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ALF-CEMIND : Alternative Fuels in the Cement Industry
EU DG TREN (Transport & Energy)
TREN/05/FP6EN Special Support Action contract 020118
www.alf-cemind.com/initiative.html

ALF-CEMIND

Memo on policy issues (draft, version 1)

Introduction.

The ALF CEMIND project focuses on alternative fuels and alternative raw materials for the cement industry. Now these aspects are also offering important interfaces with policy issues as energy efficiency, CO_2 emissions, waste handling and environmental policies in general.
Replacement of raw materials is less a subject for debate than the use of alternative fuels. But the difference between alternative raw materials and alternative fuels is – especially in the cement industry – often a thin line. The cement production process has the considerable advantage above other processes for energy conversion of waste, that most non-combustible components are in fact replacing raw materials.

Cement industry and other users of alternative fuels.

Let's look briefly at other outlets for the alternative fuels. The most important are the energy conversion of biomass (and/or waste) for electric power and the incineration of waste. From the point of energy efficiency the co-combustion of rest fuels in (coal fired) power plants offers the highest electric efficiency ($\pm$ 40%). And electricity is a high quality form of energy – the value per kWhr being in the range of 2 tot 2,5 the value of (low/medium temperature) heat. Also the NO_x emissions are strongly regulated and comparatively low. Rest heat from the power plant can mostly be used to a modest extent at best as this requires the vicinity of heat demand from industry or residential area's. And these power plants are usually located far from city centres.
A disadvantage is the non-combustible content of the rest fuel. In electric power production the non-combustibles end up in the fly ash or bottom ash and are as such a source for a new stream of rest products (often going to the cement industry). The quality the further use of these rest products of coal/biomass fired power plants depends heavily on the homogeneity and the chemical composition of these ashes. In a (very) concise SWOT analysis this would argue for the use of high energy rest fuels with preferably low ash content and a chemical composition, which does not negatively affect the overall quality of the coal derived ashes. An example could be forestry rest products and fairly clean biomass streams in general.

Waste incineration – often combined with some electricity production – is the best equipped outlet for those rest streams which contain dangerous or harmful components. Installations can handle waste with enormous variety in composition – including elusive components as mercury. Waste incineration is obviously also a strongly regulated area and consequently NO_x emissions are fairly low. The electric efficiency is however much lower than power plants (22 – 25%) and the use of waste heat is usually also mostly very modest –for the same reasons as power plants. As the input of the waste is chemically less defined and variable, the quality

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of the ashes is much lower and these ashes must either be land filled or used in lower end applications (road beds et cetera). This would argue for those rest streams which contain harmful or dangerous components.

When incinerated in the cement kiln by far the most positive point is the use as source of energy combined with replacement of raw material. Most non-combustibles are taken up in the cement matrix and simply result in less consumption of marl. There are simply no solid rest streams comparable to the ash and slag streams of the other processes. Looking at the energy conversion the high kiln temperatures assure a high combustion rate. Overall efficiency is therefore quite good and compares favourably with the alternatives of power production or waste incineration. The process does not produce electricity so the exergy of the application (thermal process heat) is less than electricity, but this is indeed offset by the replacement of raw materials. NO_x emissions are usually higher than the other processes but the process and the emissions to air are strictly regulated. The high temperatures and long residence times also result in the destruction of various harmful organic components. So the overall balance can be – and for quite some rest streams is – positive.

For the cement industry outlet this would argue for those rest streams which are composed of a larger content of non-combustibles (e.g. sewage sludge) and a chemical content which allows good blending in the cement matrix.
An important point is the economic aspect. Waste incineration always requires a substantial negative gate fee to be economically viable. When used as an alternative fuel in the cement kiln, the gate fee can be positive or negative – totally depending on the effects on the process (and market conditions).
These aspects induced a European Court of Justice ruling that using waste as a fuel in cement kilns should be classified as recovery, while burning municipal waste in dedicated incinerators, even with energy recovery, should be classified as disposal.

A second point is, that the alternative outlets (especially waste incineration) are not always available. This reduces the alternative often to land filling.

Policy developments.
Against this background the cement industry is faced with a number of important EU regulations. When looking at the considerable variations – per country – in the percentage of alternative fuels, the impact of the EU and national regulations and policies becomes apparent. The most obvious example is perhaps the waste policy in e.g. Germany and The Netherlands, which prohibits the land filling of organic waste such as sewage sludge. The effect is – in this case favourable – for the use of alternative fuels in the cement industry. The incineration alternative for sewage sludge – which contains substantial amounts of non-combustibles – is very costly.

EU Waste Framework, Incineration of Waste Directive and IPPC.
Currently the EU Waste Framework directive is being discussed and reviewed (a 'common position' is scheduled for 20 December of this year). The same applies for the Incineration of Waste Directive and the IPPC. Important from the point of view of the cement industry in these negotiations is the classification of co-processing in cement plants as recovery. A point of concern is the issue of self sufficiency and proximity of waste handling. These concepts may - as a negative and possibly unintended side effect - prevent the efficient use of waste streams in cement kilns.

The overall effect of increasing regulations in waste management may well be favourable for the use of alternative fuels in the cement industry – as the German/Dutch example in the domain of land filling indicates. One of the findings of the ALF-CEMIND study was, that the national waste management policies (or the lack of enforcement of these policies) were often a main barrier for the application of alternative fuels in the cement industry.

ETS.

The European targets for CO_2 emission reductions also both offers threats and opportunities. The fairly recent emerging of the ETS (Emission Trading Directive 2003) is an example. As biomass is declared to be CO_2 free, the use of biomass rest fuels is greatly encouraged. On the other hand the 'competition' for the available biomass streams becomes very much apparent. The specific CO_2 targets for electricity production and the targets for biomass use as automotive fuel strongly jeopardize the cement industry access to these alternative fuels. The markets for biomass products are increasingly affected by (national) green electricity grants as well as obligatory biomass shares in automotive fuels. As the margins for acceptable energy costs in the cement industry are modest (energy is a substantial cost factor in cement production), the overall effect of ETS on biomass use in the cement industry is less certain. EU Commission proposals for the revision of the ETS are expected in the beginning of 2008 and the cement industry and it's association CEMBUREAU are closely following the discussions.

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