Benefits of a LCVSM Approach to Assessing Environmental Performance at SME Level

David J Buchanan
BSc, MSc
The Problem

Barriers to LCA in Small Medium Enterprises

- No demonstrable upfront benefit
- Lack of internal resource, time & expertise
- Fear of negative environmental perception
- Impacts the quality of the LCA of large companies
- Little or no commercial driver for SMEs

David J Buchanan
7th November 2012
The Hypothesis

Method Identified to Encourage LCA Uptake

- Assessment of LCA methods & reports
- Observed similarities with Value Stream Mapping (VSM) process
- Established / understood technique & benefits, SME aspiration
- Rigorous data interrogation
- Input / output process assessment
- Lean synergy, waste/energy reduction
- Design improvements, cross company boundaries

David J Buchanan
7th November 2012
Typically SMEs in this marketplace

Environmentally literate market

Justify Governmental support based upon CO₂ reduction

Suitable supply chain to map energy, material & waste flows

Industry data available to make effective comparison
The Results

6 kW Wind Turbine LCVSM Results

LCVSM approach is successful

- Net energy impact
  24.8 month payback

- Net carbon emissions
  14.4 month payback

- Lead time reduction: 65%

- Held inventory reduction: 88%

- Study not sensitive to manufacturing process

David J Buchanan
7th November 2012
Why is LCVSM Attractive?

- Clear scope and boundaries
- Locates emissions & energy hotspots
- Current and future state illustration
- Can be sold on lean ambitions, great way in to companies, access to “real” data
- Leveraged benefits through process change, not end of the pipe solution
- Scalability: whole supply chain or discrete process
Further studies to test generic application and limitations

Parallel trials with existing LCA methods to prove LCVSM accuracy

Develop methodology to increase sensitivity to transport steps

LCVSM software development opportunities


Material Input

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Grade copper Wire</td>
<td>1</td>
</tr>
<tr>
<td>Weight</td>
<td>19 kg</td>
</tr>
<tr>
<td>Logistic</td>
<td>50 km</td>
</tr>
<tr>
<td>Material MJ</td>
<td>798</td>
</tr>
<tr>
<td>Material CO₂</td>
<td>49.4</td>
</tr>
<tr>
<td>Sub Total MJ</td>
<td>1983</td>
</tr>
<tr>
<td>Sub Total CO₂</td>
<td>139.9</td>
</tr>
</tbody>
</table>

Internal Process

Copper Winding by Machine

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle Time</td>
<td>150 min</td>
</tr>
<tr>
<td>Change Over</td>
<td>10 min</td>
</tr>
<tr>
<td>Process CO₂</td>
<td>7 Kg</td>
</tr>
<tr>
<td>Process MJ</td>
<td>13.5</td>
</tr>
<tr>
<td>Sub Total MJ</td>
<td>1996.5</td>
</tr>
<tr>
<td>Sub Total CO₂</td>
<td>146.9</td>
</tr>
</tbody>
</table>

David J Buchanan
7th November 2012
LCVSM System Boundary Comparison

Traditional LCA & VSM Comparison

Traditional VSM

LCVSM System Boundary

David J Buchanan
7th November 2012