Energy Recovery from Alternative Fuels (AF)

The Swiss Experience

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The AF use in Swiss cement plants in 2005

- 244’765 tons burnt
- Energy substitution of 5’433 TJ
  - = 46.6 % substitution
- Decrease from 2004 (51.2 %), due to:
  - Higher clinker production (+ 5.4 %)
  - Less waste oil
  - Less animal meal + fat
Approval by the authorities

• Close cooperation with authorities → permit for relevant trials with AF
• Lobbying at highest level of administration (by company and/or cement association)
• Cement industry can solve a waste problem → win – win – win solution!
• Establish new regulations for use of AF in cement plants (example CH)
• Develop high level of confidence towards authorities (monitoring, reporting, ISO 14000 can help)

Agreement with the Swiss authorities (1)

• http://www.umwelt-schweiz.ch/buwal/eng/
• Result of long negotiations → advantages of cement kiln have been recognized
• Defines which types of wastes can be used in cement plants
Agreement with the Swiss authorities (2)

The guideline contains:
• Requirements for permitted wastes
• Quality requirements for clinker, cement and flue gases (no dilution !)
• Further requirements (operation, monitoring, transport, etc.)
• Positive list of AFR

→ Periodical revision of positive list

The AF supply chain

• Availability of products, now and in future (quantity, quality / variability)
  → high flexibility required from the plant
• Price, competition on the market (other cement plants, incineration plants, landfills, export)
• Make it / buy it / joint venture ?
• Quality control at plant is indispensable
• How to overcome long kiln stops ? → storage capacity, coordination with other plants
• AF business has own rules ≠ from cement → don’t trust too much too quickly !
Acceptance from neighbours

- Respect existing environmental regulations!
- Involve local authorities from beginning of the AF project (incl. environmental delegates)
- Invite population to visit the cement plant (open doors day) → contact, transparency, confidence
- Inform population about the project, show good examples of others AF projects → no risks!
- Participate actively to the local life (support, sponsoring, presence at village fêtes): all employes are company ambassadors!

Acceptance from personnel

- More work for fuel preparation
- Kiln control more difficult
- Kiln operation disturbed (build-ups, blockages) → hard, dirty, dangerous cleaning work
- Safety & Health: strict, heavy protection measures to be observed
Kiln operation (1)

- Reduction of kiln capacity (5 to 10 %) due to low grade fuels, variability, more excess air
- Variability of AF calorific value → kiln more difficult to control → kiln control system is a big advantage, even a must for high AF level
- Increased S, Cl, alkalis input → additional blockages and cleaning work in preheater / precalciner / kiln → more kiln stops
- Increased wear of refractories / corrosion of metal parts → more kiln stops

Kiln operation (2)

- Basically high grade AF in kiln, low grade in PC
- AF with lowest variability in kiln
- $O_2$ level in rotary kiln must be always sufficient (CO → EP trip, local reducing conditions)
- Improve design of fuel/meal distribution in precalciner (long residence time, no local overheating)
- Multi-fuel burners of last generation for better operation
Product quality

- Customers should not remark any change in concrete properties!
- AF supply / quality not constant → changes of burning conditions → variability of clinker quality may increase (mineralogy)
- Increased input of S, Cl, alkalies → will be incorporated in clinker or cement → may influence workability, setting time, etc.

Environmental effects

- Basically no increase of conventional emissions (CO peaks → bag filter an advantage)
- Overall CO₂ balance improved
- Input of heavy metals increased → meet regulations, prevent accumulation in the system (e.g. Thallium)
- More reporting and transparency required by authorities for all emissions
Costs / Savings (1)

Costs
• Capex
• Production loss
• Operation (AF preparation, kiln cleaning work, increased heat/power consumption)
• Maintenance (refractories, corrosion)
• Laboratory (quality, environment)
• Reporting to authorities

Costs / Savings (2)

Savings
• Conventional fuels costs
• Coal grinding costs
• Earnings from elimination tax for various AF
• CO₂ tax
The Swiss CO₂ agreement

- Signed in 2003 with Swiss government
- On level of cemsuisse (not companies)
- Reduction from 1990 to 2010:
  - 44.2 % on fuel CO₂
  - 30.3 % on geogenic CO₂
- All AF count (not only biomass !)
- CO₂ emission allowances are indexed on the clinker/cement production

Conclusion

- AF in cement kiln: win – win – win !
  → AF use becomes a must
- High flexibility is required
- Process to be well managed and controlled: no detrimental effect will be accepted by any stakeholder