CREATING VALUE

Role of Life cycle Approaches to inform Product Transparency and Disclosure

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ULe

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PE INTERNATIONAL
Agenda

• What is an EPD?
• Look into LCA
• What an EPD is not…
• What is driving demand for EPD
• Questions/Comments
Key words to know

EPD – Environmental Product Declaration
ISO – International Organization for Standards
PCR – Product Category Rule
LCA – Life Cycle Assessment
A 3rd party verified, internationally recognized, single comprehensive disclosure of a product’s environmental impact throughout its life cycle.
Long Term Goal – Simple comparability

**Environmental Facts**

Functional unit: 1 yd³ of 3,000 psi concrete

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Energy Demand [Btu]</td>
<td>9.3×10⁵</td>
</tr>
<tr>
<td>Renewable [Btu]</td>
<td>5.9×10⁴</td>
</tr>
<tr>
<td>Non-Renewable [Btu]</td>
<td>8.7×10⁵</td>
</tr>
<tr>
<td>Global Warming Potential [lb CO₂ eq]</td>
<td>360</td>
</tr>
<tr>
<td>Acidification Potential [lb H⁺ eq]</td>
<td>40</td>
</tr>
<tr>
<td>Eutrophication Potential [lb N eq]</td>
<td>0.39</td>
</tr>
<tr>
<td>Ozone Depletion Potential [lb CFC-11 eq]</td>
<td>2.4×10⁻¹⁰</td>
</tr>
<tr>
<td>Smog Potential [lb O₃ eq]</td>
<td>21</td>
</tr>
</tbody>
</table>

Boundaries: Cradle-to-Gate
Company: XYZ Concrete
Total Recycled Content: 30%

Fly Ash: 20%
Slag: 10%
EPD Basics

**Lifecycle Assessment (LCA)** - a technique to assess environmental impacts associated with all the stages of a product's life from cradle-to-grave (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling).

**Product Category Rules (PCRs)** - a set of rules, requirements and guidelines for developing Environmental Product Declarations (EPDs) for one or more product categories.

**Environmental Product Declaration (EPD)** - A 3rd party verified, internationally recognized, single comprehensive disclosure of a product’s environmental impact throughout its life cycle. An ISO Type III EcoLabel, EPDs do not act as product ratings rather they help purchasers better understand a product’s sustainable qualities and environmental impacts.
EPD development process

- Multiple quality assurance steps ensure credibility
Create the EPD

\[\text{EPD is in accordance with PCR} + \text{Submit for Verification and Register} = \text{EPD is COMPLETE!!}\]
ENVIRONMENTAL PRODUCT DECLARATION

INSULATED METAL PANELS

KINGSPAN INSULATED PANELS NORTH AMERICA
INSULATED WALL & ROOF PANEL SYSTEMS

Kingspan Insulated Panels North America announces the first of its kind UL certified ISO compliant Environmental Product Declaration (EPD). The EPD describes environmental manufacturing footprints from cradle to grave based on an ISO compliant Life Cycle Assessment (LCA).

Kingspan's LCA calculates the environmental footprint at each stage of the supply chain, manufacturing processes, product use and end of life. All the significant environmental impacts associated with the product, including the impact on water, air, land and climate change are reported based on ISO LCA standards.

Kingspan Insulated Panels North America is part of Kingspan Group plc, the world's largest manufacturer of insulated metal panels, and as such is committed to reducing the impact of its business operations, products and services on the environment.

Follow our sustainability journey at:
www.pathnetzero.com

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Range of Applications

IMPs are well suited for commercial buildings due to their excellent thermal and weatherproofing performance characteristics as well as their competitive in-place costs. Buildings such as airplane hangars, banks, convention centers, distribution centers, manufacturing plants, museums, office buildings, schools, sports facilities, and cold storage and food processing facilities have proven to be excellent applications for IMPs. The design requirements of the building would determine the type of panel used. Applications can range from a large scale industrial building in Saskatoon, Canada to a customized convention center in downtown Boston.

Product Specifications

A partial list of key product standards is listed below. A complete list of standards, compliance and performance requirements for the products can be found on the Kingspan website at www.kingspanpanels.us and www.kingspanpanels.co.uk under Product Specifications.

- AAMA 501.2: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- ASTM E283: Test for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors (Air Infiltration).
- ASTM E351: Test for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- FM Approval Standard 4980; Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems.
Life cycle assessment results and analysis...

PRIMARY ENERGY CONSUMPTION
Life cycle assessment results and analysis…

ENVIRONMENTAL IMPACTS
Life cycle assessment results and analysis…

ENVIRONMENTAL IMPACTS
UL Environment CERTIFIED

This declaration is an environmental product declaration in accordance with ISO 14025 that describes the environmental characteristics of the aforementioned product. It promotes the development of sustainable products. This is a certified declaration and all relevant environmental information is disclosed.

<table>
<thead>
<tr>
<th>PROGRAM OPERATOR</th>
<th>UL Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION HOLDER</td>
<td>Kingspan</td>
</tr>
<tr>
<td>DECLARATION NUMBER</td>
<td>110929.11CA21665.101.1</td>
</tr>
<tr>
<td>DECLARED PRODUCT</td>
<td>Kingspan insulated panels manufactured in North America.</td>
</tr>
<tr>
<td>REFERENCE PCR</td>
<td>Building Envelope Thermal Insulation UL 110116 and draft Insulated Metal Panels UL 110217.</td>
</tr>
<tr>
<td>DATE OF ISSUE</td>
<td>September 29, 2011</td>
</tr>
<tr>
<td>PERIOD OF VALIDITY</td>
<td>5 years</td>
</tr>
</tbody>
</table>

**CONTENTS OF THE DECLARATION**
- Product definition and information about building physics.
- Information about basic material and the material's origin.
- Description of the product's manufacture.
- Indication of product processing.
- Information about the in-use conditions.
- Life cycle assessment results.
- Testing results and verifications.

The PCR review was conducted by:

**UL Environment Review Panel**

Wayne Trusty (Chairperson)

PO Box 189, 136 Charlotte St.
Merrickville ON, Canada, K0G1N0
T: 613-269-3795
F: 613-269-3796
wtrusty@symptatico.ca

This declaration was independently verified by Underwriters Laboratories in accordance with ISO 14025

- [ ] INTERNAL
- [x] EXTERNAL

This life cycle assessment was independently verified to be in conformance with the cited PCRs

(Loretta Tam), EPD Verifier

(Wayne Trusty), LCA Verifier
Environmental Product Declarations (EPDs)

Key characteristics

• Objective: no claims, just facts
• Credible: rigorous review and documentation
• Open: accessible to public
• Comparable: designed to support decision-making
• Succinct: 3–20+ pages (for example)

Image source: adapted from http://www.meridahome.com/blog/tag/greenwashing
Environmental Product Declarations (EPDs)

Key benefits

• Marketing instrument
• Transparency regarding energy and material flows
• Detection of optimization potentials from dominance analysis
• Ranking of the environmental performance
• Recognized by green initiatives (e.g., LEED, BREEAM, EPEAT)

Image source: adapted from http://www.meridahome.com/blog/tag/greenwashing
Limitations of Transparency
Transparency

EPDs/Health-declarations

Collaborative/ Consensus Standards & Certifications

Performance
EPDs do not address…

**Actual Environmental Performance**

**Human Health impacts**
Transparency, Transparency, Transparency & Disclosure

• **Chemicals of concern, supply chain performance, etc.**

• **Drivers:**
  - Private Requirements
  - Public Regulations
  - Consumer concerns
  - Social media

• **Key Implications**
  - Accountability for:
    - Value Chain Performance
    - Materials in Products
  - Potential loss of customer access
  - Need to eliminate targeted chemicals
  - Demise of ‘That’s Proprietary’ protection

• **Solutions**
  - Consumer access to sustainability information
  - Streamlined/automated EPD/HPD
  - Compliance management
  - Partnerships with suppliers and stakeholders
  - Material Certifications
Life Cycle Approaches

Raw Materials extraction

End of Life: Disposition

End of Life: Recycling?

Use

Transportation & Distribution

Materials Manufacture

Post industrial waste for recycling

Product Manufacturing

Creating Value
Improve the whole system – important to understand full life cycle impacts to inform choices

- We nearly banned fluorescent lights in the 1990s due to mercury loading in landfills, but:
  - Incandescent lights release 4 - 10 times more mercury
  - Fluorescent lights would reduce:
    - Electricity demand by 50%
    - CO₂ by 232 mil tons
    - SO₂ 1.7 mil tons
    - NO₂ by 0.9 mil tons

→ Priority should be designing Fluorescents with less Mercury and better recovery systems

Source: NEMA 1992
Avoid... 

...solving a problem...
Avoid...

...solving a problem...

... by creating a problem.
Why LCA and not just carbon footprint?

Footprint of 1 Kg of Polypropylene

- Carbon: 2 Kg
- Water (process): 4.8g

Full LCA: understand trade-offs, all life cycle hot spots

Source: PlasticsEurope PP eco-profiles, Katsoufis 2009
Life Cycle Approaches Uncovers Opportunities to Create Value

80% of current management effort covers only 20% of the available opportunities to create value

Upstream Opportunities
Supplier alliances, access to limited resources, stability of supply, etc.

Downstream Opportunities
Customer satisfaction and loyalty, improved brand image, etc.

Opportunities for value creation through environmental and social responsibility

- Source: Adapted from WWF-UK 2003
What is Life Cycle Assessment (LCA)?

Definition of Life Cycle Assessment from ISO 14040 / ISO 14044:
LCA is the “ compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.”
Overview
Which information do we need to make a product LCA?

<table>
<thead>
<tr>
<th>Production</th>
<th>utilization</th>
<th>End of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>material production</td>
<td>use</td>
<td>- disassembly</td>
</tr>
<tr>
<td>product production</td>
<td>maintenance</td>
<td>- recovery</td>
</tr>
<tr>
<td>Assembled product</td>
<td>Energy use</td>
<td>- shredder</td>
</tr>
<tr>
<td>Assembly structure</td>
<td>Electricity</td>
<td>- landfill</td>
</tr>
<tr>
<td>Piece part ID</td>
<td>Type of fuel</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Replacement parts</td>
<td></td>
</tr>
<tr>
<td>Manufacturing process</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Process yield</td>
<td></td>
<td>EoL will typically be calculated based on a theoretical recycling scenario</td>
</tr>
<tr>
<td>Type of Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The attributes listed above are typically needed to generate LCA, for EPDs even more information might be needed.
LCA Results

LCA is used in order to evaluate potential impacts on the environment. Based on inputs (e.g. materials, energy) and outputs (e.g. emissions, waste) life cycle metrics are calculated.

• Carbon footprint and energy demand are the most commonly requested metrics, but as the market matures more companies are asking about water and other metrics.

• Existing software and data bases (e.g. GaBi Suite) make it easier to complete LCA studies.

• Common Metrics
  
  • Global Warming Potential (GWP)
  • Primary Energy Demand (PED)
  • Acidification Potential (AP)
  • Eutrophication Potential (EP)
  • Smog Creation Potential (SFP)
  • Ozone Depletion Potential (ODP)
  • Land use
  • Water Use, Water Consumption, Water Footprint
  • Human and Ecotoxicity Potential (HTP, ETP)
Life Cycle Approaches
Principles

- Consider all impacts – avoid shifting-of-burdens…
  - …impacts (global warming, resource depletion, …)
  - …safeguard subjects (environment, human health, social issues, …)
  - …countries/ regions,

- Include whole life cycle of product or system (avoid shifting-of-burdens between life cycle phases, e.g. Production $\rightarrow$ End of Life)

- Relate impacts to quantified "functional unit" of the system (avoid "comparison of apples with pears")
Life Cycle Approaches

Typical answers

- The environmental performance of our product is…
- Identification of optimization potential
- Biggest contribution is related to:
  - process A
  - material Y
- Technology Y shows benefits compared to technology V
- Our contribution to end consumer products is…
- Communication with stakeholders (e.g. authorities, society,…) is based on quantified parameters
What is Hotspots Analysis?

Working draft definition:

Hotspots Analysis: A methodological framework that allows for the rapid assimilation and analysis of a range of information sources, including life cycle based and market information, scientific research, expert opinion and stakeholder concerns.

The outputs from this analysis can then be used to identify potential solutions and prioritize actions around the most significant economic, environmental and/or social sustainability impacts or benefits associated with a specific country, industry sector, product portfolio, product category or individual product or service. Hotspots analysis is often used as a pre-cursor to developing more detailed or granular sustainability information.
**Overview & Key Phases**

1. **Goal & scope**
   - Study boundary
   - Data scoping
   - Consult
   - Audience definition & needs

2. **Analysis**
   - Issue / Impact selection
   - Consult

3. **Prioritizing Action**
   - Hotspots
   - Confirm Metrics
   - Concise reporting
   - Stakeholders
   - Validation
   - Piloting
   - PCR’s & EPD’s
   - Standards

4. **Engage and consult relevant stakeholders throughout hotspots analysis process**

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**Key Phases**

- Iteration 1 (e.g. country)
- Iteration 2 (e.g. sector)
- Iteration 3 (e.g. category)
- Iteration 4 (e.g. product)
- Iteration n

**Additional Notes**

- LCA
- Scientific Research
- Trade
- Input-output
- Expert insight
- Sales
Hotspots – Potatoes

Notable primary & secondary hotspots

- Energy for machinery and irrigation, fertiliser & pesticide use are a key source of emissions (3, 4, 10).
- Main outdoor crop in the UK - around 50% needing irrigation in summer (4,18).
- Different consumer cooking methods can double the life cycle energy use (1). Up to 75% of GHG emissions (9).
- Potatoes are commonly wasted in home; about 770,000t per year (14). Grading and packing losses can reach rates of up to 25% (14), which results in potatoes going to secondary markets for animal feed (19).
- Depending on length of storage, impacts of climate control can be significant (5).
- Peat sometimes used for conservation during long distance transport of imported potatoes (e.g. new potatoes) (9).

Notes

- The hotspots, left, can be used to target efforts – however actual performance will be dependent on the specifics of your supply chain.
- Numbers in brackets denote numbered reference in references slide.
- Evidence level: High - Well studied product type, good understanding of key issues.
- 6th largest food commodity globally, with the UK being 12th largest potato producer (4).
- Accounts for c. 45% - 55% of total water used irrigation. Main growing region - Eastern England – under water stress in dry summers (4).
- Some key variables that affect performance are explored on a later slide.
Reduction opportunities

- Bite-sized inspiration – included in product summaries
- Includes: Case studies; business benefits; sign-post to best resources, initiatives
- Focus on priority products and key hotspots across a range of metrics
### Sample Results of Hot Spot Analysis

<table>
<thead>
<tr>
<th>Category</th>
<th>Raw Materials</th>
<th>Manufacturing</th>
<th>Packaging and Distribution</th>
<th>Utilization</th>
<th>End-of-life</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emissions to air</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant ozone depletion</td>
<td></td>
<td>Releases during manufacturing</td>
<td>Noise</td>
<td>Transport to recycling</td>
<td></td>
</tr>
<tr>
<td>potential</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Global warming potential</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant emissions</td>
<td></td>
<td>Releases during manufacturing</td>
<td>Energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blowing agent emissions</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impact on living resources</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous waste</td>
<td></td>
<td>Hazardous waste</td>
<td>Recyclability and packaging content</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impact on non-living resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycled content</td>
<td></td>
<td>Solid waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impact on water (quality and quantity)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emissions in supply chain</td>
<td></td>
<td>Emissions during manufacturing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Human health impacts</strong></td>
<td></td>
<td></td>
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<tr>
<td>Hazardous materials</td>
<td></td>
<td>Hazardous materials</td>
<td>Hazardous materials</td>
<td>Hazardous materials</td>
<td>Hazardous materials</td>
</tr>
<tr>
<td><strong>Socio-economic impacts</strong></td>
<td></td>
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<tr>
<td>Continued use of the refrigeration unit</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Legend:
- High
- Medium
- Low

Creating Value
Questions