ALTERNATIVE FUELS:
The "Valorisation" of Waste in the Cement Industry

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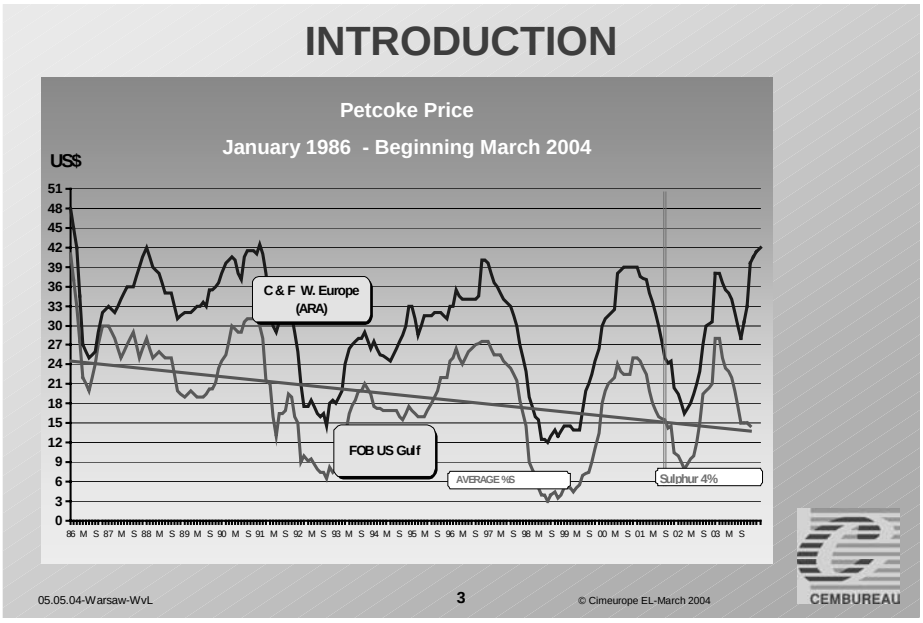
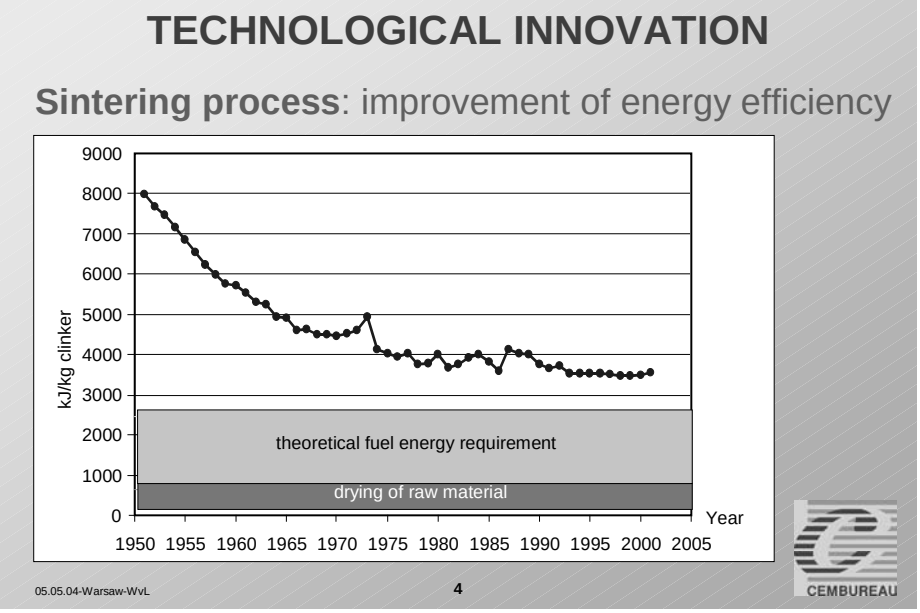
1. Introduction

The cement industry is a very energy intensive industry. Each tonne of cement that is produced requires 60 to 130 kilogrammes of fuel oil or an equivalent fuelling amount depending on the cement type and the process used. Each such tonne also requires an average 110 kWh of electricity. The energy bill represents over 25% of total production costs in the cement industry and a good deal of uncertainty in view of fluctuating energy prices.



Not surprisingly, therefore, the European Cement Industry has, over the last 40 years, made considerable efforts to reduce energy consumption. Through technological change and investment, the European Cement Industry has significantly reduced its

specific energy needs (i.e., the energy required to produce one tonne of cement). Approximately 11 million metric tonnes per year of coal have thus been saved since the 1970's through some 30% reduction of the specific energy consumption for the production of clinker in the 25 CEMBUREAU countries.[1]



Now, the cement industry is close to the limit of what can be achieved through such technical improvements and rationalisation. Already in 1993, an independent study commissioned by the European Commission assessed the potential for further improvements at 2.2%. Given the progress made since then, the present potential to reduce energy consumption through classical means may be estimated at less than 2%.

In order to safeguard its competitiveness, the European Cement Industry began some 20 years ago to look for new forms of energy and this move has recently expanded at the same time as the imperative of sustainability was leading the cement industry to try and combine energy efficiency and the need to preserve non-renewable energy and non-energy resources.

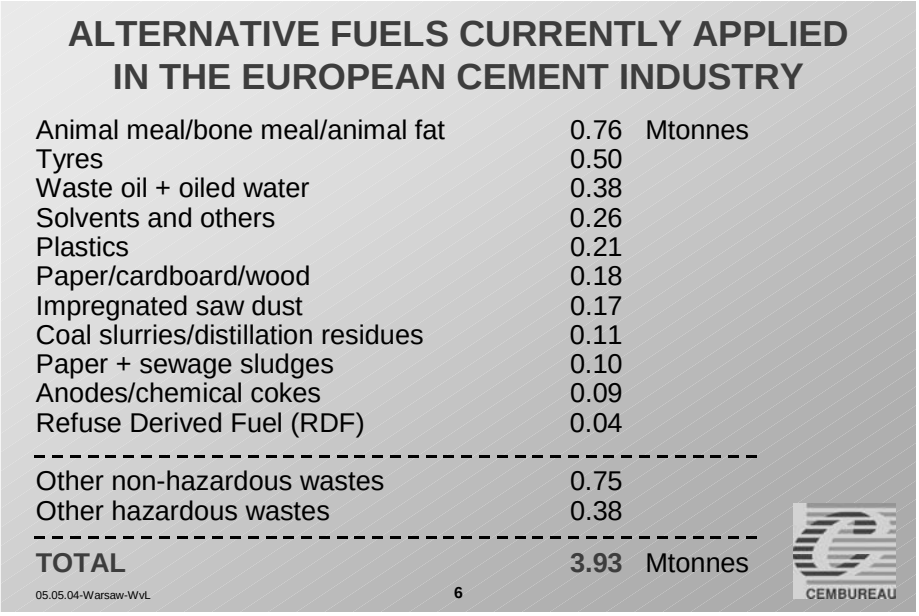
2. Waste as alternative fuel: the facts

The use of waste, both as alternative fuels and raw materials, is now common practice in many cement companies. My presentation does not extend to the waste used as

[1] Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom.

raw material, but such use should always be kept in mind when we talk about alternative fuels. It is important to remember that the non-combustible or mineral part of the waste burnt as fuels is used as alternative raw material in the clinker manufacturing process.

Many different types of waste are burnt today in cement kilns: used tyres, rubber, paper, paper waste, waste oils, waste wood, paper sludge, sewage, animal meal and animal remains to name but a few.



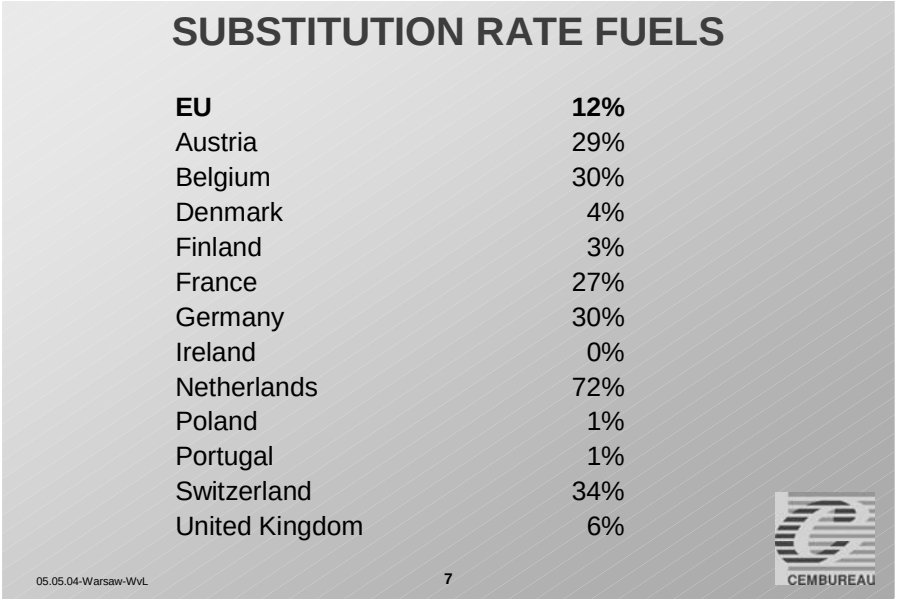
Because of the delicate balance and stability that are required by the cement-making process, the cement industry has concentrated on wastes that are sufficiently homogeneous rather than burn less homogeneous waste. A lot of these wastes originate from other industries and, of course, from agriculture.

In this context a whole new industry sector has been created: the waste pre-treatment industry. These companies apply various technologies, such as drying, blending, mixing or grinding in order to obtain the technical requirements needed for a proper clinker burning process. After all, producing clinker with the maximum quality is the first priority.

A new word - “valorisation” - has been coined by the cement industry to distinguish itself from the incineration industry and to stress the high level of efficiency in energy

recovery from waste achieved in the cement industry as the energy liberated in the kiln is used on the spot, in the kiln itself, to ensure the mineralogical transformation of the raw materials – mostly limestone – into clinker, a transformation which requires very high gas temperatures of 1,900 - 2000°C in order to reach the necessary materials temperature of 1450 °C.

In 1990, the overall rate of substitution of traditional fossil fuels by alternative fuels in Europe was only 3%. Today, it stands at almost 12% but there are still great differences between different countries. Consequently there are definitely great opportunities to further increase this level of substitution.



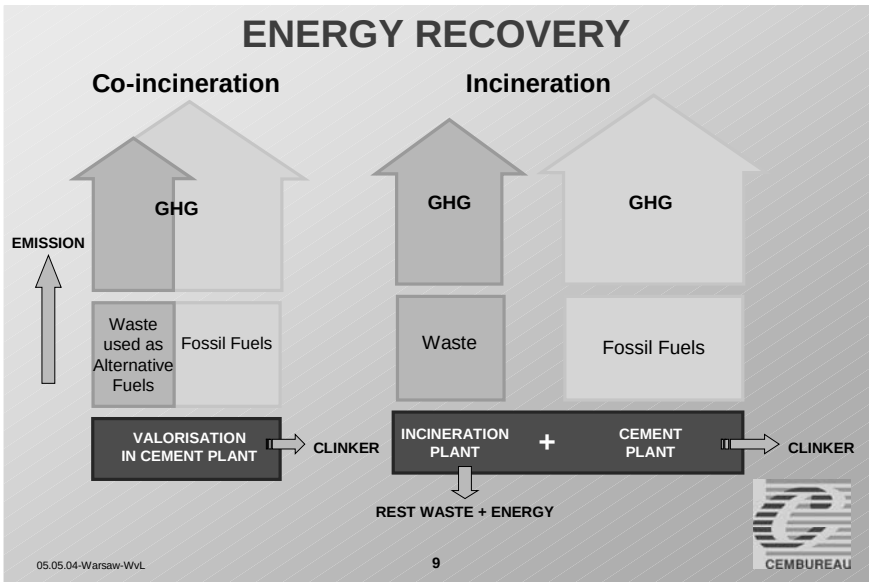
The benefit to the cement industry is fairly obvious. Even if it often needs to be treated and made sufficiently homogeneous to be valorised in a cement kiln and despite the process investment and special maintenance which this may require, waste is usually cheaper than primary fossil fuels; in certain cases, alternative fuels may even be a negative cost item. Such cost varies, of course, with each type of waste and each set of local conditions. The saving that can thus be obtained is important to maintain the sustained development of the cement industry in Europe where energy prices are among the highest in the world and where the use of energy is heavily taxed.

This economic aspect is not, however, the end of the story. Far from it! The valorisation of waste in cement kilns entails many other aspects such as national and European legislation and societal as well as environmental benefits.

3. Waste as alternative fuel: the societal context

First of all, the use of waste as alternative fuels in cement production benefits the environment by preserving non-renewable fossil fuels such as coal or oil. The equivalent of about 3 million tonnes of coal is already saved in this manner every year by the cement industry in Europe. More marginally, but nonetheless real, this also reduces the environmental impact related to coal mining.

Secondly, the use of waste as alternative fuels in cement kilns contributes to lower overall CO_2 emissions, replacing fossil fuels and their relevant CO_2 emissions by waste materials which would otherwise have to be incinerated or landfilled[2] with corresponding greenhouse gases emissions.



It is abundantly clear that valorisation of waste in the cement industry is an asset when it comes to environmental policy-making. As a solution, it has the advantage of flexibility: if there is a way to prevent the generation of particular type of waste or if there is a more environmentally friendly way to use such waste, then the waste flow may be changed and the cement plant will either switch to other types of waste or revert to traditional fuels … it will still continue to operate as a plant as it is not a dedicated facility for incineration purposes. This advantage seems hard to understand to the Greens who should evidently be most interested in this flexibility … As landfilling is clearly becoming a less acceptable waste management solution, the valorisation of

[2] The emissions from landfill consist of about 60% methane, a gas with a global warming potential that is 21 times that of CO_2.

waste will become even more attractive in the future. Sometimes, it is even proving indispensable as exemplified by the requisition in Belgium of the cement industry by the government to burn animal remains in 1999 and, more generally, by the actions in Switzerland, France, Germany and Spain in respect of the elimination of animal meal since 2000.

For society and more specifically for local communities, the valorisation of waste in cement kilns offers a cheaper solution than investing in dedicated facilities which require a huge capital investment and in which operating costs tend to be higher than when waste is valorised in a cement plant. In addition to the Greens, the taxpayers should definitely be on our side as well.

Now, at this point, you should really be asking me: if the use of waste in the cement industry is such a marvel, how come that it is only representing just over 12% of the total energy requirements in the cement industry in Europe? What are the risks or barriers which still stand in the way and make policy-makers wonder whether this is the right way or not?

4. Waste as alternative fuel: the regulatory context

The valorisation of waste in cement plants is a strictly regulated process. Since January 1997, CEMBUREAU has cooperated with experts from the European Commission, the Member States and environmentalist organisations to define the “Best Available Techniques” (BATs) that will be used as a reference by regulators throughout the EU when issuing permits. Those BATs will minimise the environmental impact of cement manufacture. The valorisation of waste in the cement industry is covered by the BAT Reference Document applicable to the cement industry (BREF) issued in 2001. In due course this BREF document will be revised, in order to take into account to the current practice of the use of alternative fuels and raw materials.

In 1998 and 1999, CEMBUREAU also worked with the European Commission and the European Parliament in the elaboration of a very comprehensive Directive on Incineration of Waste covering all types of waste, non-hazardous as well as hazardous, and all incineration or co-incineration facilities. The new Directive (2000/76/EC) was adopted on 4 December 2000 and it had to be transposed into national laws by 28 December 2002; it may be described as very demanding but fair.

New obligations and stricter emission limit values are imposed on the cement industry but the latter is committed to meet this challenge through a positive approach.

The following emission limit values are provided for cement plants burning non-hazardous waste or less than 40% hazardous waste:

DIRECTIVE ON THE INCINERATION OF WASTES

Total dust	30
Hydrogen Chloride (HCl)	10
Hydrogen Fluoride (HF)	1
NOx for existing plants NOx for new plants	800 500
Cadmium (Cd) + Thallium (TI)	0.05
Mercury (Hg)	0.05
Antimony (Sb) + arsenic (As) + lead (Pb) + Chromium (Cr) + cobalt (Co) + copper (Cu) + manganese (Mn) + nickel (Ni) + vanadium (V)	0.5
Dioxins and furans	0.1
Sulphur dioxide (SO_2)	50
Total Organic Carbon (TOC)	10

Limit values expressed as a daily average, 10% O_2, dry, mg/m^3 (dioxins mg/m^3)

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Except when justified by the cement-making process (NOx, SO2 and dust), those values are in actual fact the same as for dedicated incinerators and it should be stressed, in particular, that the emissions of dioxins of the cement industry are well below the very strict legal requirements.

A recent step to further acceptance of the use of alternative fuels is the standardisation of Solid Recovered Fuels (SRF) based on non-hazardous wastes. All European countries are involved via the CEN TC 343 and CEMBUREAU is fully involved. Our main topic is the classification of SRF and the determination of the biomass fraction.

It is often argued that the use of alternative fuels has a detrimental impact on the quality of soil and water as a result of the release of (heavy) metals by leaching from concrete. The leaching performance of concrete has been thoroughly investigated by numerous independent laboratories and institutes and it has been found that there is no significant increase in leaching when using alternative fuels. The reason being that virtually all metals are firmly bound in the hydrated cement matrix and thereby chemically and physically immobilised to such a degree that for concrete in contact

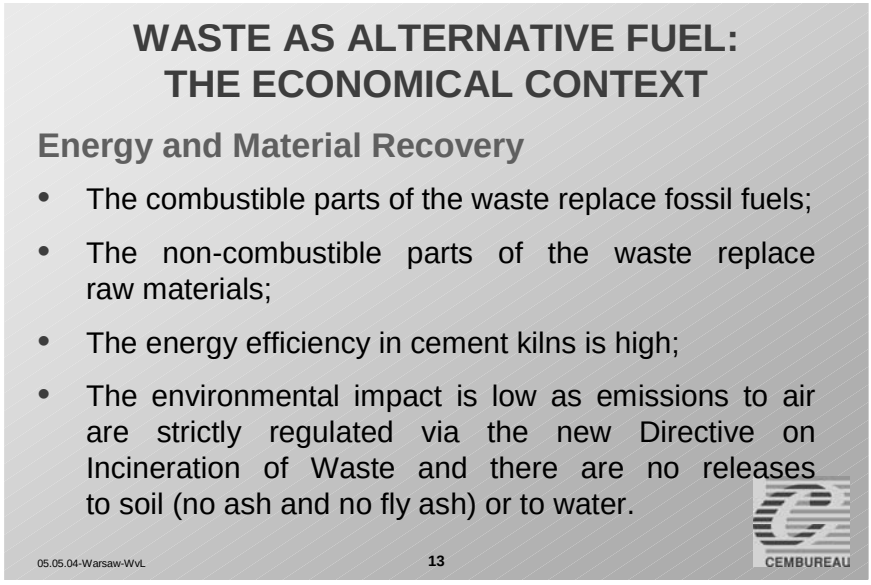
with drinking water the requirements in the European Directive for Drinking Water can be easily complied with.

5. Waste as alternative fuel: the economical context

So, there are many advantages attached to the use of alternative fuels in the cement industry and it is a strictly regulated process at EU as well as at local level. Given these, what is standing in the way of a more widespread use of such fuels?

A first difficulty is the harsh competition with dedicated incinerators to have access to the waste. This emerges as a key policy issue: is it waste for disposal or for recovery? The question whether the use of waste is a disposal operation or a recovery operation is of concern to the cement industry, not only in relation to the free circulation of waste suitable for use in cement kilns. Member States may be tempted to apply different tax regimes and permitting regimes to the two types of operations and, at EU level, different provisions related to the two types of operations may be introduced in future waste management legislation. Finally, the public perception of cement operation is affected by the disposal/recovery labelling of the operation.

In this context, CEMBUREAU shall repeat loud and clear that the valorisation of waste in cement kilns is, in all cases, a recovery operation for the following reasons:



CEMBUREAU recently completed a position paper on the Characteristics of Waste Recovery which has been offered to the European Institutions in the context of the

New Thematic Strategy on the Prevention and Recycling of Waste and the possible re-definition of Recovery/Disposal operations as now defined in Annex II of the Waste framework Directive (75/442/EEC):

This point of view of the cement industry is gaining recognition in the recent case law of the European Court of Justice which has ruled that the use of waste as fuels in cement kilns is indeed a recovery operation.

6. Waste as alternative fuel: the relation to climate change

Today the debate regarding co-incineration or rather valorisation of waste in cement kilns is getting a new dimension: it is a key factor for the cement industry in the context of the CO_2 Emissions Trading Scheme which is being put in place in the EU.

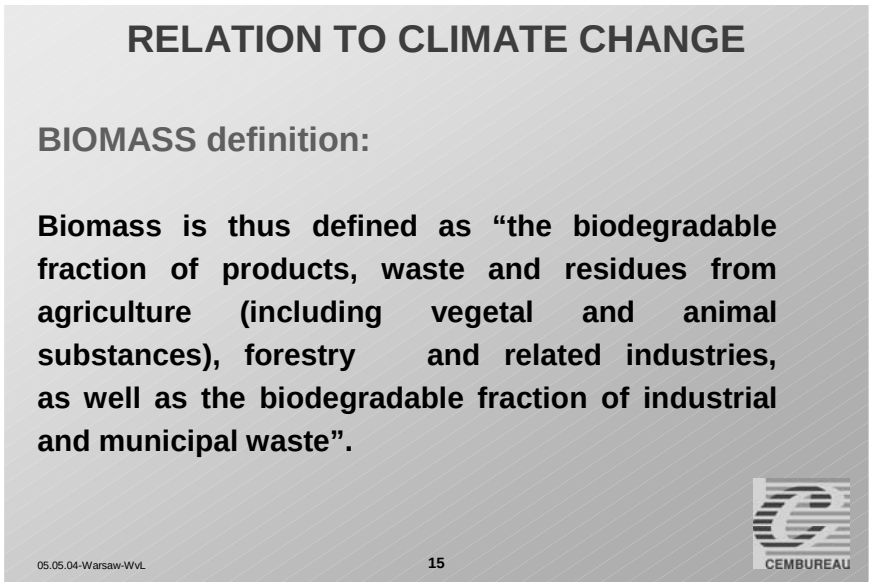
We have seen that valorisation of waste in cement kilns significantly contributes to reduce CO_2 emissions. How can that precious role be recognised and rewarded in the context of the emissions trading?

The answer is not easy.

The EU Emissions Trading Directive deals only with direct emissions. So, there is no way in which savings achieved outside the cement plants can be taken into account. No credit will be given for savings upstream, downstream, or next door.

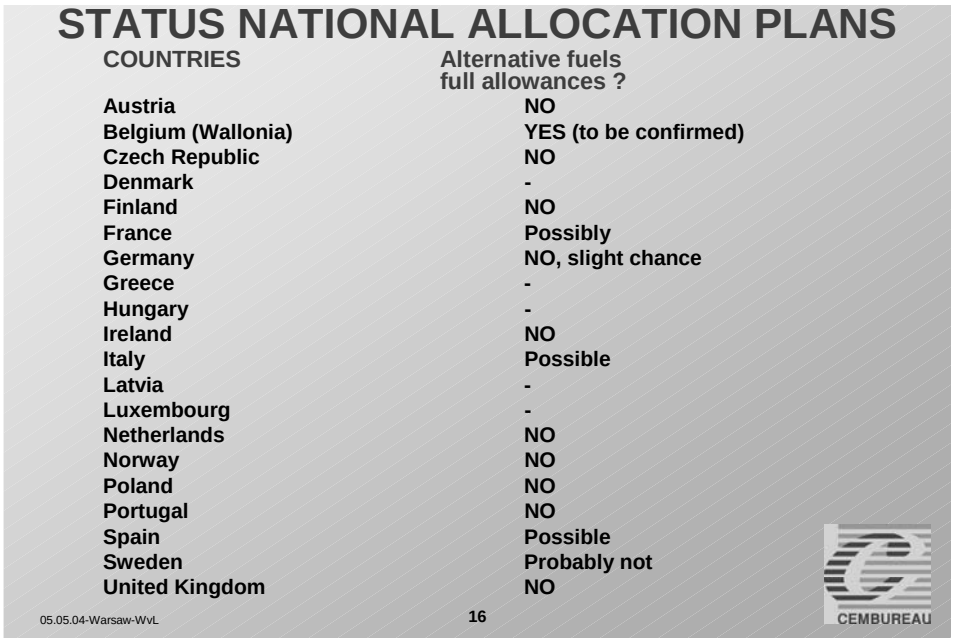
Could a reduced emissions factor be recognised?

This is the case for biomass. Biomass will be treated as CO_2 neutral and the emissions factor will be zero. The problem, however, is how to define biomass. CEMBUREAU argues that, in order to ensure consistency of Community legislation, the definition in the Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market and in the draft Energy Tax Directive must be retained.



This definition is in line with the IPCC (International Panel on Climate Change) recommendations. CEMBUREAU is arguing that this broad definition should prevail. Today it has already been adopted by CEN TC 343 dealing with, among other things, with the determination of biomass.

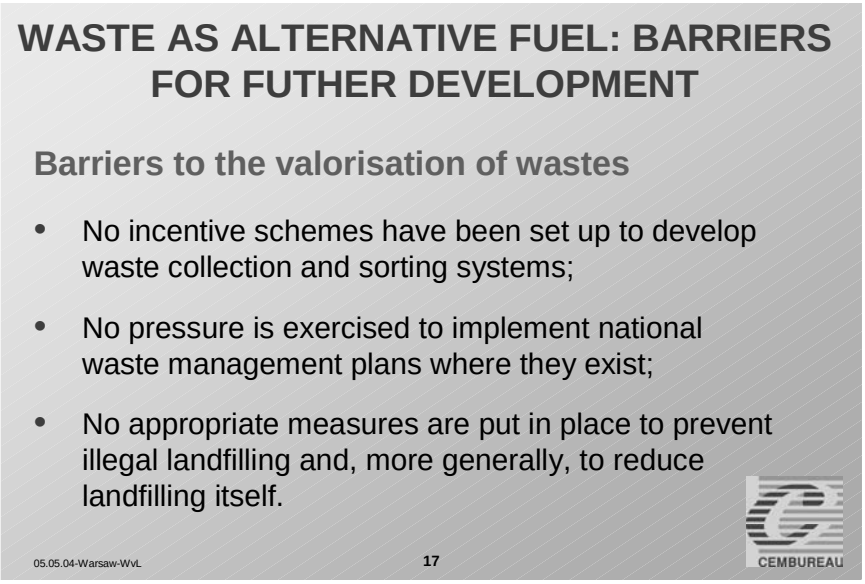
For other types of waste, however, the recognition of an emission factor lower than 1 poses problems. Only in some countries credits for the use of waste as alternative fuels seem to be accepted in the so-called National Allocation Plan.



7. Waste as alternative fuel: barriers for further development

In its battle to gain recognition of “valorisation” of waste, the European cement industry has still a long way to go. There are significant barriers which still stand in the way.

The first barrier preventing a successful development of alternative fuels lies with the attitude of the EU Member States. With a few exceptions in certain sub-national regions, they have shown a reluctance to consider waste management as a high priority and they have therefore failed to establish the proper policies:



The recognition that “valorisation” of waste in cement plants can help to deal effectively and economically with the waste and the adoption of appropriate measures such as those that have just been listed would help reduce a very significant societal problem. It should be done now before it is too late. As far as the cement industry is concerned, we are ready and willing to help as we have demonstrated recently with the crisis concerning animal remains. Valorisation of waste in the cement industry is beneficial and safe. This is a reality which should be an element of any sound environmental waste management policy. The challenge is to get the message across to the Member States to turn this into a reality and a priority.

The second barrier presents a more difficult problem. It is psychological and has to do with perceptions and communication.

A recent survey carried out over a broad sample of the European population shows that, on environmental and health matters, Europeans do not trust industry whereas they trust environmental NGOs and certain professions, especially medical doctors.

The cement industry will not succeed in persuading people about the benefits of using alternative fuels by showing itself factual evidence of this. It will even be less successful if its communication attempts to refute the arguments raised by opponents.

Someone in a low trust position must be humble, find allies with more credibility and learn how to work with them.

One thing is sure: honesty is the best policy. It is important to be transparent when discussing the environmental and health impact of the cement industry especially with local communities nearby plants.

8. Conclusion

The use of wastes as alternative fuel by the European cement industry is a win-win-win situation. The winners are:

All together a clear example of Sustainable Development.