Measuring the Environmental Impacts of Reusable Packaging in the Circular Economy, Using Life-Cycle Data

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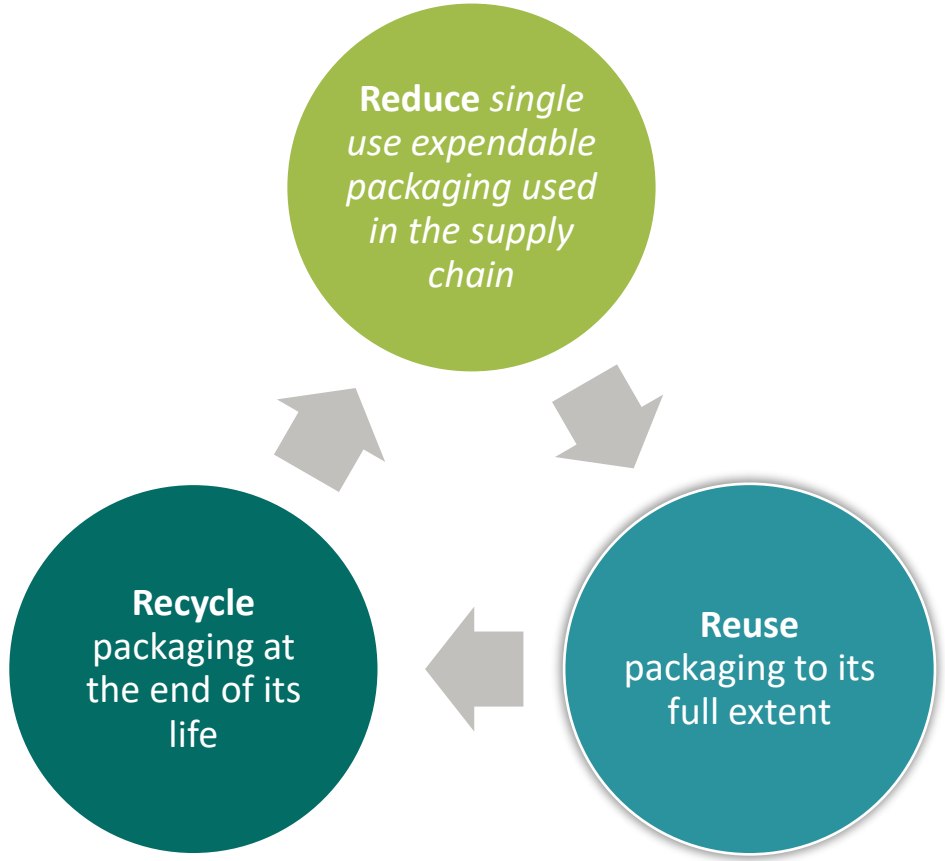
Bre Herbert

A BETTER WAY

Why Reusables?

- Reduced waste
- Drives supply-chain wide cost savings
- Improved efficiency
- Standardized workflow
- Optimized transportation



ORBIS uses Life-Cycle Analysis

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A BETTER WAY

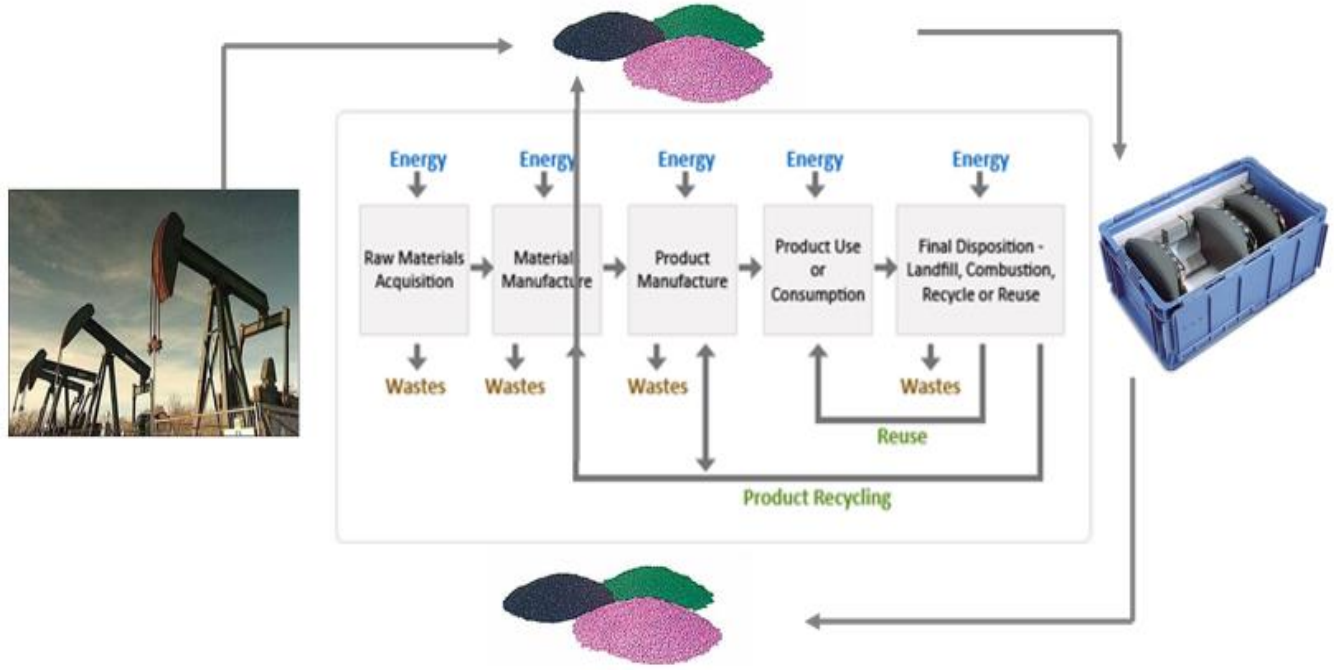
Reusable Packaging Key Impacts

WASTE

WATER

ENERGY

CO2e



Evaluate each system, including all stages from raw material extraction through end-of-life management of the transport packaging

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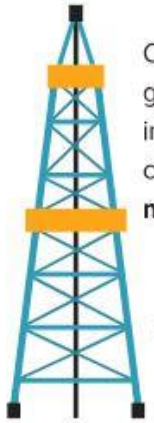
Packaging Design Considerations

- **Cube Utilization (full packaging)**
  - Right-size packaging to maximize trailer cube utilization
  - More pcs / shipment = less shipments = less fuel/emissions
- **Light-Weighting**
  - Appropriate packaging for application (sleeve-pack vs. bulk-bin vs. steel)
  - Less weight on truck = less fuel/emissions
- **Collapsibility/Nestability**
  - Maximizing cube utilization for empty return shipments
- **Recycled/Alternative Materials**
  - Eliminate need to extract or mine for virgin materials

Plastics lifecycle

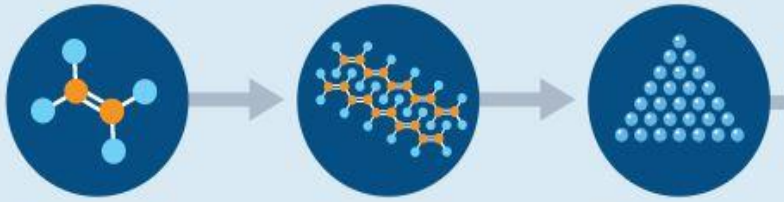
Oil and natural gas are refined into short-molecule chemicals called **monomers**.



Oil and natural gas

PLASTIC MANUFACTURING

Monomers such as ethylene and propylene are linked together to form long polymer chains. Once the polymers have been formed, the hot liquid plastic is cooled and cut into chips or pellets.



Monomers | Polymers | Plastic pellets

The pellets are then used to create plastic products.

Plastic products

Sold to consumers

Disposal

Landfill

RECYCLING

Chemical recycling

Mechanical recycling

Plastic waste is chemically processed back into monomers.

Plastic waste is washed and melted back into polymers.

The recovered monomers allow you to make new plastics and other chemical products such as waxes, lubricants and fuels.

GHG increased 12,000 Million Tons in last 150 yrs

Recycled Packaging Material Choices

1. Recovered post-consumer (PCR) and post-industrial plastic (PIR)
2. Recovered plastic at risk of entering the oceans (OBP)

Bales of waste | Shredded | Cleaned/Deodorized | Pelletized OIM Blend

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Typical LCA Inputs

- Packaging Type
- Trip Distance
- Trip Rate
- Weight of product being shipped
- Backhaul details
- End-of-life plan

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Environmental Sustainability Analysis

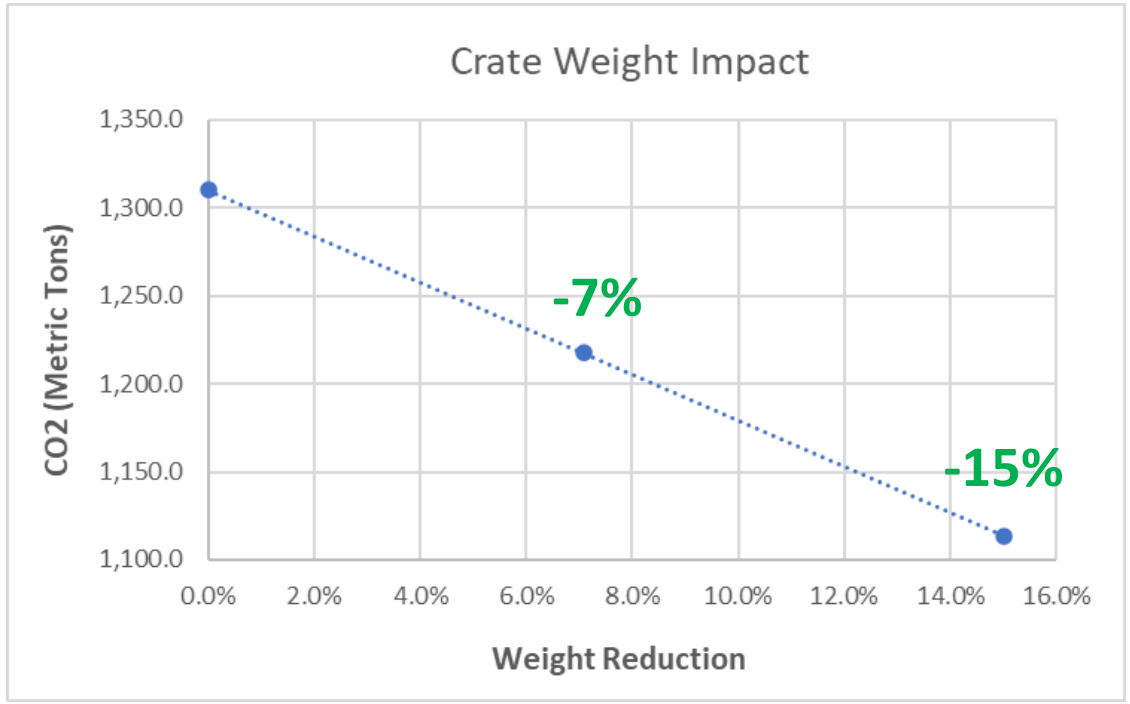
- *Corrugate Box Conversions (small and large boxes)*
  - **Plastic boxes** (small and large) typically produces better environmental numbers with plastic in all 3 categories: Energy, Solid Waste & CO^2

- *Wood Pallet Conversion*
  - **Plastic pallets** produce better energy and solid waste metrics
  - *Note:* Plastic pallets may not be positive change with respect to CO^2 related categories
    - Credit due to capturing and storing carbon dioxide as a tree and small % will never decompose in landfill (carbon credit at end of life for CO^2 storage)

A BETTER WAY

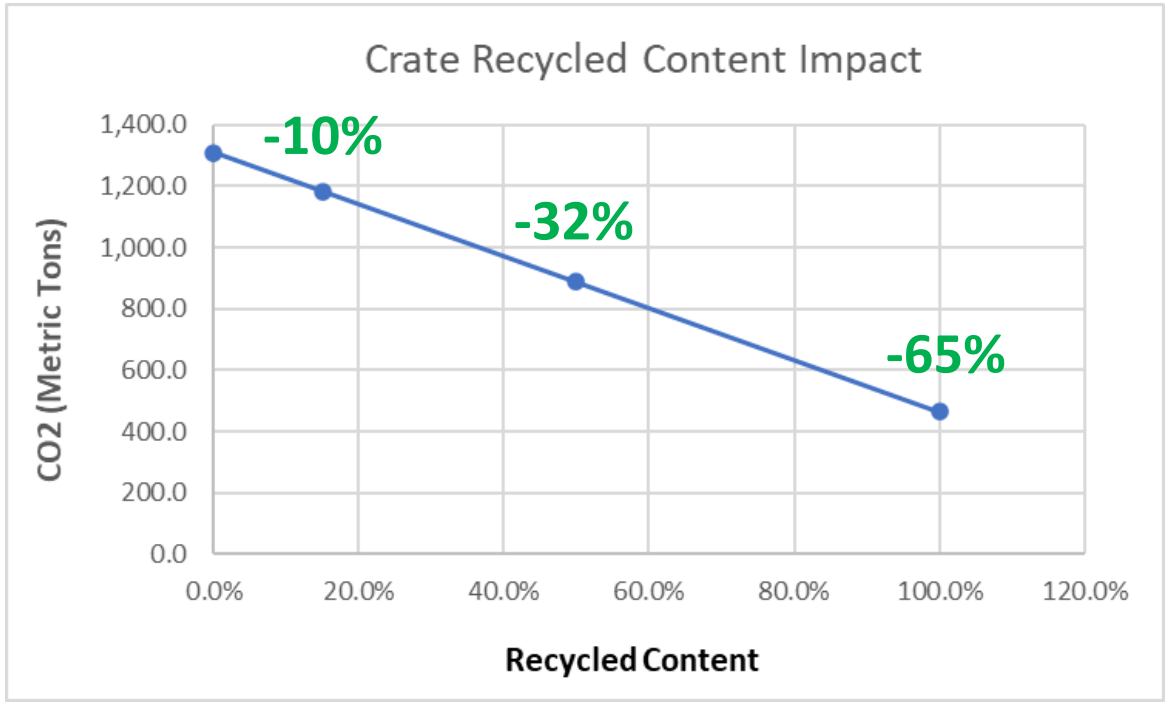
Impacts to Sustainability Analysis

Weight Impact to CO^2



WEIGHT REDUCTION = LOW IMPACT

Recycled Content Impact to CO^2



RECYCLED CONTENT = HIGH IMPACT

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Questions

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