Possibilities of the cement industry to support Serbian Waste Management Strategy

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Content

- What is co-processing?
- Lafarge experience in co-processing
- Potentials in Serbia
Lafarge Group in brief

- Founded in 1833
- World leader in building materials
- Leadership positions in all its business
  - no. 1 in Cement & Aggregates
  - no. 3 in Concrete & Gypsum
- Employs 84,000 people
- Operates in 79 countries
- € 19 billion in sales in 2008
- 2187 production sites
- Global partnership with WWF since 2000
Co-processing: cement kiln as a solution for waste treatment

- The waste produced by agricultural, industrial and human activities contains components which can be used as AF for cement production up to 9% of the substitution rate, saving that way unrenewable resources

- Usage of waste in cement kiln is know as **co-processing**

- Usage of waste in cement kiln has started at the end of 70’s in the Western Europe and North America, taking advantage of
  - an existing equipment
  - a service with high technical efficiency
  - a given solution to the needs of the country in terms of waste treatment capacity

- Usage of waste in cement kilns is recognized as a legal solution by a lot of regulations in the world: EU, USA, Brazil...
Advantages of co-processing

- Substitute of fossile fuels by alternative fuels
- Preservation of natural sources
- CO₂ Reduction
- Co-processing does not produce other waste nor ash
- Fast and clean solution for the waste management
- Cement industry supports the global future strategy „Zero Waste“
Cement production: co-processing

Fuel
(Coal; Alternative fuel)

Main burner
flame: 2000°C
clinker:
1450°C > 15’

Calcinator
Gas: 1200 °C

Raw material: 900°C

Clinker

Raw material
(limestone, sand, marle, iron; Alternative Raw Material)
Cement process: co-processing
Usage of AF in Lafarge

- Average 12% of alternative fuels
- 3 plants with 90% of usage of alternative fuels
- 12 plants with more than 40%
- 27 plants with more than 25%
- 55 plants with more than 10%
Potential AF material

Legend:
- 2008
- 2007
- 2006
AF: images
Cement industry in Serbia

- Lafarge Beocin
- Holcim Novi Popovac
- Titan Kosjeric
Cement industry in Serbia

- Lafarge Beocin
  - 1.2 Mt of clinker production capacity
  - Co-processing permit for end of life tires
  - Permit procedure ongoing for used oil, solid shredded waste and animal meal

- Holcim Novi Popovac
  - 0.9 Mt of clinker production capacity
  - Co-processing permit for end of life tires and solid shredded waste
  - Permit procedure ongoing for animal meal and biomass

- Titan Kosjeric
  - 0.6 Mt of clinker production capacity
The “cement factor” is the percentage of the total produced waste of a defined region, which can be used for co-incineration in the cement plant.

\[ \text{Cement factor} [\%] = \frac{W_p [t]}{W_t [t]} \]

\[ W_p [t] = \frac{AF[\%] \cdot W_{\text{total}} [J]}{H_u (w) [J/kg]} \]

- \( W_p [t] \): waste potentially used in cement kilns
- \( W_t [t] \): total waste produced in defined area of the study (region or country)
- \( AF \): alternative fuel rate [\%] is percentage of alternative fuel energy of the total fuel energy consumption of the cement plant
- \( W_{\text{total}} [J] \): total energy consumption of the cement industry in the area of the study
- \( H_u (w) [J/kg] \): calorific value of waste
Cement factor: assumptions

- Total clinker production: 2.7 Mt
- Heat consumption: 3.8 GJ/t clinker (assumption)
- Total heat consumption: 8,816,000 GJ/a = 230,000 tons of coal
- Alternative rate in all cement factories 50%
  - 10% tires
  - 25% municipal waste
  - 9% waste oil
  - 6% biomass
Cement factor: Used oil

- **Result:** 90.67%
- Only 9% of alternative fuel rate
- 25,000 tons of collected used oil
- Calorific value $H_u$: 35 kJ/kg
- With higher alternative fuel rate, all the collected oil can be used
Cement factor: tires

- **Result**: 108.8%
- 10% alternative fuel rate
- 30,000 tons of collected used tires
- Calorific value $H_u$: 27 kJ/kg
- Serbian cement industry can use more tires than it is produced in the country
  - According to new regulation, only 20% of collected tires will be intended for cement industry
  - Import?
Cement factor: biomass

- **Result**: 150%
  - 6% of alternative fuel rate
  - 22,000 tons of collected biomass
- Calorific value $H_u$: 16 kJ/kg
- Difficult to estimate the quantities, because biomass material includes:
  - Waste wood (packaging)
  - Agricultural waste (straw, sunflower shells)
  - Animal meal
Cement factor: Solid shredded waste (SSW)

- Solid shredded waste is pretreated waste with a size of 30 mm and 19 kJ/kg out of municipal and industrial waste

- 2.800.000 tons of municipal solid waste are existing with following waste composition

Source: Goran Vujic
Cement factor: Solid shredded waste (SSW)

- **Result: 7,12%**
- 25 % alternative fuel rate
- 2,816,000 tons of collected municipal waste
- Calorific value Hu: 19 kJ/kg
- On national level only 7,12%, but on regional up to 50%
  - Transport radius is very small because of financial value of the SSW
  - Higher cement factor is possible for industrial waste and packaging waste
Cement factor: Solid shredded waste (SSW) – regional level

- 1. Step - mechanical treatment: up to 24%
  - 24% of municipal waste can be used in co-processing, including:
    - Paper
    - Plastic
    - Textile
    - Wood

- 2. Step - mechanical biological treatment: up to 45%
  - 45% of municipal waste can be used with biological drying, including dried biological waste
  - 80% of Industrial waste can be used, but depending on the material input
Co-processing in Serbian cement plants can be a full solution for the treatment of
- Tires
- Used oil
- Biomass / animal meal

Co-processing in Serbian cement plants can be a regional solution both for
- Municipal waste
- Industrial waste

Co-processing can be also a fast reliable solution for the government, because all factories have huge experience in that field.

Conclusion
Conclusion: Main waste streams

SSW

OIL / SOLVENTS

TIRES