EURITS

Revision of the Cement and Lime BREF

Eurits "Wish List": March 2005

INTRODUCTION

Eurits welcomes the opportunity to contribute to the initial work being undertaken in preparation for the review of the Cement and Lime BREF. Eurits participated in the TWGs for both the WI BREF and the WT BREF; this experience has been very useful in understanding the processes involved and the need for detailed technical information.

We note that the IEF has requested the establishment of an initial "wish list" of points to be reviewed. The EIPPCB has since requested that the list cover new and available information that the TWG would like to gather and to provide. Members of the TWG have been asked for a short description of the information that they have (or will shortly have) so that the TWG is aware of the information that will be brought forward for review. Eurits has identified 13 tasks that we believe should be undertaken by the TWG to help develop a constructive, clear and coherent BREF.

WHY REVISIONS ARE NECESSARY

Since the original BREF, technology and the associated performance levels have changed. This revision of the BREF should take into account new obligations concerning climate change, energy efficiency, environmental protection and sustainable development.

The original BREF does not make a clear distinction between clinker and cement production. Without this distinction (both in the BREF and in literature produced by the cement industry) it is difficult to assess industry claims about reductions in the consumption of materials.

The practice of co-incineration was only covered briefly in the original Cement and Lime BREF. Since then, there has been a significant increase in the amount of co-incineration being undertaken in the EU as well as legislative and regulatory developments that need to be reflected in the revised document. We suggest that there are four main reasons for dealing more fully with co-incineration in the revised BREF.

1. **Increase in use of waste as a fuel:** The original BREF stated that "in 1995 the most commonly used fuels in cement kilns were petcoke (39%) and coal (36%) followed by different types of waste (10%), fuel oil (7%), lignite (6%) and gas (2%)". Our research shows that waste now accounts for 40% of the fuel used in France and 30% in Germany.

2. **WI BREF:** Since the original BREF was developed, a great deal of work has been done to develop the BREF covering waste incineration. During the deliberations on this BREF, it was agreed that co-incineration need not be addressed on the grounds

that it was a practice already covered in the Cement and Lime BREF. Various members of the WI BREF TWG expressed concern that very little attention had been paid to co-incineration in the original BREF and this was acknowledged by the EIPPCB. It was therefore made clear during the initial TWG meeting on the WI BREF that the review of the Cement and Lime BREF would need to cover co-incineration in some detail as it would otherwise not be addressed in any BREF. The revised Cement and Lime BREF should contain as detailed an analysis of the sector and what constitutes BAT as the WI BREF.

3. **New legislation:** The major development that needs to be reflected in the revised BREF is the introduction of new legislation with which the co-incineration sector needs to comply, particularly the Waste Incineration Directive [2000/76/EC]. This Directive, which has been adopted since the original BREF was drafted, has to be fully implemented by 28 December 2005. This new Directive is full of provisions covering co-incineration, including setting out specific ELVs for co-incinerators (this continues the convergence of ELVs for incinerators and co-incinerators). All these provisions need to be addressed in the BREF.

4. The **original Cement and Lime BREF** anticipated this and recommended that the BREF be reviewed in 2005, particularly in relation to NO_x abatement techniques (especially the development of SCR technology and high efficiency SNCR). It acknowledged that the key environmental emissions in the production of cement were nitrogen oxides (NO_x), sulphur dioxide (SO_2) and dust. It went on to say that "whilst dust abatement has been widely applied for more than 50 years and SO_2 abatement is a plant specific issue, the abatement of NO_x is a relatively new issue for the cement industry". As this recommendation formed part of the original BREF, we assume that such techniques will be fully considered during the revision process.

5. **Stockholm Convention on POPs:** the Basel Convention has produced "General technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (POPs)", which are awaiting ratification by the Conference of Parties to the Stockholm Convention. The technical guidelines specifically mention that cement kiln dust (CKD) could be a problem and may need further treatment.

6. The **Kyoto Protocol** (December 1997) sets objectives for the reduction of the production of 6 major greenhouse gases by 2010. Incinerators and co-incinerators play a key roll in this, with energy recovery from waste treatment.

7. **Directives 2003/34/EC and 2003/36/EC** (26 May 2003) relating to restrictions on the marketing and use of certain dangerous substances and preparations (substances classified as carcinogens, mutagens, and substances toxic for reproduction - CMR). These new Directives have consequences for waste traceability, staff protection and product quality all of which must be covered in the BREF revision.

SPECIFIC ISSUES TO BE CONSIDERED

Equality of treatment between incineration and co-incineration:

8. From our experience in working on previous BREFs, we are aware that economic factors are fully considered when BAT recommendations are developed. The concluding remarks in the final draft of the WI BREF state that "*when a given waste may be treated in various sectors, the relative regulatory controls may, in a free market, have a significant impact on the destination of the waste. Ultimately, this*

may lead to a situation where installations with higher environmental requirements (and higher costs) are penalised. It can therefore be seen that, in such situations, particular care is required when considering the emission values and other requirements that are to be placed upon all industries competing in such markets". This principle should be considered during the review of the Cement and Lime BREF.

9. During the discussions on the WI BREF, it was also argued that more stringent "associated operational emission levels" should be established in the BREF on the grounds that it was possible to demonstrate that some plants could operate to more stringent limits than those in the Waste Incineration Directive, with the ELVs in the Directive being the absolute minimum levels to be achieved. This approach should also be adopted in the revised Cement and Lime BREF.

Air emissions (ELVs) and flue gas cleaning possibilities:

10. **Provisions of new Directive:** The Waste Incineration Directive [2000/76/EC] states that co-incineration plants should be "operated in such a way that the emission limit values determined according to or set out in Annex II are not exceeded in the exhaust gas" and that "if in a co-incineration plant more than 40% of the resulting heat release comes from hazardous waste, the emission limit values set out in Annex V shall apply." In the case of co-incineration of untreated mixed municipal waste, the limit values have to be determined according to Annex V and Annex II does not apply.

11. Annex II of the Directive sets new limits for co-incineration which can be divided in three groups:

- Limits which are equal for incineration and co-incineration and for which no exemptions are possible, e.g. HCl, dioxins and heavy metals.
- Limits which are equal for incineration and co-incineration but for which exemptions are possible, e.g. SO_2 and TOC. Exemptions may be granted by the competent authority where the SO_2 and TOC do not result from the incineration of waste (the onus being on the operator to prove that the emissions do not come from the waste).
- Limits which are different for incineration and co-incineration, e.g.; dust and NO_x.

12. **BAT in original BREF:** The original BREF stated that the BAT emission level associated with the use of best available techniques for reducing NO_x emissions (a combination of general primary measures, primary measures to control NO_x emissions, staged combustion and SNCR) was 200-500 mg NO_x/m^3 (as NO_2) and this range has been reflected in the Waste Incineration Directive.

13. The best available techniques for reducing SO_2 emissions were felt to be a combination of general primary measures and absorbent addition for initial emission levels not higher than about 1200 mg SO_2/m^3 and a wet or dry scrubber for initial emission levels higher than about 1200 mg SO_2/m^3. The BAT emission level associated with these techniques was stated to be 200-400 mg SO_2/m^3.

14. As well as the main environmental parameters, the original BREF also states that certain other issues were not addressed fully at the time, including: associated BAT emission levels for VOC, metals, HCl, HF, CO and PCDD/Fs. As limits are set for all these parameters in the Waste Incineration Directive, they need to be taken into

account in the revised Cement and Lime BREF, particularly as the original BREF acknowledged that "the use of waste containing volatile metals (mercury, thallium) or volatile organic compounds can result in an increase of the emissions of mercury, thallium or VOCs when improperly used". As these parameters are clearly covered in the Waste Incineration Directive, BATs need to be developed to avoid these problems arising during a co-incineration process.

15. **Current situation:** Notwithstanding the recommendations in the original BREF and the provisions of the new legislation, an analysis of a variety of published information shows that some co-incinerators still do not comply with the requirements of the Waste Incineration Directive, let alone achieve emissions that are significantly lower than the ELVs stipulated in the Directive. The BREF should therefore be updated to show what techniques need to be used by cement kilns to reduce emissions or what other measures a cement kiln operator needs to take to ensure, as an absolute minimum, that its plants comply with the Waste Incineration Directive, which they must do by December 2005.

16. **Task 1:** As the Waste Incineration Directive covers both dedicated incineration and also co-incineration plants, our proposed solution is that the BAT techniques listed in the WI BREF that are applicable to both types of operation should be evaluated carefully and, where appropriate, replicated in the revised Cement and Lime BREF.

17. **Task 2:** A methodology should be established whereby a cement kiln can prove that that the SO_2 / TOC being emitted does not come from the waste so that it can take advantage of the exemption offered in Annex II of the Waste Incineration Directive. This methodology should be harmonised at an EU-level to ensure common application both by local authorities across all Member States and also for every co-incinerating cement kiln.

Air emissions (ELVs) and waste composition:

18. **Provisions of new Directive:** The Waste Incineration Directive [2000/76/EC] states that "the permit granted by the competent authorities to a co-incineration plant using hazardous waste shall specify the minimum and maximum mass flows of those hazardous wastes, their lowest and maximum calorific values and their maximum contents of pollutants e.g. PCB's, PCP, chlorine, fluorine, sulphur, heavy metals" (art. 4.5).

19. **BAT in original BREF:** there is no information on this topic in the original BREF and it clearly has to be covered.

20. **Current situation:** Examples in practice show that for several pollutants there is an influence of the waste composition on the resulting emissions to air. This should be studied in a structured and detailed way and reflected in the BREF.

21. **Task 3:** The influence of pollutants in the waste on the emissions to air should be identified and quantified. This information should result in a methodology for the specification of waste which can be co-incinerated in a specific cement kiln, taking into account the specific characteristics of that kiln. This methodology should be harmonised at an EU-level to ensure both that it is applied by local authorities in the same in each Member State and that it covers every co-incinerating cement kiln.

22. **Task 4:** If cement kilns do not comply with the WID ELVs for co-incinerators nor with BATAOELs, the composition of pollutants in the waste should be limited

accordingly, based on the methodology developed in task 3, eg the chlorine content in case of HCl emissions, or mercury content in case of Hg emissions.

23. **Task 5:** If a cement kiln cannot prove that 100% of the SO_2 / TOC come from the raw materials and not from the waste, a similar approach to that in task 4 should be adopted based on the limitation of the relevant pollutants in the waste.

Air emissions (ELVs) and operating conditions

24. **Provisions of new Directive:** The Waste Incineration Directive [2000/76/EC] defined specific conditions for co-incineration of waste [Article 6]. As a result, the practice of introducing waste containing organic material at the low-temperature side of the kiln had to be stopped because the temperature was less than 850°C and resulted in VOC emissions, such as monocyclic aromatic compounds.

25. **BAT in original BREF:** The original BREF states that waste can be fed at different stages of the process. Data should be gathered on the corresponding impacts on emissions levels.

26. **Current situation:** The introduction of waste together with the raw material (at the low-temperature side of the kiln) and the introduction of waste in the mid-kiln option have different effects on the air emissions than the introduction of waste at the high temperature side of the kiln. There is also a link with the physical characteristics of the waste introduced at these places.

27. **Task 6:** The effect of the introduction of waste at different stages of the process should be studied and quantified, with specific attention to the limitation of the organic content of waste introduced at the low-temperature side (limit is necessary) and the specific effects of mid-kiln introduction on the air emission quality.

Influence of waste on cement quality

28. **Task 7:** The influence of waste composition on cement quality should be examined in detail, e.g. for elements such as phosphor, chlorine and chromium. It should be investigated if other limitations are known from current practice?

29. **Task 8:** The end-of-life stage of building materials and the multiple use of building- and demolition waste requires there to be a self restriction on the loads of hazardous components which can be co-incinerated. The accumulation-effect can be controlled by means of an 'input neutrality' principle. The issue of traceability and the accumulation effect of contaminants in recycled cement should be addressed. If the practice of co-incineration continues to expand, it may be necessary to consider the development of quality standards for cement covering the issue of contaminants in cement.

Influence of waste on cement kiln dust (CKD) quality

30. **Provisions of new Directive and Technical Guidelines of the Basel Convention:** In Article 9 of the Waste Incineration Directive [2000/76/EC] the provisions for residues are stipulated. Point 173 says that cement kiln co-incinerators should be aware of the following point and develop the necessary technology to treat the process gases: "*Release control and post-treatment:* Process gases require treatment to remove cement kiln dust and organic compounds, sulphur dioxide, nitrogen oxide, as well as heat so that formation of PCDDs and PCDFs is minimized. Treatments include use of pre-heaters, electrostatic precipitators, fabric filters and

activated carbon filters.[1] It has been reported that PCDD and PCDF concentrations within cement kiln dusts range between 0.4 and 2.6 ppb.[2,3] Accordingly, recovered cement kiln dusts should be put back into kilns to the maximum extent practicable, while the remainder may require disposal in a specially engineered landfill or permanent storage in an underground mine or formation".

31. **Task 9:** Due to by-pass equipment, it is possible to incinerate waste with a higher chlorine content, because a part of the volatile metal-chlorides are evacuated from the process. The co-incineration of waste changed the quality of CKD. The effects on composition and leachability of heavy metals should be studied in the BREF, as well as the treatment options for this residual waste: re-introduction in the process, mixing with clinker, other recovery possibilities or final landfilling.

Fuel characteristics

32. **Suitability and standardisation of fuels:** Since the original BREF was developed, work has been done by various organisations, including ERFO (the European Recovered Fuel Organisation) and CEN Working Group TC343, to assess the suitability of substituting waste as a fuel and developing fuel standards. The work of these groups should be reviewed by the TWG to ensure that BATs on the suitability of substituting waste as a fuel are developed and examples of fuels considered. The cement industry has placed much emphasis on the contribution of "substitute fuels" to sustainable development and reduction of use of fossil fuels and this should be assessed. Points to be considered include:

    a. Energy balance – do the wastes have a sufficiently high calorific value to contribute to the process?
    b. Reference fuel – for any comparisons to being meaningful a reference fuel is essential. It would also help to have a temperature profile of the system for the "reference mass of gas" (no waste, reference fuel, for each process).
    c. The development of a methodology for assessing the suitability of a fuel
    d. The design of storage/preparation plants. This needs to be covered as there is only a brief reference in the original BREF to the need to design plants to be multi-purpose because "supplies of waste suitable for use as a fuel tend to be variable".
    e. When waste is used as a fuel in the main burner what is the influence of the higher temperature requirement on the CO_2 production (compared to a high temperature incinerator) ie in an incinerator the temperature is in the range of 850°C to 1100°C. In the cement kiln, in the main burner the temperature has to be around 2000°C. What is the resulting energy requirement and corresponding CO_2 emission?
    f. It is clear that certain emissions (especially CO_2) depend on the type of fuel or waste used. What is the difference in CO_2 production when using the various types of fuel/waste for the same energy requirement by the process.

Energy Requirements

33. **Mass and energy balances:** in the different mass and heat balances shown in the BREF and any future examples given, precise references should be made to the type of fuel used, their characteristics and to the corresponding CO_2 emissions

1 See CMPS&F – Environment Australia, 1997; Karstensen, 2001 and UNEP, 2004c in annex V, References.

2 TEQ were not indicated.

3 See UNEP 2004c in annex V, References.

(emissions per kg of clinker). This applies for all types of process: wet, dry, semi-wet, semi-dry and should show the energy consuming steps: (pre-heater, dryer, main burner, mid kiln input etc) and, where relevant, the type of natural raw material.

This should also be presented under the form of energy requirement (enthalpy and level of enthalpy) for the various phases of the process, given that energy transferred is the result of a loss of temperature for a given mass of hot gases.

34. **Task 10**: A methodology should be developed to determine if the replacement of a fuel by a waste contributes positively to the energy balance of a cement kiln. Specific attention should be paid to the water content and the carbon-hydrogen ratio of the waste which is used. This methodology should be harmonised at EU-level so that the application by local authorities is the same in every Member-State and for every co-incinerating cement kiln.

EU Emissions Trading Scheme (ETS):

35. **Provisions of new Directive:** Directive 2003/87/EC on emissions trading defines in annex IV a formula for the determination of CO_2 emissions on the basis of activity data, emission factors and oxidation factors. Activity data are based on data of amounts of used fuel types and specific productivity data.

36. **Current situation:** From data available in the EPER, it appears that some kilns have been given CO_2 allowances identical to those declared in the last EPER figures – it is not clear how these allowances have been calculated. This would appear to be incorrect given that biomass is being co-incinerated in some of these kilns (biomass should not be included as it is excluded from the ETS). On its website, Cembureau states that the industry contributes 3% of the anthropogenic emissions of CO_2 in the EU. The cement industry argues that by substituting fuel with a waste, the industry is helping to combat climate change. Our initial analysis indicates that these claims are not always as robust as the industry would assert, especially regarding the efficiency of some of the replacements. We are aware that some modelling has been done to assess these claims and this modelling should be the reference used in the EU.

37. **Task 11**: A harmonised allocation model for CO_2 credits in the scope of the EU Directive on emissions trading should be developed taking into account the difficult issue of mixed and variable fuel input in the cement industry. This methodology should be harmonised at an EU-level so that the application by local authorities is the same in every Member State and for every co-incinerating cement kiln.

38. **Task 12**: a publicly-available model should be developed to quantify the environmental benefits of substituting waste as a fuel, particularly in relation to the impact on CO_2 emissions. This methodology should also be harmonised at an EU-level so that the application by local authorities is the same in every Member-State and for every co-incinerating cement kiln.

Risk management

39. **Provisions of new Directive:** Handling of hazardous and specific waste streams for co-incineration requires specific BAT-practices. The WID refers to these items in several articles, e.g. Article 5 on delivery and reception of waste and Article 9 on handling of dry residues in the form of dust etc. All the relevant provisions should be covered in the BREF.

40. **Task 13:** Specific BAT should be defined for following topics:

- Acceptance and delivery control
- Occupational health and protection for workers, more stringent operating rules and possibly different personal protection equipment
- Emission of diffuse VOC and dust as result of storage of hazardous waste
- Emission of dust as result of storage of non-hazardous waste
- Fire prevention and fire fighting infrastructure

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