Industrial symbiosis and innovation

Abolish industrial symbiosis’ barriers with the implementation of innovation

Envimpact training day
Where is the link between industrial symbiosis and innovation?

How is the environmental impact of this link?

How can we measure these impacts?
Industrial symbiosis

- Create link between different industrial sectors
- Use waste to produce (substitute raw materials)
- Less demand for raw materials, natural resources
- Reduction of industrial water and CO$_2$ emission
Transform linear systems into circular ones

Linear system
Natural resources → Product → Waste → landfill

Circular system
Natural resources → Product → Waste → Recycling, processed → Natural resources
Products → Waste → recycling

Envimpact
When applying industrial symbiosis methodology we try to keep waste/resources on the first ranks of the waste hierarchy (reuse, recycle or create energy).

“Higher we get on the hierarchy, more savings can be realised”
NISP

• Industrial dating – intermediator role
• Practitioners role, business opportunity workshops

Have
Unnecessary materials

Want
Materials to be processed

Identify Synergies

NISP MATCH!
• Assess resources in the production (input & output) – to identify synergies

• Progress synergies

• Identify synergy barriers \[\rightarrow\] EUR-IS
Barrier types

• Legal

• Financial:  
  - landfill cost (cheaper)
  - transport cost
  - processing cost

• Technology
Solution

• New (innovative) machine
• New (innovative) technology
• Experiences, experiments
• Science of materials – characteristics
• New (innovative) product design, implementation
Results

• Waste recycling technology creation
• Moderate demand for raw materials and for extraction of natural resources into industrial use
• Resource-efficiency
Stakeholders

- Manufacturing companies – issuing
- Recycling companies
- Universities, researchers, PhD students, innovators, R & D companies
- Funders?
Environmental impacts

- More resource being recycled → less resource on landfill
- Less raw materials into industry → more natural resources left
Environmental impacts

- Transform raw materials extracted from nature needs more energy and causes more emissions (energy, water, CO$_2$)

- Secondary materials are cheaper (quality requirements, standards, safety regulations, qualification)
Monitoring

- ISL – Synergie software
- Methodology DEFRA (Department for Environment, Food & Rural Affairs, UK)
  - Reduction in input quantity
  - Savings through the process steps
  - Reduction in landfilled quantity

(savings/carbon impacts)
<table>
<thead>
<tr>
<th>Material</th>
<th>Embodied fossil energy (tonnes CO$_2$e saved per tonne of waste prevented)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and card</td>
<td>2.556</td>
</tr>
<tr>
<td>Kitchen/food waste</td>
<td>2.428</td>
</tr>
<tr>
<td>Garden/plant waste</td>
<td>0.089</td>
</tr>
<tr>
<td>Wood</td>
<td>0.256</td>
</tr>
<tr>
<td>Textiles</td>
<td>19.294</td>
</tr>
<tr>
<td>Plastic (dense)</td>
<td>12.778</td>
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<tr>
<td>Plastic (film)</td>
<td>10.222</td>
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<tr>
<td>Ferrous metal</td>
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<tr>
<td>Non-ferrous metal (incl. Aluminium)</td>
<td>16.1</td>
</tr>
<tr>
<td>Silt/soil</td>
<td>0.004</td>
</tr>
<tr>
<td>Aggregate materials</td>
<td>0.102</td>
</tr>
<tr>
<td>Misc. combustibles</td>
<td>0.102</td>
</tr>
<tr>
<td>Glass</td>
<td>1.406</td>
</tr>
<tr>
<td>Estimated impact of materials not covered in ERM study (municipal and C&amp;I)</td>
<td>2.86</td>
</tr>
</tbody>
</table>

Table 1: Embodied fossil energy by material (Defra, see [2])
<table>
<thead>
<tr>
<th>Material</th>
<th>CO$_2$e saved per tonne of waste not landfilled (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and card</td>
<td>0.687</td>
</tr>
<tr>
<td>Kitchen/food waste</td>
<td>0.258</td>
</tr>
<tr>
<td>Garden/plant waste</td>
<td>0.135</td>
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<tr>
<td>Wood</td>
<td>0.298</td>
</tr>
<tr>
<td>Textiles</td>
<td>0.233</td>
</tr>
<tr>
<td>Plastic (dense)</td>
<td>0.01</td>
</tr>
<tr>
<td>Plastic (film)</td>
<td>0.01</td>
</tr>
<tr>
<td>Ferrous metal</td>
<td>0.01</td>
</tr>
<tr>
<td>Non-ferrous metal</td>
<td>0.01</td>
</tr>
<tr>
<td>Silt/soil</td>
<td>0.01</td>
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<tr>
<td>Aggregate materials</td>
<td>0.01</td>
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<tr>
<td>Misc. combustibles</td>
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<tr>
<td>Glass</td>
<td>0.01</td>
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<tr>
<td>Estimated impact of materials not covered in ERM study (municipal and C&amp;I)</td>
<td>0.081</td>
</tr>
</tbody>
</table>

Table 4: Savings for landfill avoided (Defra, see [2])
EUR-IS workshop

Meeting and networking opportunity for businesses, scientific professionals, innovators, universities

20. March 2013. at 9:30

1063 Budapest, Munkácsy M. u. 16. IFKA

Pioneers into Practice program
Thank you for your attention!

Annamária Virág Dr.

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