

High resource efficient waste management: SRF used in cement plants

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Jan Theulen



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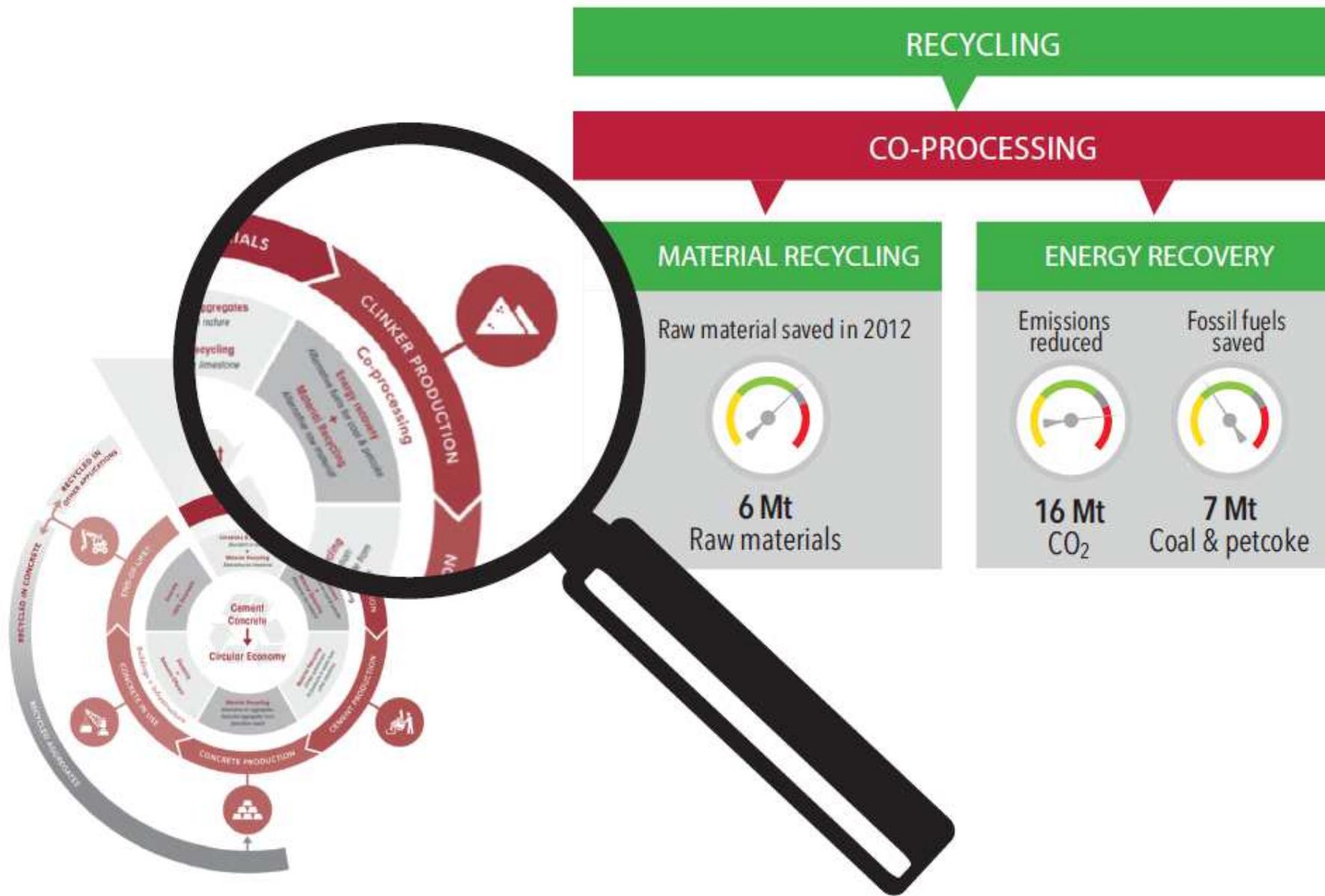


A world map where countries are colored in shades of green and grey. The green areas represent regions where HeidelbergCement has a presence, including North America, Europe, parts of Africa, and Australia. Grey areas represent other global regions. A small green square is located in the top left corner of the slide, and a vertical green bar runs along the right edge.

HeidelbergCement in a glance

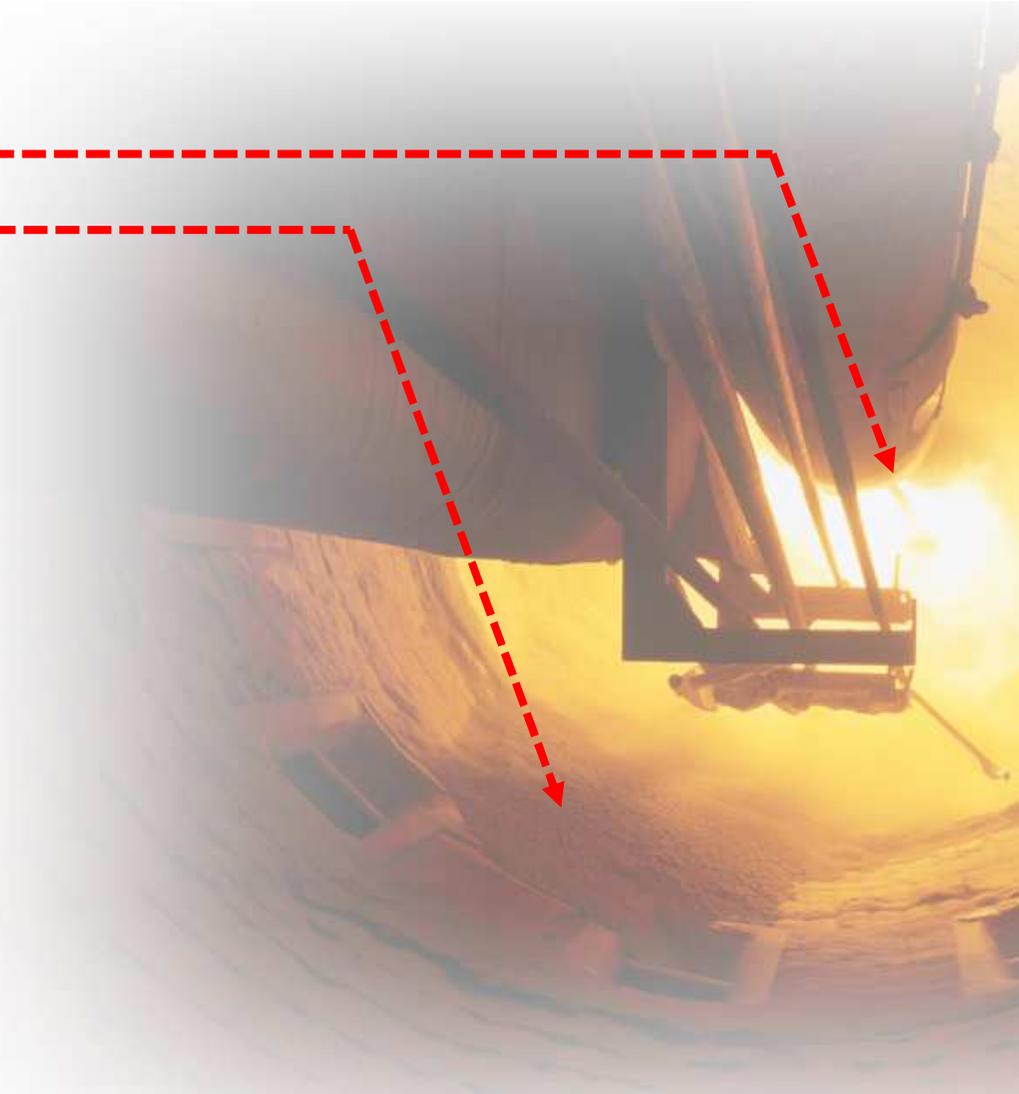
- **Global top 4 in cement, ready-mix and aggregates**
 - **Building on People, Planet and Profit**
- **Recover globally 6 million tons Waste Materials in 2013**
 - **We see “Waste as a Resource”**

How does the cement industry fit into the EU circular economy?



What is co-processing?

- Simultaneous 'recovery of energy' and 'recycling of resources' when waste materials are used in a cement plant.
- High flame temperature of 2000°C and long residence time ensure complete combustion
- Raw material preheating acts as "natural scrubber" exhaust gases → no increase emissions !



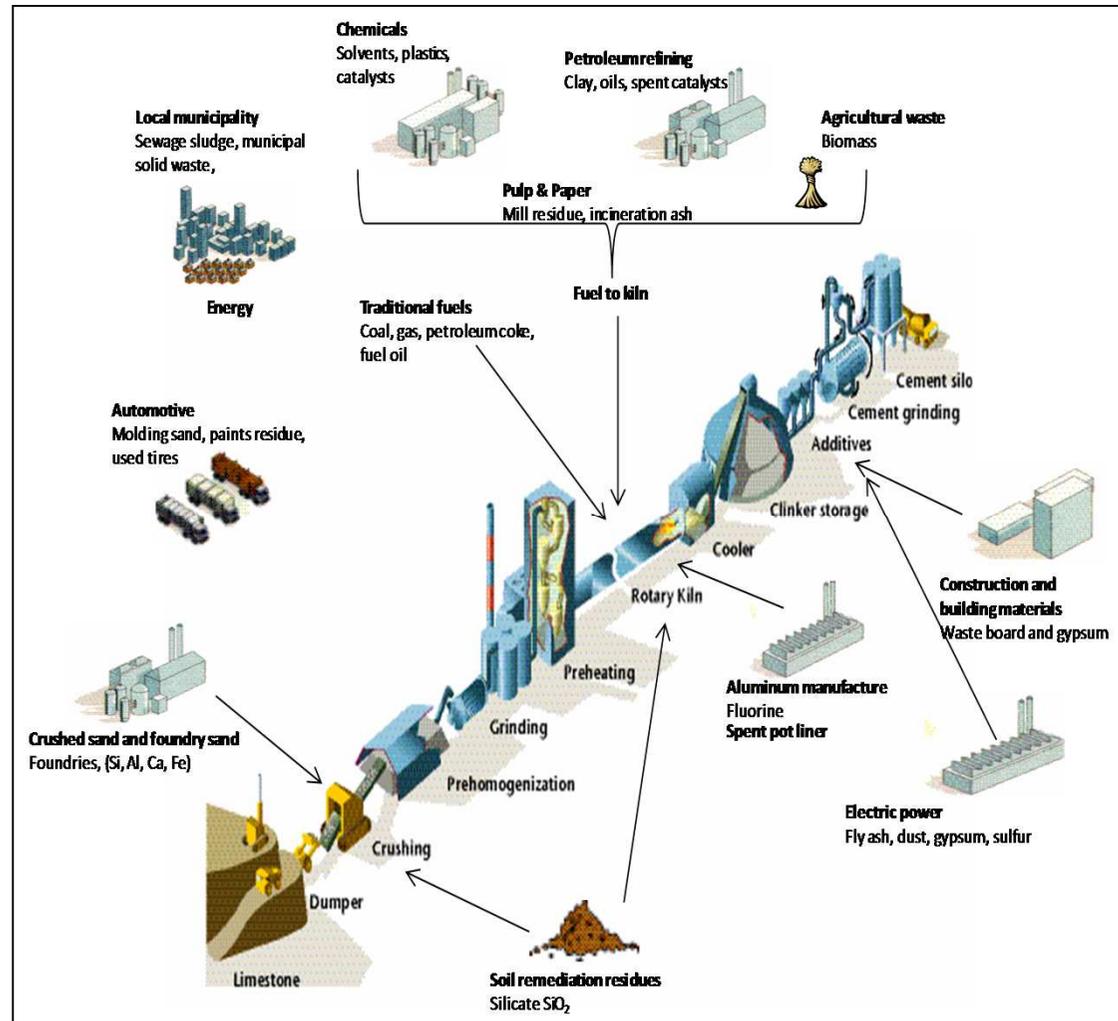
Which waste is Cement Industry Co-processing?

- Non recyclable waste, in case of:

- not always economically viable
- insufficient market for the recycled product
- recycling could not be the best ecological option (eg, it could increase the CO₂ footprint)

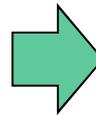
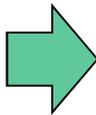
- Example types of waste:

- sewage sludge
- hazardous waste
- used tyres
- Municipal Solid Waste (and C&I-waste) transformed into SRF

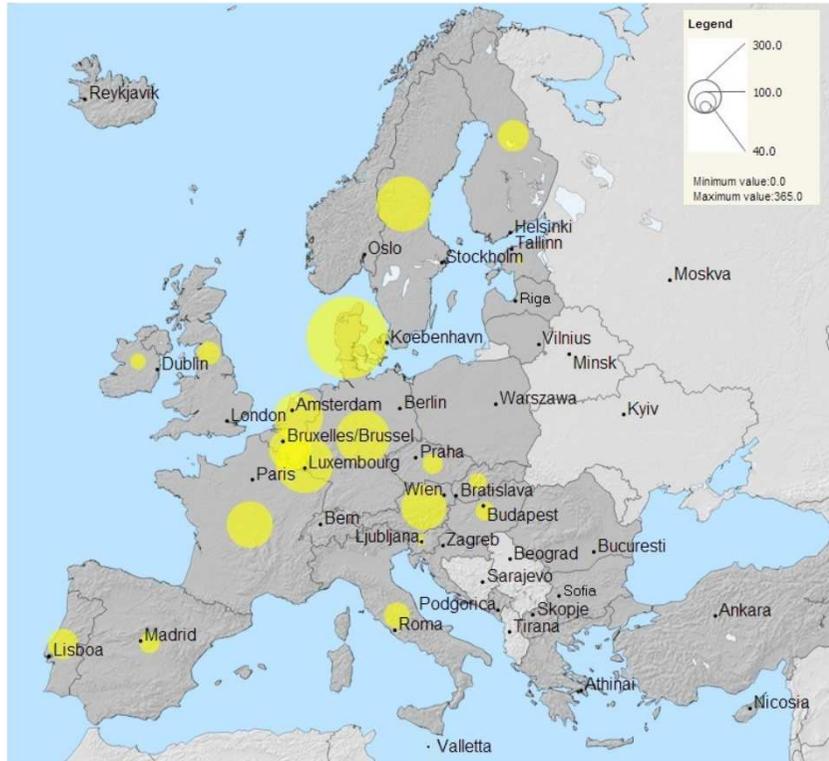


What makes Co-processing unique?

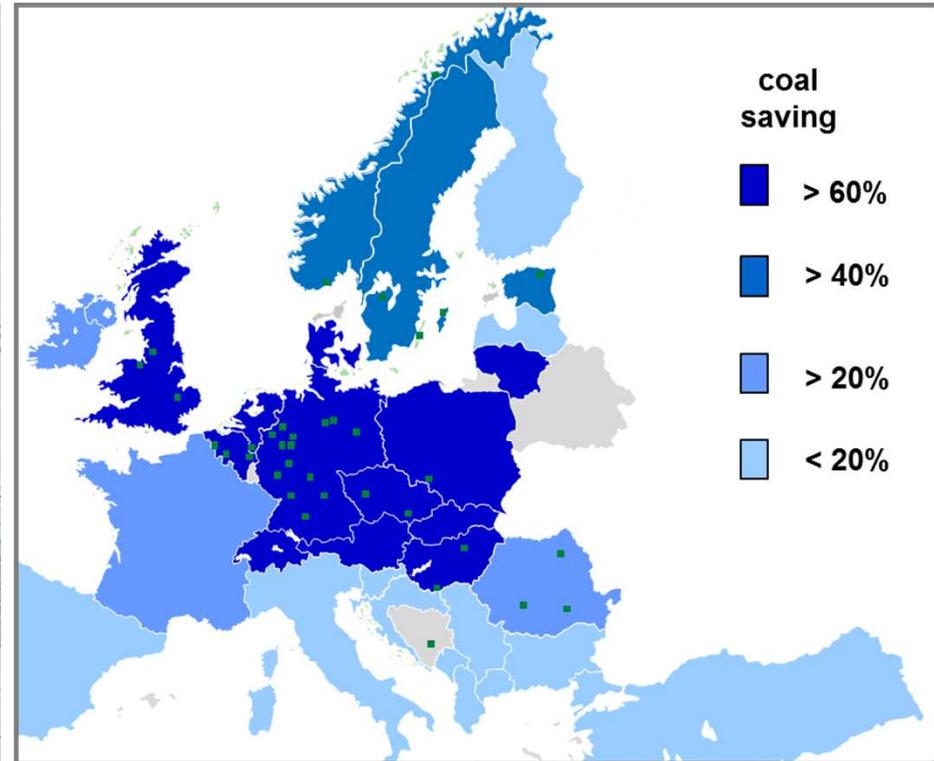
- **Dedicated waste pre-treatment facilities are established to:**
 - Separate any waste that can be recycled to the recycling industry
 - Transfer the raw waste into a waste derived fuel/material within certain specifications
 - Manage the logistics between waste generation and recovery of waste derived flows in cement kilns
- **It utilizes the existing infrastructure of cement kilns that are capable to thermally treat waste derived materials, without any additional emission**



WtE versus SRF in cement in European countries



Waste-to-Energy in Europe (kg/cap)



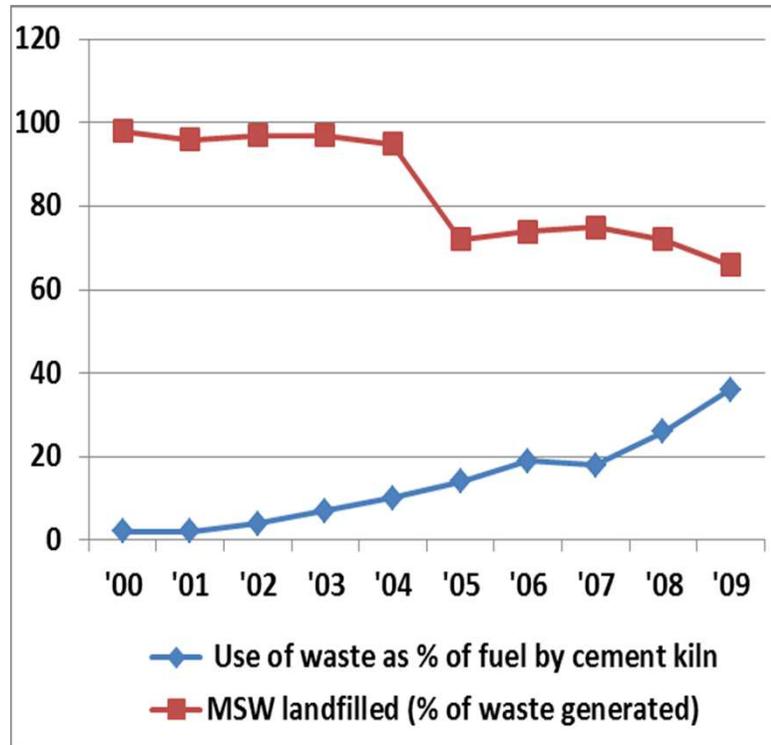
SRF (and other waste fuels) Cement in Europe

Waste-to-Energy and SRF to cement co-exist in Europe

■ SRF versus RDF

1. Quality control more explicit executed at the SRF-supplier
→ cement industry as user can limit control efforts
2. Supplier A and supplier B better exchangeable
3. Network of several suppliers and several off-takers is easier to build when standards are applied
4. Cross border flows will become less complicated:
 - a. Reduce paper work load
 - b. Shorten timeframe between application and approval
5. Stakeholder – acceptance by cement plant is easier realized when EU-standardization is applied on waste fuels

Best practice example recovery of SRF: Poland (I)



- **2002:**
 - Early start co-processing due to import SRF from Germany
- **2010:**
 - 2 mio ton of MSW equivalent to cement industry (no subsidies!!)
 - Zero incinerator capacity
- **2014:**
 - Cement-industry reaches saturation
 - Waste-to-Energy starts with EU support

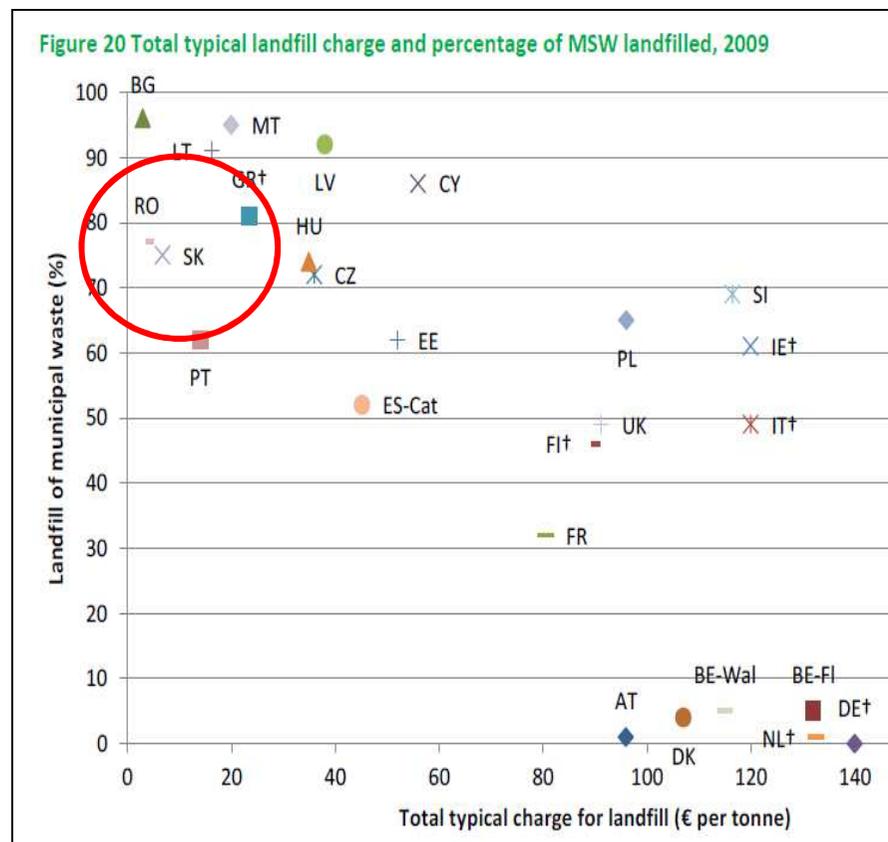
Cross border flows + existing cement plants can kick-start landfill diversion!

Best practice example recovery of SRF: Poland (II)



- **EU-standards and emissions limits 100% respected**
- **Imports from Germany meanwhile marginal**
- **Professional infrastructure established both at pre-treatment plants as well as cement plants**
- **Other energy intensive industries can follow**

Opportunity SRF recovery: Romania (I)



- Co-processing of waste by cement industry started:
 - Oil lagoons
 - Waste tyres
 - C&I wastes

- Import of MSW-derived SRF problematic
 - Intensive administrative burden
 - Stakeholder acceptance

- Local development slow due to low landfill costs (due to accepting open dumping)

Cross border flows SRF[®] are essential for market development !

Opportunity SRF recovery: Romania (II)



Source: GlobalCEMFUELS 2014



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- **MSW to SRF possible with mechanical biological treatment technologies**
 - Low automation → low investments
 - Environmental responsible & safe
 - Adapted to high organic waste (biodrying)
- **Co-processing in cement:**
 - MSW uptake capacity 3 mio ton / year
 - Landfilling 6 – 7 mio ton MSW per year
- **Accelerators for this development**
 - Push municipalities for landfill diversion
 - Require sanitary landfilling as reference
 - Allow SRF imports as transition

Allow SRF import and require sanitary landfill; and push diversion!

Feed-in tariffs for electricity from MSW; example 220 kton/y Estonia

Turn waste to energy

Production

- Electricity: **138GWh/y**
- Heat: **320-400 GWh/y**

Investment

- **€100m**

Recovered energy

- **83%**

Incentive from Estonian Government

- **€32,000 for each GWh electricity produced***



Combined Heat and Power unit IRU power plant

*Source – Eesti Energia AS, April 2011, Sustainable Energy Week, EU Commission

Subsidy:

€4,4m per year (during 12 years)

Turn MSW to SRF for cement

Production

- Solid recovered fuel:
- **120,000 tonnes per year at 15GJ/t**

Investment

- **€36m**

Recovered energy

- **90%**



Kunda cement plant

Subsidy:

Zero subsidy needed

Concluding remarks

1. The use of SRF (and RDF) is widely adopted in the European Cement Industry and is an established circular economy practice
2. In some EU-countries the potential of Co-processing in Cement Kilns is close to saturation; other Energy Intensive Industries (EEI's) could further grow their contribution
3. In some EU-countries landfilling is still the standard practice; if “normal” standards of sanitary landfill would be applied, the costs of landfilling are rising to a level that MSW conversion to SRF for co-processing becomes feasible;
4. Landfill diversion could be further stimulated by applying landfill tax and/or banning of waste above 6 GJ/t
5. Feed-in tariffs for “electricity from waste” are causing an unlevel playing field with SRF use as heat source for EEI's.

Waste is a resource...



Contact:

Jan Theulen

Global Director Alternative Resources

Global Environmental Sustainability

[jan.theulen@](mailto:jan.theulen@heidelbergcement.com)

heidelbergcement.com

+31 62 9097 354

HEIDELBERGCEMENT