fill/ Recycling
- **Sensitivity study**

Life cycle inventory of PET



CO_2

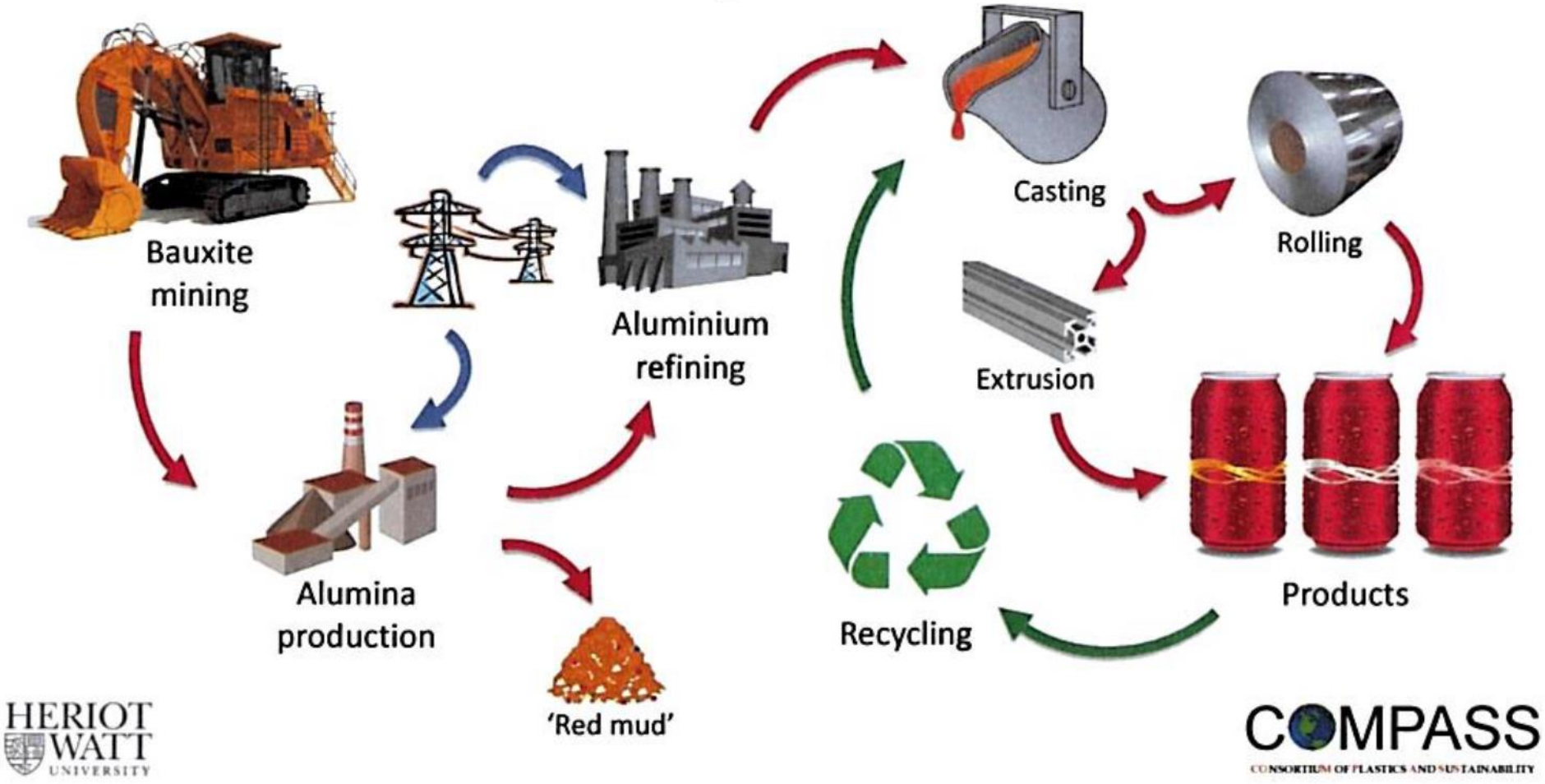
2.19 Kg eq CO_2/Kg[1]



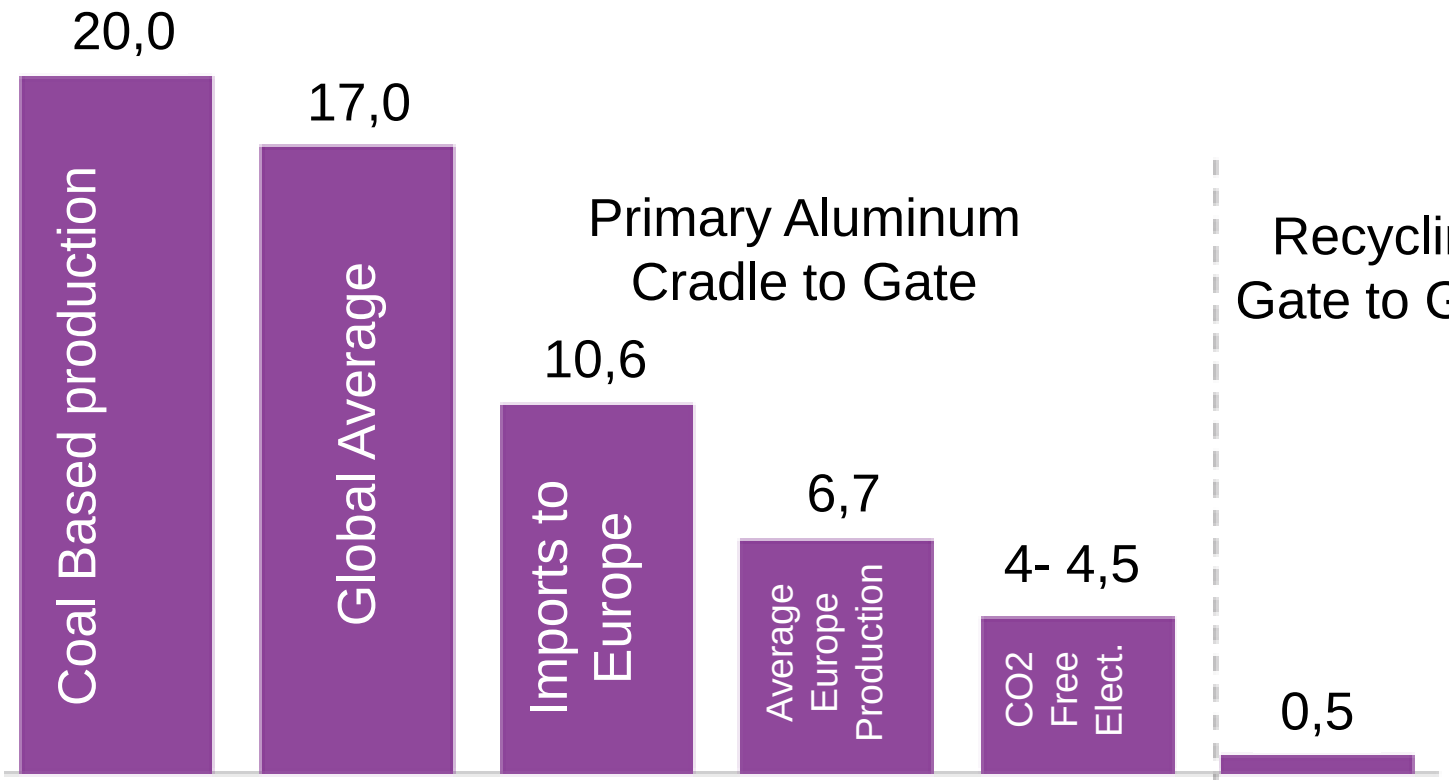
1 Life cycle inventory of PET/Plastics Europe 2010
2 Denkstatt study for Alpla 2017/Cure presentation 2020 at PETCORE Monomer recycling conference/Geography and collection scheme dependent

Life cycle inventory of Aluminum

Aluminum Production cycle



Energy mix and Location impact for Aluminum

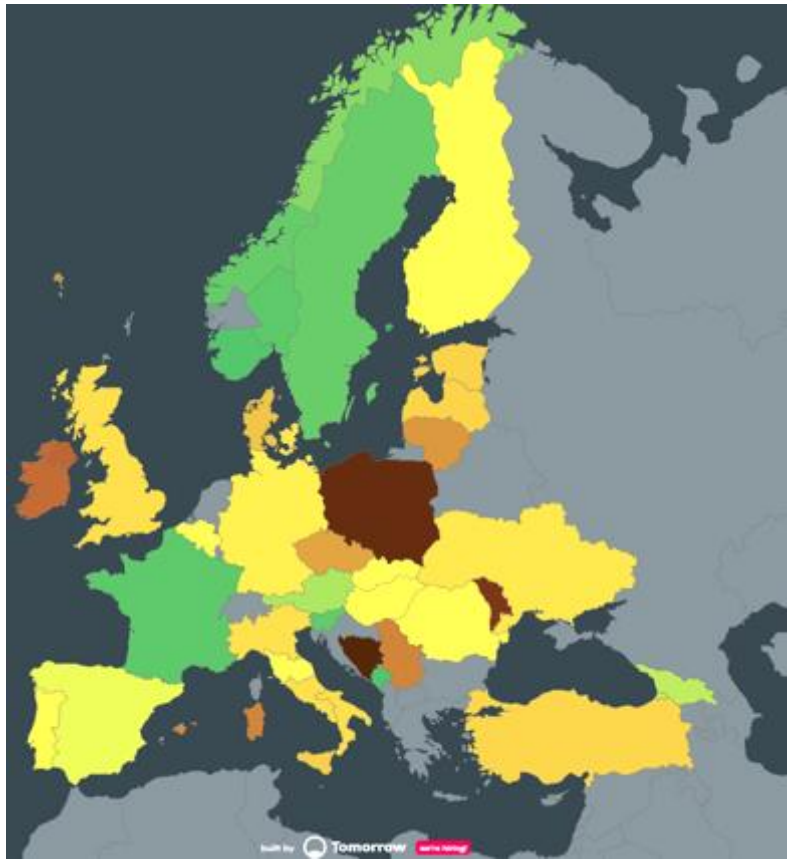


- Energy Mix
- Transportation
- End of Life

Source: https://european-aluminium.eu/media/2931/2020-05-13_european-aluminium_circular-aluminium-action-plan_executive-summary.pdf

Carbon intensity of Electricity production

Example of Europe



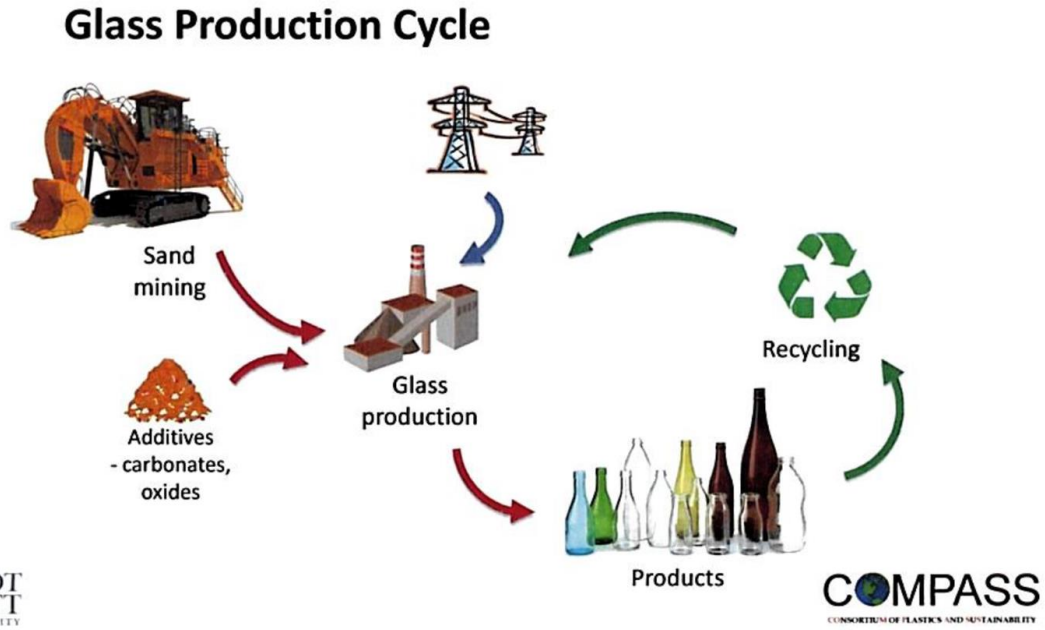
- Electricity Mix has a significant impact on GHG footprint;
  Example according to the data from the map:
  - 1 MWh used by a site in France would emit **31kg CO2e**.
  - 1 MWh used by a site in Poland would emit **698kg CO2e**.

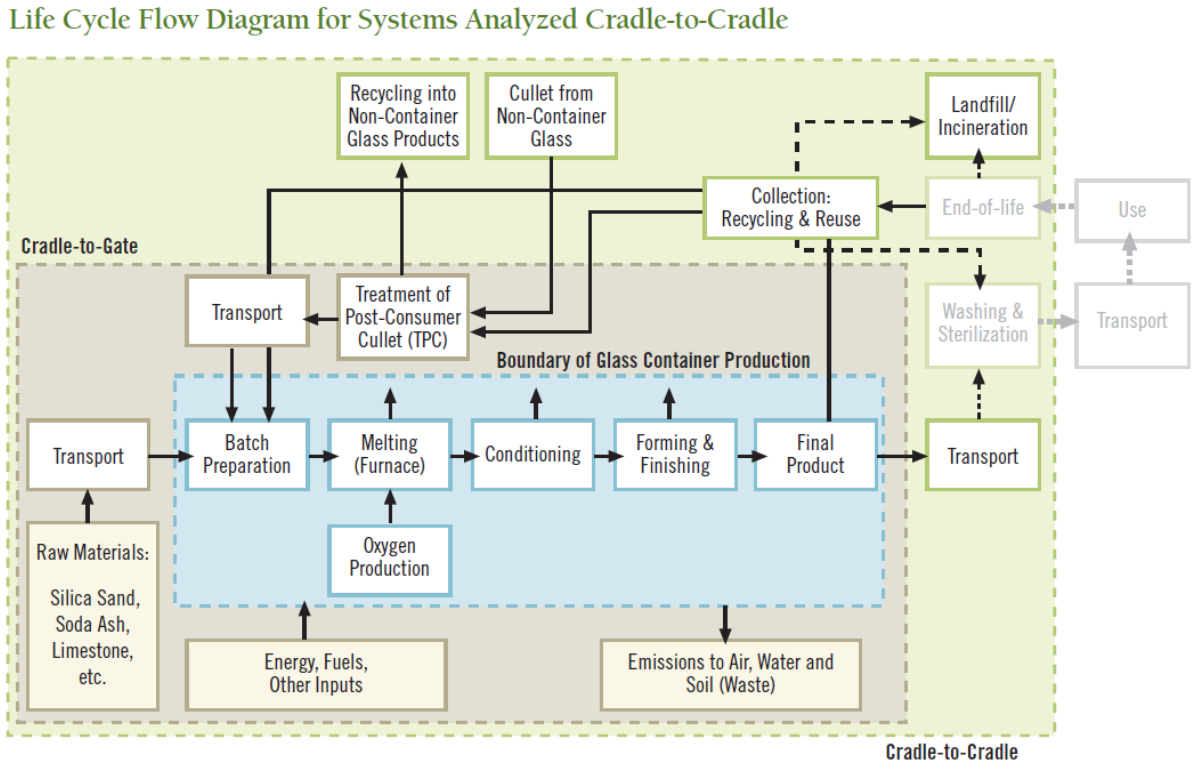
x22

Carbon intensity (gCO2e/kWh)

0 200 400 600 400

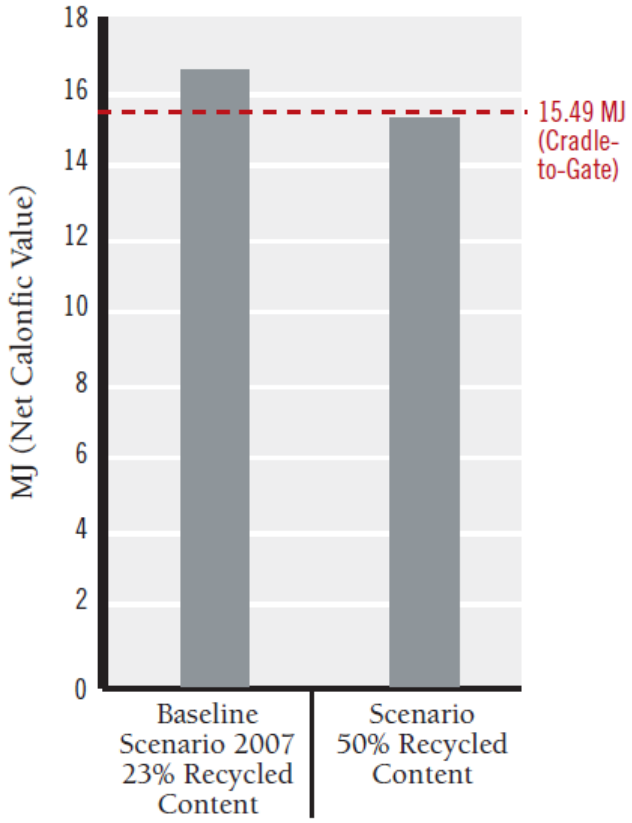
Glass production cycle



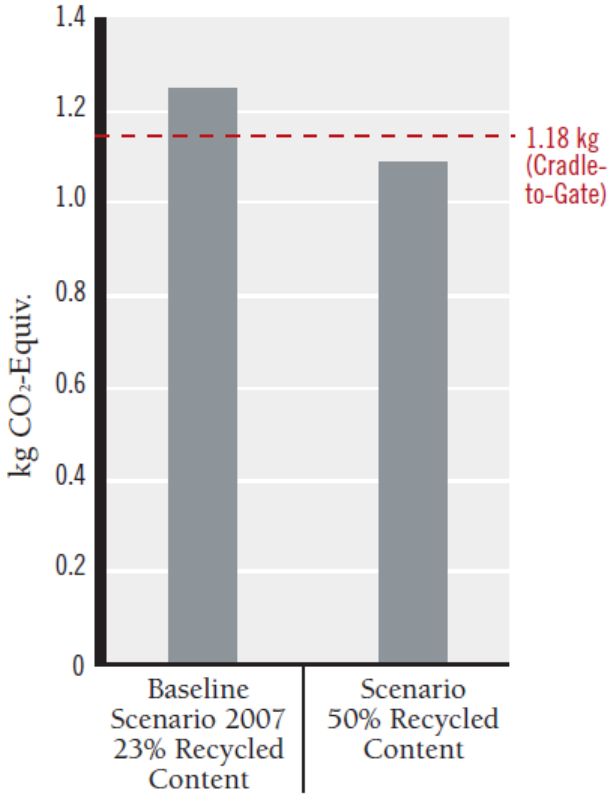


Impact of Recycling for Glass

Cradle-to-Cradle Primary Energy Demand – (1 kg Formed & Finished Glass)



Cradle-to-Cradle Global Warming Potential – (1 kg Formed & Finished Glass)



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From materials footprint to Packaging footprint

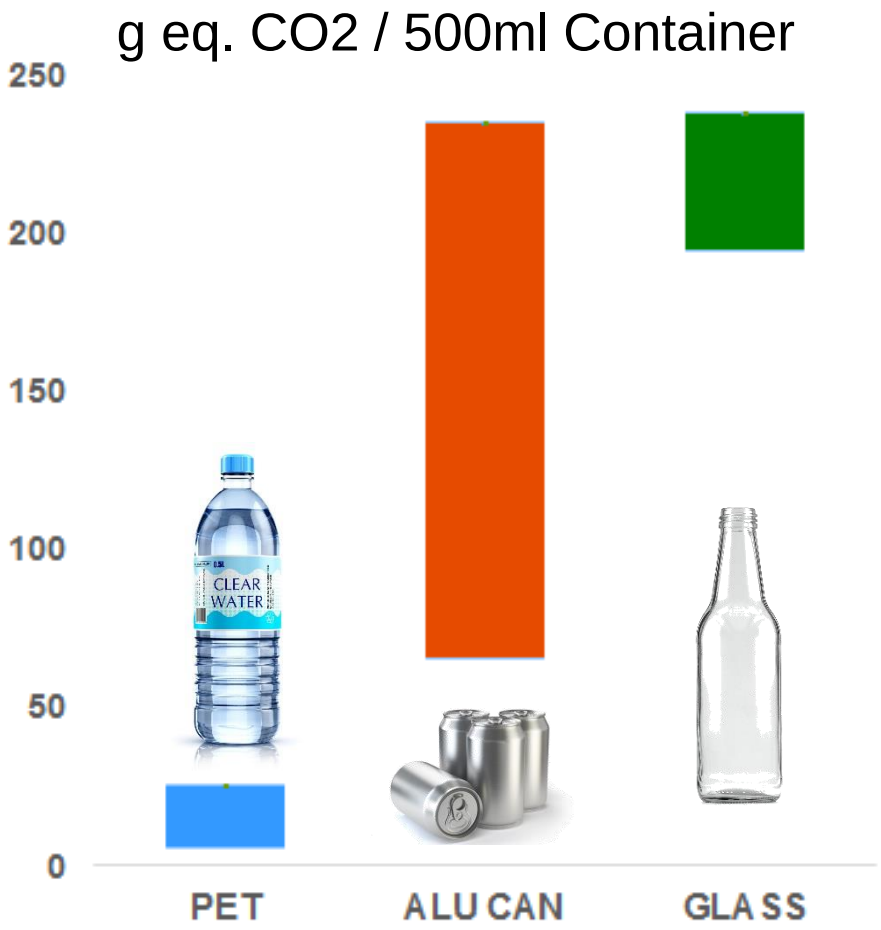
Eco profiles of materials combined to container weight and recycle content are key to selection

Eco profile × Material weight = GHG of Material

			PET	Aluminium[1]	Glass
Primary Energy (MJ/kg)			69	223[2]	16.6
r-Content GHG ($kgCO_2$ eq./kg)	0%		**2.15**	**13.85**	**1.26**
	100%		**0.45**	**3.84**	**NA**
Weight Ranking (500 ml)	**One-way**	**Water** (500 ml)	**12**	**17**	**200**
GHG One-way water (500 ml)	**0%**		**25.8**	**235**	**252**
	100%		**5.4**	**65.3**	

Source: https://www.aluminum.org/system/files/2014%20Can%20LCA%20--%20Technical%20Memo.pdf
1 Aluminum cans: 8% in weight for coatings and ink | **2** 0% recycle content

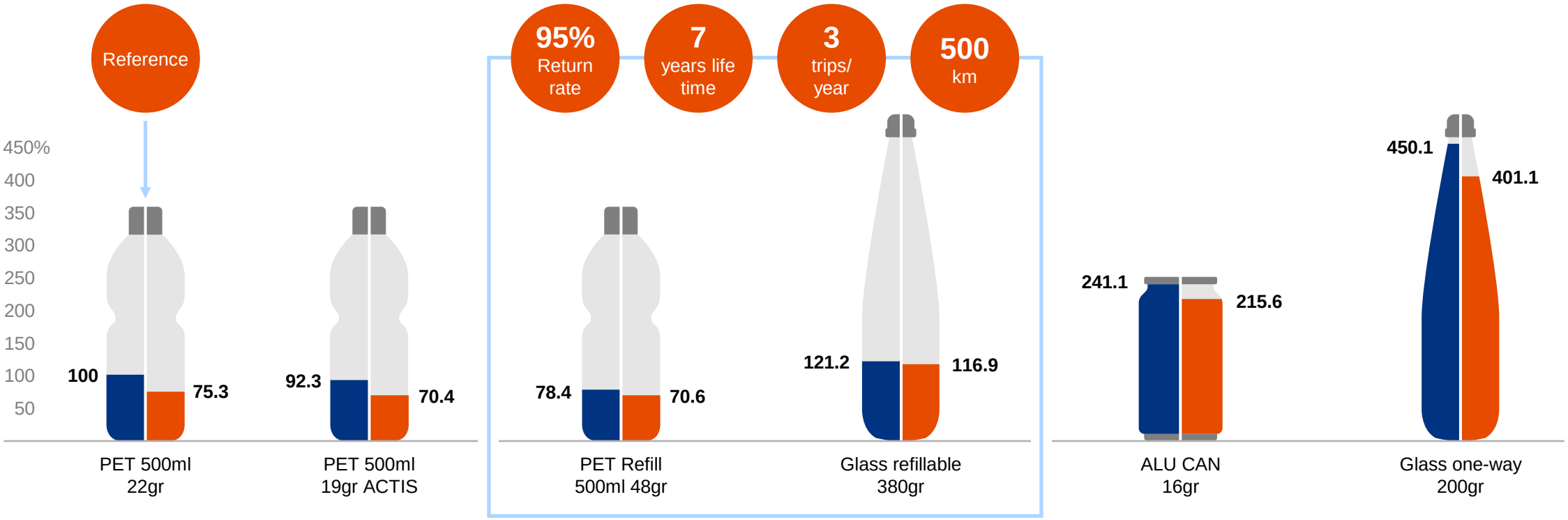
From materials footprint to Packaging footprint



Full picture

Comparison in % in relation to reference case for greenhouse effect

0,5 L CSD packaging solutions (European hypothesis)



2030 (Collection rate: 90% all materials, Incineration rate: 10%)
Hypothesis today (Collection rate: PET 53%, Aluminium 63%, Glass 64%, Incineration rate: 51%)
Source: Sidel LCA tool

Refillable environmental performance is linked to logistics

4 main parameters have to be looked at

The number of trips the bottles will do in reality:
This can vary a lot and depends on …

	Life Span (LS)	**Return Rate** (RR)	**Annual Use** (AU)	**Number of Uses** (U)
Local distribution	7 years	95 %	3 times	10.25
Country wide distribution	3.5 years	89.18 %	1 → 2 times	2.53 → 3.98

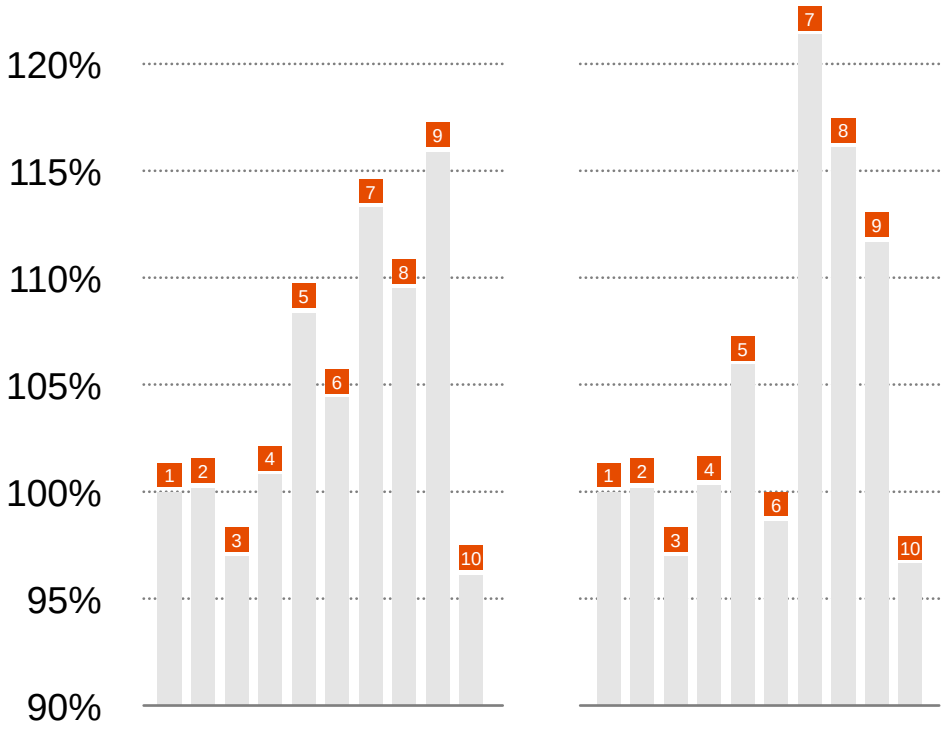
The average distance between the filling plant and the retailer

The bottle **material choice**

Hygiene/contamination risks

Alternatives in Secondary Packaging

Environmental performance often differs from perception



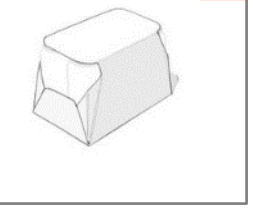
1 Shrink film without handle
Shrink film with handle

2

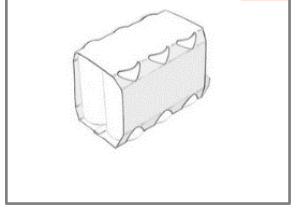
3 Stretch Film

4 Tray Corrugated + Shrink film

5 Tray Corrugated



7 Carton Solid fully enclosed



8 Carton solid closed on 2 sides

9 Box corrugated

10 Cones

Milk has more impact compared Packaging manufacturing & distribution

Source: RDC Environment LCA of different packaging for milk Study for SIDEL Final report March 2011

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Conclusion

LCA is a powerful tool adapted to:

- Optimize packaging solutions in Eco design approach:
  - Sourcing of raw materials and semi-finished products
  - Packaging material selection (Primary, Secondary & Tertiary)
  - Energy mix
  - Recycle content
- Compare Packaging solutions
  - For the same functional unit
  - For the same shelf life
  - For the same distribution area
- Communicate
  - When supported by peer review

THANK YOU

Sidel is a leading global provider of packaging solutions for beverage, food, home and personal care products in PET, can, glass and other materials.

Based on over 170 years of proven experience, we help shape the factory of tomorrow, through advanced systems and services, line engineering, eco-solutions, and other innovations. With over 40,000 machines installed in more than 190 countries, Sidel has 5,000+ employees worldwide who are passionate about providing equipment and service solutions that fulfil customer needs.

We continuously ensure we understand the evolving business and market challenges our customers face and commit to meeting their unique performance and sustainability goals. As a partner, we apply our solid technical knowledge, packaging expertise and smart data analytics to assure lifetime productivity at its full potential.

We call it **Performance through Understanding**.

Performance through Understanding

Sidel