ecra

european cement research academy

Newsletter 1/2005

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The first two years of ecra – review and future prospects

The European Cement Research Academy is no longer in the fledgling stages

At the beginning of 2003, the European Cement Research Academy was founded as a first step towards a European research platform. For two years now the Academy has developed into an exchange forum for research activities focusing on cement production and concrete application. Experts from the cement industry, the Research Institute in Düsseldorf as well as from equipment manufacturers and renowned institutions have contributed to the seminars and workshops. For the first time ecra organized an international conference on "Innovation and Future Developments in Cement Production and Concrete Construction", held in November 2004 in Amsterdam.

During the first two years the ecra seminars, workshops and the conference attracted participants from all over the world. Though the main source naturally was Europe, visitors came, e.g., from Australia and India, Nigeria and the USA as well. All in all, representatives came from 38 countries. Through these contacts ecra got requests for specific training courses and dedicated consultant services.

Right from the beginning, the interest in an ecra membership has been high and it is still increasing. At this time the Academy counts 33 members, even from non-European countries like Australia, India and the United States, to mention but a few (**table 1**).

The greatest number of seminars and workshops took place so far in Düsseldorf in the Research Institute of the Cement Industry. The ecra takes advantage of the excellent meeting and conference facilities the Institute provides. It can also easily revert to the Institute's scientists and its large pool of knowledge on cement production and concrete construction. All events were carefully evaluated since ecra strives to continuously improve its work. A major challenge faced often is to address participants who want to gain first insights into a topic whilst providing detailed information for those who are already experts in that field at the same time. It always has proven to be most important, however, to give sufficient time for discussion and personal contacts.

During the first two years, many events focused on subjects dealing with emissions, alternative materials and – in workshops – clinker microscopy, chromate analysis and emission monitoring. Those events which proved to attract the greatest interest will of course either be repeated or a complementary follow-up will be offered.

The seminar which has met the greatest interest as yet was the one on "Experiences with Precalciner Kilns" which took place in Bernburg in close collaboration with Schwenk Zement KG. Due to the positive experience with this kind of seminar some of the forthcoming events will be organized again in cooperation with ecra member companies.

Last year's highlight was no doubt the "First International Conference on Innovation and Future Developments in Cement Production and Concrete Construction" held in Amsterdam on November 12. A wide range of subjects - from the European cement industry's saving natural resources to underground transport routes - were covered. Several participants expressed great interest in a repetition of the conference every year or at least every two years.

ecra's newsletter which is published at irregular intervals (four to six times per year) accompanies the events and describes their topics on a more general level. The response to the newsletters is very positive.

ecra's Technical Advisory Board which steers the Academy and decides upon the subjects of the seminars and workshops is staffed with members of leading European cement companies (in alphabetical order: Buzzi, Cemex, CRH, Dyckerhoff, HeidelbergCement, Italcementi, Schwenk and Titan).

A change at the top of the Academy took place in July 2004: Håkan Fernvik, one of the founders of ecra, retired. Daniel Gauthier took over chairmanship. With deep

Aalborg Portland A/S	**Italcementi Group**
ANNELIESE Zementwerke AG	**jura cement**
BUZZI UNICEM S.p.A.	**LAFARGE CTEC GmbH**
Cement Australia PTY LTD.	**Nesher Israel Cement Enterprises**
Cementeria Aldo Barbetti S.p.A.	**Phoenix Zementwerke Krogbeumker GmbH & Co. KG**
Cemex Trademarks Services, Ltd	**Portland Cement Association**
Cemsuisse	**Portlandzementwerk Wittekind**
Ciments Luxembourgeois S. A.	**Povaská Cementáren, a.s.**
CIMPOR SGPS, S.A.	**Readymix AG**
CRH Ltd.	**SCHWENK Zement KG**
Dyckerhoff AG	**Spenner Zement GmbH**
Gujarat Ambuja Cements Ltd.	**Suwannee American Cement**
HeidelbergCement Group	**Titan Cement Company S.A.**
Hellenic Cement Industry Association	**Verein Deutscher Zementwerke**
Holcim (Baden-Württemberg) GmbH	**Vereinigung der Österreichischen Zementindustrie**
Holcim (Deutschland) AG	**Wietersdorfer & Peggauer Zementwerke GmbH**
Holcim (Schweiz) AG	

Table 1: ecra member companies and associations (March 2005)

regret we had to announce the death of Giuseppe Pintor of Italcementi. Luigi Cassar took over his place as a member of the Technical Advisory Board. CRH will be represented by Henry Morris in the future, who succeeds Declan Doyle. Wim van Loo of HeidelbergCement joined the Board beginning of 2005.

The conclusion of two years' work with ecra is throughout a positive one. Ideas and suggestions have been welcomed, thoroughly considered and more than once put into practice. No doubt, ecra is on a good way that will prove to be more and more important in the future.

ecra conference in Amsterdam, November 2004

CO_2 monitoring according to EU guidelines leads to high costs

Companies have to propose appropriate technical monitoring schemes to their authorities

In January 2004 the European Commission has adopted guidelines for CO_2 monitoring and reporting within the CO_2 emissions trading scheme. These guidelines are applicable to all industrial sectors covered by the trading scheme. In European member states which have not implemented the EU guidelines into national legislation these have to be applied directly. As some of the contained rules are technically not appropriate or would lead to excessively high costs, the cement companies have to propose an appropriate monitoring scheme to their authorities.

CO_2 emissions trading requires a monitoring of all covered installations and companies which is reliable, verifiable and feasible. The "Guidelines for the Monitoring and Reporting of Greenhous Gas Emissions" adopted by the European Commission contain among others detailed requirements for the monitoring of CO_2 emissions from the clinker burning process in the cement industry. From the cement industry's point of view these – partly incorrect – methods as well as the required analytical effort are not appropriate. Furthermore the guidelines do not recognise the established and proven monitoring and reporting schemes of the cement companies.

The cement industry's proposal

In order to achieve unilateral rules for the CO_2 monitoring in the cement industry the Research Institute of the Cement Industry has proposed a methodology which has been approved and published by the European cement association CEMBUREAU in early 2005. This paper identifies weak points in the guidelines and evaluates the described methods with regard to their technical and economical feasability. Furthermore it describes the current practices which are used in the cement industry and which are in line with the spirit of the guidelines.

High requirements

The EU guidelines provide for different requirements with respect to the uncertainty of the data being monitored depending on the total emission of an installation. The distinction into three groups is drawn: up to 50,000 t CO_2 per year, between 50,000 and 500,000 t CO_2 per year and above 500,000 t CO_2 per year. As the specific CO_2 emission of the clinker burning process is relatively high, most cement plants in Europe will belong to the two last mentioned groups.

The requirements according to the uncertainty and the methods for the establishment of the fuel-related CO_2 emissions are presented in **table 1.** According to these requirements cement plants have to analyse their solid fuels regularly for their calorific value and carbon content. Many cement plants are used to analysing the calorific values of most of their fuels in the plant laboratory. However, used tyres represent a special case, because the preparation and analysis of samples is very costly. Depending on storage facility, weather and size, more or less water can be contained in the tyres which then is introduced into the combustion process. As the composition of tyres, however, is comparatively uniform, the cement industry proposes to use a fixed net calorific value as well as a standard emission factor for tyres as fuel.

The EU guidelines also require the analysis of emission factors if the total emission of the installation exceeds 500,000 t per year. However, Annex IV of the Emission's Trading Directive imposes the use of accepted emission factors and mentions that default factors are acceptable for all fuels except non-commercial ones. This is understood to mean fuels derived from waste. Therefore the analysis of fuel carbon content should only be necessary for waste fuels.

If the elementary analysis for the carbon content has to be done in addition, the plant lab has to be equipped with additional analysers, or an external lab has to be commissioned. The analytical result should be used to build a larger data base. This should allow to determine statistically robust emission factors (standard values) for such fuels in a mid-term future. Furthermore, new guidelines require the analyses to be carried out in a laboratory accredited according to EN ISO 17025. As a plant lab usually is not accredited according to this ISO standard, this requirement would lead to significantly higher costs.

This is also true for the monitoring of the process-related CO_2 emissions for which either an online measurement of the clinker production with a very high accuracy or a representative balance of the whole process is required. Both methodologies are not possible without excessively high additional efforts.

For the determination of the quantity of fuels used, the method which uses purchases and corrections related to changes in stock is recommended. All fuel quantities that are delivered to the plant are weighed with calibrated scales or determined on the basis of registered ship's draught. The calibrated weighing can be performed either by the operator or by the supplier.

Determination of process related emissions

The idea of the EU guidelines is to achieve a very high accuracy of the total CO_2 emissions of the installations based on a number of very precise single measurements or analyses. As most of the measuring devices in the cement plants have been installed for process control reasons, the high accuracy required by the EU guidelines cannot be guaranteed in many cases. Therefore many cement companies have established a methodology for the determination of their production and consumption rates by balancing the process. The balance bases on an input and output calculation. The input calculation uses the kiln feed and the kiln feed/clinker ratio to calculate the produced quantity of clinker. It takes the quantity of the preheater dust into account which leaves the clinker burning process directly with the preheater exit gas. The fuel ashes as well as secondary raw materials which are not introduced by the raw meal path are also taken into account. The kiln feed/clinker ratio is usually determined at larger intervals. The result of this calculation is the quantitiy of clinker from the kiln which is being transported to the clinker storage facility.

For the purpose of a cross check calculation on the output side, many cement plants maintain detailed inventory and production statistics, which make the calculation of the clinker production from the cement deliveries possible. Both calculation methods have their respective inaccuracies. By comparing the quantities of the consumed and produced mass flows of input materials and products a detailed accounting treatment of the entire cement production process is possible (**fig. 1**). Corrections in the booked amount are required since both methods usually do not lead to the same results. Depending on the production site the parameter with the greatest uncertainty in the determination will usually be corrected. This can for instance be the kiln feed/clinker ratio, the stock in the clinker storage facility or another parameter.

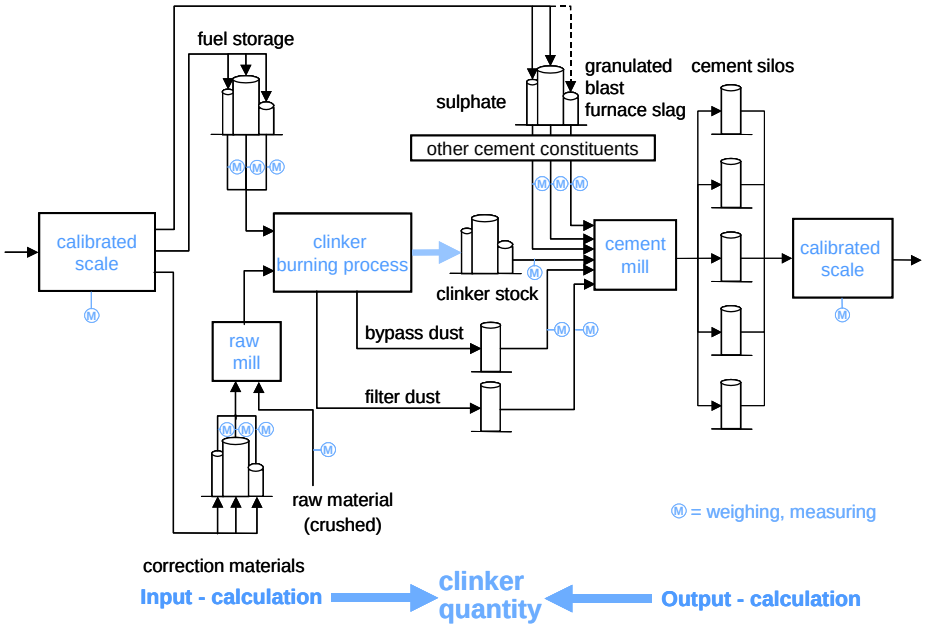

Fig. 1: Determination of clinker quantity for CO_2 monitoring (cement industry's proposal)

CO_2 emission total	50,000 - 500,000 t CO_2/year		> 500,000 t CO_2/year	
	Tier Level	Permissable uncertainty [%]	Tier Level	Permissable uncertainty [%]
I Fuel quantity				
a. Via continuous measurement				
Gaseous, liquid fuels	3a	± 2.5	4a	± 1.5
Solid fuels	2a	± 5	3a	± 2.5
b. Via purchase				
Gaseous, liquid fuels	3b	± 2	4b	± 1
Solid fuels	2b	± 4.5	3b	± 2
II Net calorific value				
Gaseous, liquid fuels	2	country-specific standard values	3	Analyses
Solid fuels	3	Analyses	3	Analyses
III Emission factor				
Gaseous, liquid fuels	2a	country-specific emission factors	3	Analyses
	2b	approximate values[1]		
Solid fuels	3	Analyses	3	Analyses

[1] not relevant for the cement industry

Table 1: Permissible uncertainties for the determination of fuel-related CO_2 emissions from clinker burning process (acc. to the EU Guidelines)