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Research Officer
PhD
make ecodesign happen!
boosting LCA in SMEs
NO GREEN BULL
Ecodesign Trade-Offs in New Product Development
What ecodesign trade-offs occur when ecodesign strategies are applied to the design of an office furniture product?
Ecodesign strategies & material selection decisions

Bill Of Material Analyses

Abridged LCA

Reusability and Recyclability Rates Reusability and Recyclability Benefit Indices (JRC Methods)
Results
Efficient Assembly
Local manufacturing
Disassembly
End of Life
Cradle to Cradle
Aluminium
30% part reduction
30% faster assembly
27% lighter
<table>
<thead>
<tr>
<th></th>
<th>CASE A</th>
<th>CASE B</th>
<th>CASE C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Weight (kg)</td>
<td>17.2</td>
<td>21</td>
<td>14.7</td>
</tr>
<tr>
<td>Recycled Content (kg)</td>
<td>6.9</td>
<td>11.0</td>
<td>2.7</td>
</tr>
<tr>
<td>%</td>
<td>40.1</td>
<td>52.0</td>
<td>18.4</td>
</tr>
<tr>
<td>Virgin Content (kg)</td>
<td>10</td>
<td>9</td>
<td>12.0</td>
</tr>
<tr>
<td>%</td>
<td>59.9</td>
<td>42.9</td>
<td>81.6</td>
</tr>
<tr>
<td>Composite Material</td>
<td>2</td>
<td>5.5</td>
<td>8.1</td>
</tr>
<tr>
<td>(kg) (%)</td>
<td>10</td>
<td>26</td>
<td>55</td>
</tr>
<tr>
<td>CASE A</td>
<td>Case B</td>
<td>Case C</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
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<td></td>
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<tr>
<td>![Chair Image]</td>
<td>![Chair Image]</td>
<td>![Chair Image]</td>
<td></td>
</tr>
<tr>
<td><strong>0.072 mPts per 1 hour of use</strong></td>
<td><strong>0.48 mPts per 1 hour of use</strong></td>
<td><strong>0.067 mPts per 1 hour of use</strong></td>
<td></td>
</tr>
<tr>
<td>Total amount of service delivered</td>
<td>13616 x 1 hour of use</td>
<td>13616 x 1 hour of use</td>
<td></td>
</tr>
<tr>
<td>980 mPts</td>
<td>6.5x10^3 mPts</td>
<td>910 mPts</td>
<td></td>
</tr>
<tr>
<td>Estimate</td>
<td>Estimate</td>
<td>Estimate</td>
<td></td>
</tr>
<tr>
<td><strong>Greatest impacts</strong></td>
<td><strong>Impact Category</strong></td>
<td><strong>Impact Category</strong></td>
<td></td>
</tr>
<tr>
<td>SBOM input</td>
<td>Aluminum, cast, semi-permanent mold (SPM), at plant/kg NREL/US Human Toxicity Manufacturing</td>
<td>Aluminum, cast, semi-permanent mold (SPM), at plant/kg NREL/US Human Toxicity Manufacturing</td>
<td></td>
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<tr>
<td>Impact category</td>
<td></td>
<td></td>
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<tr>
<td>Life cycle stage</td>
<td></td>
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</tr>
</tbody>
</table>

**560% performance reduction**

**7.1% performance improvement**
<table>
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<th>CASE C</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{use}=^\text{ }$</td>
<td>81%</td>
<td>90%</td>
<td>85%</td>
</tr>
<tr>
<td>$R_{cyc}=^\text{ }$</td>
<td>93%</td>
<td>93%</td>
<td>82%</td>
</tr>
<tr>
<td>Reusability Benefit Rate ($R'_{use}$)=</td>
<td>91%</td>
<td>99%</td>
<td>94%</td>
</tr>
<tr>
<td>Recyclability Benefit Rate ($R'_{cyc,ecotoxicity}$)=</td>
<td>93%</td>
<td>95%</td>
<td>93%</td>
</tr>
</tbody>
</table>
Efficient assembly, but lowest reusability

High recyclate but highest environmental impacts

Most durable!

Lightest, lowest impacts, but also lowest recyclate and highest quantity of virgin
It’s a confusing story!
Tension between short term resource efficiency and true environmental impact reduction
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