Commercial Roofing Material Recycling In Europe

Icopal Program for Recycling Bituminous Roofing Materials in Europe
Siplast In The United States

- Manufacturer of SBS-modified bitumen systems in the United States since 1981.
- Supplier of lightweight insulating concrete systems since 1995.
- Manufacturer of PMMA liquid roofing, flashing, and waterproofing systems since 2003.
- A full-line supplier of roofing accessory products for over 10 years.
Siplast & The Icopal Group

- Siplast is a member of the Icopal Group, one of the world’s largest manufacturers of roofing and waterproofing systems, with:
  - Business activity in 85 countries.
  - 36 manufacturing sites.
- This corporate affiliation offers the advantage of shared R&D initiatives and field experience, as well as exchange of best practices among Icopal companies.
- These best practices are not only product-related, but also employee-related.
European Issues With Roofing

- Europe is roughly similar in size to US, but more than twice the population.
- Oil prices and the cost of bitumen raw materials typically higher.
- Growing regulation on the landfill disposal on construction materials, particularly in Germany, France, Belgium and especially The Netherlands.
- Cost of dumping materials EU the landfills on the rise.
- Corporate image as environmentally responsible in the spotlight.
<table>
<thead>
<tr>
<th>Icopal Group Country</th>
<th>Dumping Cost €/t Dumping Forecast</th>
<th>Old Roof Recycling</th>
<th>Recycling Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>120 Restricted</td>
<td>yes</td>
<td>I,W</td>
</tr>
<tr>
<td>France</td>
<td>100 Restricted</td>
<td>yes</td>
<td>R,D</td>
</tr>
<tr>
<td>UK</td>
<td>70 Restricted</td>
<td>no</td>
<td>D</td>
</tr>
<tr>
<td>Norway</td>
<td>100</td>
<td>no</td>
<td>D</td>
</tr>
<tr>
<td>Denmark</td>
<td>80</td>
<td>yes</td>
<td>R</td>
</tr>
<tr>
<td>Sweden</td>
<td>65 Restricted</td>
<td>yes</td>
<td>I</td>
</tr>
<tr>
<td>Netherlands</td>
<td>150 Restricted</td>
<td>yes</td>
<td>W, R, I</td>
</tr>
</tbody>
</table>
The Netherlands
Issues With Roofing

- Equal in size to Maryland, but the population of New York State with 25% of the land below sea level.
- Landfills are used for less than 10% of all waste.
- 70,000 tons of roofing waste annually ends in landfill or is incinerated.
- Ministry of Housing and Spatial Planning & Environment (VROM), University of Rotterdam & Icopal Programme to 2008-2020 to recycle 200 m² or existing bitumen roofing into new roofing felts of same coverage.
• In The Netherlands Esha started in 1994 with a Siefer-Ecken machine, which utilized shredder (slow double-screw, heated and lubricated with molten bitumen) and a Siefer mill. Esha is now Icopal BV, Groningen, NL.

• Siefer-Ecken technique was used successfully for many years but was only suitable for production waste – could not extract screws, stones, or other foreign matter.

• BiELSo® technology was developed by the Icopal Group and subsidized in part by the European Commission (life+ subsidy program).
### Types Of Bituminous Roof Membranes In The Netherlands

<table>
<thead>
<tr>
<th>Coating type</th>
<th>Time Period</th>
<th>Estimated Roof Area</th>
<th>New Roofs 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Tar</td>
<td>19th century – 1980</td>
<td>± 20 million m²</td>
<td>0%</td>
</tr>
<tr>
<td>Oxidized Bitumen</td>
<td>1970 – 1985</td>
<td>± 55 million m²</td>
<td>&lt; 10%</td>
</tr>
<tr>
<td>SBS</td>
<td>1983 – present</td>
<td>± 35 million m²</td>
<td>15%</td>
</tr>
<tr>
<td>APP</td>
<td>1980 – present</td>
<td>± 150 million m²</td>
<td>80%</td>
</tr>
</tbody>
</table>

New roofs are 20 million m²/year. Annual waste is estimated at 40-100 k tons.

Most bituminous roofing is incinerated since dumping of waste in the Netherlands is strictly regulated.
Commercial Roofing Material Recycling In Europe

BiELSo

Bitumen End of Life Solutions

Conversie  Verjonging  Verwerking

Recyclingproces
Recycling Of Roof Membranes

BiELSo®: Bitumen Endless Life Solutions

• Unlike previous recycling, this program is the route to full recycling: cradle-to-cradle or more appropriately, roof-to-roof.

• “Bitumen balance” – intent of full chain of custody from production waste, demolition waste, etc. – into processing new roofing membrane production and related materials.

• BiELSo gains recognition for reduction of carbon footprint; customers can receive a CO2 certificate from the MBDC.
BiELSo Recycling Process

- The process is currently utilized primarily for oxidized bitumen and for APP. No coal tar or asbestos.
- Quality control starts on the roof before demolition.
- Bitumen rejuvenation is needed (to compensate for hardening/aging and to help extract the waste).
- Reinforcement (glass & polyester) fibers, sand, and slate surfacings are milled down to filler size.
- Contamination (construction materials such as gravel, wood, nails, and metal) are sieved out.
BiELSo Processing Steps

The output blend after milling is called Ecorec®.

Old roofing prepared → Smelting section → Sieve section → Milling & polishing → Final mixing into Ecorec → Production line

New virgin bitumen

Extracted solids, ±15%
The output blend after milling is called Ecorec®.
BiELSo Processing Steps: Old Roofing Prepared

**Jobsite organization:**

- Materials are sorted by a waste specialist before delivery to Icopal.
- Insulation is sorted on the roof into large bags, and placed into 16-10 m³ containers on the ground.
- Membranes are organized into bulk on the roof, and placed into 8-16 m³ containers on the ground.
BiELSo Processing Steps

The output blend after milling is called Ecorec®.
BiELSo Processing Steps

Shredder - Front View
BiELSo Processing Steps

The output blend after milling is called Ecorec®.
BiELSo Processing Steps

Smelter Section
The output blend after milling is called Ecorec®.
BiELSo Processing Steps

Separator – Sieve Section
BiELSo Processing Steps

The output blend after milling is called Ecorec®.

Old roofing prepared → Smelting section → Sieve section → Milling & polishing → Final mixing into Ecorec → Production line

Extracted solids, ±15%
Sieving – Extracted Solids

- Lead
- Zinc
- Aluminium
- Nails & screws
- Glass
- Gravel (coarse)
- Gravel (fine)
- Wood
- Oxidised / aged bitumen
- Fibres / felt
Old roofing prepared

New virgin bitumen

Smelting section

Sieve section

Extracted solids, ±15%

Milling & polishing

Final mixing into Ecorec®

Production line

The output blend after milling is called Ecorec®.
Composition Ecorec Bitumen

Bitumen

Fibers  Slates  Slates / Sand  Filler
Techniques

The output blend after milling is called Ecorec®.
Properties Ecorec

Molten waste

Ecorec before use in production
Techniques

The output blend after milling is called Ecorec®.

Old roofing prepared → Smelting section → Sieve section → Milling & polishing → Final mixing into Ecorec → Production line

Extracted solids, ±15%
Applications Ecorec Binder

Possible applications:

- Roofing – oxidized felts.
- Roofing – APP felts.
- Roof ashesives, cements, and mastics – asphalt binder.
- Roofing – block bitumen.
- Roofing – cant strips and other fillett products.
- Road construction materials – binders and pellets.
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