

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

## ECO-SERVE workshop "Cluster 3, Aggregate and Concrete Production"

**Meeting date:** 2 - 3 February, 2004

**Agenda:** The programme for the workshop was the following:

Chairman: Torbjörn Muhr, Co-ordinator of Cluster 3

### Monday, 2 February 2004:

- 12:00 Registration at Danish Technological Institute
- 13:00 Workshop opening, Mette Glavind (MEG), Danish Technological Institute
- 13:15 General presentation of cluster 3, Torbjörn Muhr (TBM), NCC Sweden
- 13:30 Short (2 minutes) individual presentations of each of the workshop participants
- 14:15 Coffee break
- 14:50 Presentation of Task 2 of the management part of ECO-Serve, Mette Glavind (MEG), Danish Technological Institute
- 15:00 Baseline on aggregate production, Edda Lilja Sveinsdottir (ELS), IBRI
- 15:30 Baseline on concrete production, Dorthe Mathiesen (DMA), Danish Technological Institute
- 16:00 Group discussions (aggregate and concrete)
- 17:15 End of day one
  
- 19:00 Workshop dinner in Copenhagen sponsored by NCC Sweden.

### Tuesday, 3 February 2004:

- 09:00 Group discussions...continued
- 10:30 Presentation of group discussion synthesis
- 11:30 Lunch break
- 12:30 Presentation of environmental visions for aggregate industry, Jan Bida (JAB), UEPG
- 13:00 Presentation of environmental visions for concrete industry, F. Biasioli (FRB), ERMCO
- 13:30 Future research needs, Svein-Willy (SVW), Frazefoss
- 13:45 Closure summing up the workshop results, Torbjörn Muhr (TBM), NCC Sweden
- 14:00 End of workshop

**Participants:** The participants in the workshop can be seen in the minutes from the group discussions (see Appendix 1 and 2).

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

The main topic of the workshop was to gather the members of Cluster 3 and discuss the draft baseline report and to get the members input and comments to be able to complete the baseline report in June 2004.

The workshop was organised partly as a series of presentations, in order to provide the members with a common frame of reference, and partly as group discussions on concrete and aggregate respectively.

The presentations from the workshop will be available from the website of ECO-SERVE: [www.eco-serve.net](http://www.eco-serve.net).

## ***Welcome***

TBM opened the workshop welcoming everyone and introduced the programme for the workshop.

## ***Workshop opening by Mette Glavind, Danish Technological Institute***

MEG welcomed everyone at Danish Technological Institute and presented shortly Danish Technological Institute and the Concrete Centre.

MEG introduced the workshop participants to the main activities of the whole ECO-SERVE network.

## ***General presentation of Cluster 3 by Torbjorn Muhr, NCC Roads***

TBM presented the planned activities and the members of Cluster 3.

The objective of Cluster 3 is to contribute to the reduction of environmental impact of aggregate and concrete production, to make them more cost-effective while improving or at least maintaining the technological performance.

The milestones in the Cluster work were also presented:

1. Establishing of Network members;
2. Workshop (gather information from members);
3. Baseline Report (to be finished in June 2004);
4. BAT report;
5. Guidelines for aggregates and concrete production.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

The reimbursement was shown to the participants and it can be summarised as follows:

Travel and subsistence costs: Max. 5.000€ (1.500€ the first year; 1.500€ the second year; 2.000€ the third year);

Personnel and computing costs: not reimbursed.

Information regarding bank account was asked to be sent to the co-ordinator of the Cluster.

### ***Short individual presentation***

All workshop participants introduced themselves.

### ***Presentation of Task 2 of the management part of ECO-SERVE by Mette Glavind, Danish Technological Institute***

MEG presented the main activities in Task 2 “Environmental benchmarking and indicators”

The idea of Task 2 is to be able to quantify environmental improvements in an operational way from the data gathered in the 4 clusters of ECO-SERVE.

Indicators from ECO-SERVE were stated as follows: environmental impact, working environment, contribution to growth and wealth by increasing productivity, competitiveness and quality.

When evaluating environmental technologies it is important to look into the entire life cycle of the products considered, even though ECO-SERVE is focused on the production phase.

Task 2 is working in three levels; the baseline representing the current practise and the average level, the BAT level (best available technology) representing the highest level of current practise, and finally the R&D level representing the visions for the industry.

Calculations will be carried out in order to place environmental technologies in these three levels. The timetable of Task 2 is the following:

Indicators representing the Baseline	→ 1 <sup>st</sup> March 2004
Indicators representing the BAT	→ 1 <sup>st</sup> June 2004
Indicators representing the RTD	→ 1 <sup>st</sup> January 2005

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

### ***Baseline on aggregate production by Edda Lilja Sveinsdottir, IBRI***

ELS introduced the general chapters representing both concrete and aggregate in the baseline report.

The structure of the baseline comprises an introduction part (with background information, objectives, definitions and terms), a chapter on aggregate production, a chapter on concrete production and a chapter on research needs.

ELS then presented the chapter regarding aggregate production making an overview of the current practise and on-going research activities in the field of sustainable aggregate addressing the situation within their economical, societal and political issues.

ELS underlined that this baseline report is only a draft and that the members input is of great importance in order to finalise the report. The baseline report shall create the foundation to determine BAT and input for preparing guidelines on environmentally friendly aggregate and concrete production.

### ***Baseline on concrete production by Dorte Mathiesen, Danish Technological Institute***

DMA presented the draft baseline on concrete production. The structure of the concrete chapter is similar to the chapter regarding aggregate.

DMA also mentioned the importance of getting inputs from the members for the report and underlined that the report at this stage is only a draft.

Jørn Bødker from Danish Technological Institute presented an environmental issue from the Danish concrete industry, which is very much in focus right now. JB presented results from a Danish project financed by the Environmental Protection Agency regarding hydrocarbons in concrete slurry which cause the concrete manufacturers high costs in deposit taxes due to the high amount of hydrocarbons in the concrete sludge.

JB asked if this is a European problem, but it seems that it is not required to carry out analysis to register the amounts of hydrocarbons in any other European country.

The main sources of hydrocarbons are from release oil (mineral), lubricants and fuel.

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

## ***Group discussion of aggregate***

See Appendix 1

## ***Group discussion of concrete***

See Appendix 2

## ***Presentation of group discussion synthesis***

Thorbjörg Holmgeirsdottir, ERGO presented the main conclusions from the group discussion of aggregate and Claus Nielsen, Danish Technological Institute presented the main conclusions from the group discussion of concrete. These conclusions are included in the minutes from the group discussions in the sections above.

## ***Presentation of environmental visions for aggregate production by Jan Bida, UEPG***

JAB made a presentation on environmental priorities for the European Aggregate Industry and started with the presentation of the UEPG – members, structure, vision and mission, strategic objectives and environmental issues.

The quantities of aggregate production worldwide and also in European countries were shown as well as the EU standard's “history” and the aggregate trades over the borders.

The presentation can be seen on the ECO-Serve website.

## ***Presentation of environmental visions for concrete production by Francesco Biasioli, ERMCO***

FRB made a presentation on environmental visions for the concrete industry focusing on sustainability as a development tool.

FB talked about general aspects regarding sustainable development and presented sustainable development strategy and policies and introduced sustainable development in the concrete industry focusing on cement aggregates and concrete.

The presentation can be seen on the ECO-Serve website.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

### ***Research needs by Svein-Willy Danielsen, Franzfoss Pukk AS***

SWD made a presentation on research needs on aggregate and concrete industry mentioning:

- Technological foresight;
- Challenges for research.

SWD pointed out 4 urgent areas where research is needed:

- Concept development
- Production technology
- Basic materials knowledge
- Application technology for materials.

The baseline report will include a chapter where future research needs for aggregate and concrete production is discussed.

### ***Closure summing up the workshop results by Torbjörn Muhr, NCC Roads***

TBM thanked everyone for their participation in the workshop and told that the next step is being the finalisation of the baseline report.

TBM invited the members who have not already answered the questionnaires to send them to him as soon as possible.

## Appendix 1, Group discussion of aggregate

2/2/2004/PH

### Topics for discussion

1. **Sustainable development**
  - a. Is it an issue in your country? – Economical, Societal, Political
  - b. Is it implemented into some kind of regulations?
  - c. Environmental Indicators!
  
2. **Environmental issues**
  - a. What kind of environmental issues are related to the aggregate industry?
  - b. Conflicts?
  
3. **Production & Technologies**
  - a. Aggregate specifications
  - b. New technologies
    - i. Machinery?
    - ii. Processes?
  - c. Manufactured sand
    - i. Surplus fines
  
4. **Production statistics**
  - a. Key figures
  - b. Trade/Material flow
  - c. Terminology
  - d. Surplus Materials
  
5. **Recycled material**
  - a. Key figures
  - b. Material flow
  
6. **R&D projects**
  - a. Research needs

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

## Participants of the aggregate group discussion

Börge Wigum	ERGO Engineering Geology/Hönnun hf.	<a href="mailto:wigum@honnun.is">wigum@honnun.is</a>
Edda Lilja Sveindottir	IBRI	<a href="mailto:els@rabygg.is">els@rabygg.is</a>
Erik Bruun Frantsen	Danish Technological Institute	<a href="mailto:Erik.Bruun.Frantsen@teknologisk.dk">Erik.Bruun.Frantsen@teknologisk.dk</a>
Fidel Peña	Dragados Obras y Proyectos, S.A.	<a href="mailto:fpm-dragados-constr@dragados.com">fpm-dragados-constr@dragados.com</a>
Finn Thøgersen	Vejdirektoratet	<a href="mailto:Fit@vd.dk">Fit@vd.dk</a>
Giuseppe Bonifazi	UNIVERSITA' DEGLI STUDI DI ROMA "LA SAPIENZA	<a href="mailto:giuseppe.bonifazi@uniroma1.it">giuseppe.bonifazi@uniroma1.it</a>
Jan Bida	The European Aggregates Association	<a href="mailto:Jan.bida@sbmi.org">Jan.bida@sbmi.org</a>
Jan Lindgård	SINTEF Civil and Environmental Engineering, Cement and Concrete	<a href="mailto:Jan.Lindgard@sintef.no">Jan.Lindgard@sintef.no</a>
Kirsten Pommer	Danish Technological Institute	<a href="mailto:Kirsten.Pommer@teknologisk.dk">Kirsten.Pommer@teknologisk.dk</a>
Peer Neeb	NGU	<a href="mailto:Peer.neeb@ngu.no">Peer.neeb@ngu.no</a>
Per Hedvall	Sandvik Rock Processing, Process Technology Center	<a href="mailto:per.hedvall@sandvik.com">per.hedvall@sandvik.com</a>
Phillip Marchione	Umbria Filler	<a href="mailto:phillip@umbriafiller.com">phillip@umbriafiller.com</a>
Svein Willy Danielsen	Franzefoss Pukk AS	<a href="mailto:svein-willy.danielsen@franzefoss.no">svein-willy.danielsen@franzefoss.no</a>
Terje Bøe	Franzefoss Pukk AS	<a href="mailto:terje.boe@franzefoss.no">terje.boe@franzefoss.no</a>
Þorbjörg Hólmgeirsdóttir	ERGO Engineering Geology/Hönnun hf.	<a href="mailto:thh@honnun.is">thh@honnun.is</a>

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

## **Minutes of the group discussion of aggregate**

### General discussion on Environmental Indicators

- There is ongoing work with the UEPG on environmental indicators in association with the industry; this work also includes economical and societal indicators. Amongst these are:
  - Water demand
  - Land demand
  - Land management
  - Use of dangerous substances
  - Environmental incidents
- Another important issue is transport distances, for instance the use of local quarries may reduce transport distances.
- As a rule of thumb, the energy consumption per ton of produced aggregates is about 10 kW. This is relatively small compared to the energy consumption of concrete and it can be stated that the energy consumption in the production of aggregates has limited effects when we take a holistic look at the concrete production.
- Energy types used: Mixed. The aggregate plants are either fixed or mobile; the fixed plants normally use electricity whereas the mobile units run on fossil fuel. When looking at the efficiency, all comparison of these two types of plants is difficult.
- The major energy savings may be made in the transportation. For instance, a survey in Denmark showed that about 2/3 of the energy used within the aggregate production was for transport within the pit itself. Note that here we are talking about sand & gravel and not crushed rock; the energy balance is different there.

SWD: The energy issue is a very complicated issue, e.g. how many factors should we include? Designers may not always look at the whole picture when they make their savings, relatively small savings in one area may lead to greatly increased transport distances.

Jan Bida: Energy indicators – we need to specify what is meant.

BJW: We may need a holistic view.

Finn: Cluster 4 has mainly been looking at cement-bound applications, may need to take a broader view.

BJW: Environmental indicators – complex matter.

Terje: Transportation – need to take that into account – wherever possible, the production should be close to the market, perhaps the production of aggregates, concrete and recycled material should be at the same place.

Fidel: Could be difficult in practice in Spain – different material sources for different use.

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

- Per Hedvall: Dust – is a big issue. The form release oils are partly used for dust protection – often forgotten to look at the whole picture.
- Jan Bida: Transportation distances on average < 15 km in Europe.
- SWD: Find an indicator that can calculate all energy consumption.  
Focus on three indicator groups:
1. **Energy**
  2. **External environment**
  3. **Use of resources**
- Indicators need be quantifiable.**
- BJW: **Why be more sustainable?** What is the industry's gain?  
Regulations? Taxes?
- Erik: Implemented in Danish regulations – also have a lot of tools to regulate.  
Taxing: Pure taxation, no carrots to increase sustainable development.
- Jan Bida: In Sweden, there is only tax on sand & gravel quarrying in order to save these deposits – there is demand to substitute natural sand & gravel with crushed rock. However, this will increase cost and increase transport and is not necessarily approved by the industry.  
Taxes in Sweden are not dedicated to a specific use, charges & fees are.
- Fidel: There are no taxes in Spain.
- Jan Bida: The highest taxation in Europe on all extraction is in the UK.
- Erik: Taxation in Denmark is on all aggregates.
- ELS: What is the influence of taxation?
- Jan Bida: The answer to that question depends on who answers; the ministry claims that the moment taxation was put into practice, sand & gravel extractions decreased. However, the industry claims that the decrease in S&G extraction coincided with changes in specifications which were not in favour of S&D properties.
- Terje: No taxation in Norway.
- SWD: We will face depletion in S&D resources in the coming years.
- Peer Richard Neeb: Transport is not only on land but also on sea – sea transport is very important in Norway, allows for longer transportation distances.
- SWD: **Define sustainable aggregate production** within the aggregate industry. We must also be careful: One solution may create another problem – e.g. replacing natural S&G with manufactured sand may result in large quantities of surplus fines that need dumping.
- BJW: **Waste fees/taxation?**
- Erik: High cost for depositing e.g. concrete slurry, same price for all non-hazardous industrial waste.
- Terje: ..... Proportion from EU .....
-

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

- Jan Bida: ..... General taxes on all aggregate waste will shortly come into action.  
Most of the aggregate waste is non-active.
- Erik: How is it possible to distinguish between different types of material, according to origin? .....
- BJW: Land planning – how is the situation? Norwegians are starting to go underground.
- Phillip: Almost impossible to open up new quarries in Italy. There are monthly inspections regarding e.g. waste and sewerage, if the visited company does not meet the regulations it may expect a ticket and fines, accumulated fines may lead to closure.
- Giuseppe: Need to consider both the land used for quarries but also the total impact:  
Visual – an ugly site reduces the value of land nearby  
Dust produced  
Noise  
Land  
These are the main reasons why it is almost impossible to open new quarries.
- Is it a solution to go underground?
- Erik: The main arguments for **turning down quarry applications** in Denmark are:  
Environmental care  
Landscape – the effects on landscape  
The land has been planned for other use  
**The main arguments for approval:**  
The area is already planned for aggregate production.
- Terje: Planning – very important. It is also very important to distinguish between **unwanted** and **unnecessary** – these are not the same! This is a conflict; need to make a distinction between these two because the society needs these aggregate products. It is also important to bear in mind that quarries cover small areas compared to cities.
- Jan Bida: A drastic change in how Swedish authorities deal with applications for new quarries. Now: A greater group of stakeholders can complain and have a say in the approval of new quarries. It is now almost impossible to get approval of new quarries and it may even be difficult to prolong current quarries.
- In Italy: New quarries only get about 2-3 years approval, which means that it is almost impossible for producers to invest for such a short time.
- Terje: Long term planning is best to avoid conflicts – it is also important to maintain a good relationship between the aggregate industry and the society.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

3/2/2004/PH

- BJW: Production & technology: Specifications – new technology – manufactured sand. Anything new in the view?
- SWD: Production and technology – manufactured aggregates in Norway, are very close to being able to replace S&G with manufactured sand (MS).
- BJW: Have other countries experience with this?
- SWD: MS is the fraction from 0-4 mm. Norw. can now replace a large fraction of the natural sand with MS, reduce cement and get a better concrete.
- Jan Bida: Manufactured aggregates according to the EN standards are not what the Norw. mean by MS, but slag and the like. In Sweden term crushed rock aggregates is used. –
- General: Terminology, although we have standards, can still cause some confusion.
- SWD: The Norwegians are close to solving many of the problems associated with crushing rock – especially the fine fraction.
- Per: The type of the raw material plays a very important role – determines the properties of the final product. – In Sweden, the amount of cement is increased when manufactured sand is used.
- SWD: Production technologies in the concrete production are fundamentally different depending on the geological origin.
- Jan Bida: A research project – financed partly by the state and the industry – future aggregates – crushed rock aggregates.  
The trend is to reduce the amount of natural S&G – due to depletion of resources.  
Properties of S&G are very different from the properties of MS – particle shape and surface roughness. The Swedish experience is that more water and more cement are required.
- SWD: The modern technology allows us to play with the aggregates use this difference to our advantage – the specific surface is different using flocculation theories and with the help of the right admixtures the amount of cement can be used. There is a Norw. example where there was a reduction in cost when natural S&G was replaced by MS.  
There is a big difference between crushed mica and “natural” mica.
- BJW: Anything going on in this field in the South?
- Fidel: Some private work in this field.
- Erik: Nothing in Denmark, there is no apparent need for work in this field, S&G resources are ample.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

- Jan Bida: A difference between N Europe and the rest due to glaciations. Dolomites and limestone are the coarse aggregate and natural S&G are the fine aggregate. Causes no shape problems and no affinity problems, whereas problems arise when the coarse aggregate is substituted with granite and gneiss.
- Giuseppe: The main problem in Italy is not a resource problem but a license problem. – Quality aspects are, however, of importance. The customer wants something that is easy to use, cheap, has consistent properties. Small companies vs. larger companies – different in terms of consistent properties – however transport cost may be higher for the material from the larger companies.
- BJW: Comments on the new standards?
- Jan Bida: Not a new way of thinking but a standardized way of thinking. – The standards all tackle aggregate properties – The standards all include a FPC (Factory Production Control) –
- SWD: The standards refer to standards in the place of use. How do we overcome the different ways things are carried out in practice?
- Jan Bida: It is still a possibility to use the same procedures as have been used over the years. – Environmental issues are not addressed in the present generation of the standards. These are for natural aggregates and in theory also for manufactured aggregates (e.g. slag) and recycled aggregates, however, they discriminate against the latter. Not clear whether there will be separate standards for recycled aggregates.
- Fidel: Standards ready in Spain, don't know about the producers.
- Phillip: The same in Italy.
- Erik: Third party control has been the standard practice in Denmark for many years, the national specifications will probably also be ready. How will the government regulate that the standards are complied to?
- Terje: The main point is that knowledge is used in practice.
- Jan Bida: Regarding the FPC, it is up to each country to decide which level of attestation is used. The UK uses up to four levels – no third party supervision. The customer, however, makes the ultimate requirements – in Germany 2+.
- ELS: In Iceland – aggregate producers have not started to think about this, not decided which level of attestation. If the national requirements do not ask for it, we don't need to declare it, except for threshold values. The customer however may require the information.
- General: In most of the countries, there are national specifications. – The question is how it is controlled.
- Terje: No-waste production should be a goal. All material taken for production should be used.
- BJW: How is the situation today? How can we change it?

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

- Erik: Waste is not a problem in Denmark. People are starting to try to produce more fines for SCC.
- SWD: If the quarries are well planned, regarding end-use, then waste is rarely a problem in Norway. It is not only the quarry owners that need to answer these questions; the authorities need to formulate a view on how these issues are handled.
- Phillip: Quarry owners need to take care of all waste – aggregates are washed to rid them of clay – there are strict controls on how this is handled. The amount of surplus material is on average 20%.
- Jan Bida: Statistics normally not available on this subject, it is not a favourable subject. Topsoil cover is generally thin in North Europe, but can be huge in other parts of Europe. Can be used to backfill the quarries but in some countries this is not allowed.
- Erik: To meet a good mass balance is not only a question of production etc but also the society's demand for products and their properties. Fines are not a problem but mass balance is a problem, due to requirements of the society.
- SWD: Maybe it is not good to have too high technical requirements but have the emphasis on the environment.
- Per: We are on the way of the “new” product way of thinking, not there yet but on the way. There are a huge amount of solutions but these are not necessarily good solutions.
- BJW: Production statistics – refer to the baseline draft – asking for updated information. Terminology is also a problem in this context. Recycled material – the issue has been touched in this discussion. This will be updated.  
**Research – current research projects.** We are constantly re-searching something that as already been re-searched. To make this re-search and research more focused, all input from members regarding on-going national and international research projects.  
**Research needs** – we have this network – how can we use it to make an impact in the future on this industry?
- Giuseppe: An advantage of the network is to meet colleagues from the industry and share experience. In spite of differences in thinking and lifestyle, we still can share ideas and experience and expertise, whether from the North or the South. Think up projects so the individuals from this industry may continue to meet and continue the sharing.

## Appendix 2, Group discussion of concrete

### Participants

There were following participants in the concrete group:

Christoph Müller ( <b>CM</b> )	Forschungsinstitut der Zementindustrie, Abteilung Betontechnik, Germany (representing Cluster 2 Blended cement)	mc@vdz-online.de
Francesco Biasioli ( <b>FB</b> )	ERMCO Secretary General, Italy	fb@ermco.org
Francesco Santonicola ( <b>FS</b> )	CTG Italcementi Group, Italy	<a href="mailto:l.ravelli@itcgr.net">l.ravelli@itcgr.net</a>
Genowefa Zapotoczna-Sytek ( <b>GZS</b> )	CEBET, Poland	<a href="mailto:gzapotoczna@cebet.waw.pl">gzapotoczna@cebet.waw.pl</a>
Jacek Kucinski ( <b>JK</b> )	CEBET, Poland	<a href="mailto:Kucinski@ippt.gov.pl">Kucinski@ippt.gov.pl</a>
Jacob Bjerre ( <b>JB</b> )	GH-Beton, Denmark	<a href="mailto:bjb@gh.dk">bjb@gh.dk</a>
Jana Šelih ( <b>JS</b> )	Laboratory for concrete National Building and Civil Engineering Institute, Slovenia	<a href="mailto:jana.selih@zag.si">jana.selih@zag.si</a>
Luis Fernández Luco ( <b>LFL</b> )	IETcc, Spain	<a href="mailto:Lfluco@ietcc.csis.es">Lfluco@ietcc.csis.es</a>
Jan Lindgård ( <b>JL</b> )	SINTEF Civil and Environmental Engineering, Norway	<a href="mailto:Jan.Lindgard@sintef.no">Jan.Lindgard@sintef.no</a>
Claus V. Nielsen ( <b>CLN</b> )		<a href="mailto:Claus.Nielsen@teknologisk.dk">Claus.Nielsen@teknologisk.dk</a>
Dorthe Mathiesen ( <b>DMA</b> )		<a href="mailto:Dorthe.Mathiesen@teknologisk.dk">Dorthe.Mathiesen@teknologisk.dk</a>
Mette Glavind ( <b>MEG</b> )	Danish Technological Institute, Denmark	<a href="mailto:Mette.Glavind@teknologisk.dk">Mette.Glavind@teknologisk.dk</a>
Tiago Gaio ( <b>TG</b> )		<a href="mailto:Tiago.Gaio@teknologisk.dk">Tiago.Gaio@teknologisk.dk</a>

# Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

## **Agenda**

The agenda for the group discussion followed the content of the questionnaire send out before the workshop:

### **1. Reducing clinker content in concrete**

- a. The use of supplementary materials
- b. The use of blended cement
- c. Optimisation of concrete mix design

### **2. The use of waste for concrete production**

- a. Reuse of water/slurry
- b. Recycling of concrete and demolition waste (C&DW)

### **3. Working environment**

- a. The use of SCC concrete

### **4. Environmental indicators**

#### **Item 1: Reducing clinker content in concrete**

The group participants outlined the situation in their countries regarding the use of supplementary materials, the use of blended cement and on optimisation of concrete mix design in order to reduce the need for binder.

#### Italy

FS explained that most cement used for concrete in Italy is blended cement, which is allowed according to the national application rules.

FS also mentioned that there are great differences in concrete production and composition of concrete between the northern and southern part of Italy.

FS mentioned that Italcementi is working with other aspects to reduce environmental impact from concrete. For instance applying  $\text{TiO}_2$  for concrete or on the concrete surfaces makes it possible to reduce some pollutant by the photo catalytic effect, which cause that atmospheric organic pollutants in contact with the surface is destroyed by oxidizing them to carbon dioxide.

FB asked about the interface between Cluster 2 – Blended cement and Cluster 3 - Concrete and aggregate production. DMA answered that Cluster 3 is dealing with concrete as a whole and thereby it is obvious also to include the use of blended cements. However, the work has to be done in close collaboration with Cluster 2, which is a main reason for CM to be present at the workshop.

FB mentioned that there are no traditions for optimising concrete mix design in Italy to be able to save cement, because the price of aggregate and cement is almost the same, which is a very different situation compared to the Scandinavian

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

countries. Furthermore, environmental aspects related to concrete is not that much in focus in Italy compared again to the Scandinavian countries.

### Slovenia

JS told that in Slovenia there are two manufactures of cement. The cement used for concrete is about fifty-fifty on CEM I and blended cement.

Fly ash is used for concrete. There are three manufactures of fly ash. In 2003 22.000 tonnes of fly ash were sold for concrete applications.

Silica Fume is also used for concrete purposes in Slovenia.

The traditions in Slovenia with regard to concrete production are very similar to the traditions in Germany and Austria.

The national application document for EN 206-1 contains no specific Slovenia additions in table F.

Optimising concrete mix design by the use of models in Slovenia is not normal procedure. Defining the right mix design is normally done by carrying out initial testing and adjusting mix design from the results from these tests.

### Spain

LFL reported the status on concrete production in Spain with regard to reducing clinker content.

In Spain the most common type of cement used is CEM II.

Fly ash and limestone filler is used not directly in concrete but in cement for production of blended cement. Silica Fume is available as a supplementary material. Silica Fume is provided from the admixture suppliers.

As in Italy there is not very much focus on reducing clinker content in order to improve the environment. The concrete mix is determined from an economic point of view. There are no traditions for using models for optimising concrete mix design.

LFL has access to the national Spanish application rules to EN 206-1 and promised to send a copy to Cluster 3.

### Germany

CM told that in Germany the use of pure Portland cement is decreasing, instead Portland composite cement is increased.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

Blast Furnace Slag (BFS) is only used for cement production.

Fly ash is available for concrete applications. The k-value for fly ash is 0,4.

The use of inert fillers as limestone filler will be seen in the future with the increased use of self compacting concrete (SCC). A German guideline for SCC has been prepared. CM promised to send a copy to Cluster 3.

### Poland

GZS and JK presented the Polish situation. In Poland a lot of fly ash is used for concrete purposes and also Silica Fume is available.

Most of the fly ash produced in Poland is used for the production of Autoclaved Aerated Concrete (AAC). According to the Polish technology the cellular concrete contains about 70% fly ash. The total production of the AAC in Poland (in 30 factories) is about 4,5 mio m<sup>3</sup> per year and 1/3 of the AAC is produced with fly ash.

### Denmark

JB presented the Danish status on concrete production with regard to reducing clinker content.

In Denmark the most common type of concrete produced is ready mix concrete followed by precast concrete.

The most utilised type of cement is CEM I cement used together with fly ash and silica fume. Denmark has been using fly ash for concrete purposes in 25 years.

The typical aggregate for concrete is sand material from gravel pit and from the sea. And high quality granite stones are imported from Norway and Sweden.

The Danish types of concrete are to a large extent optimised with regard to a dense packing of the aggregate in order to minimise the need for binder. In Denmark aggregate is so much cheaper compared to cement.

JB suggested that the concrete trade should focus more on variations in the aggregate. Large variations in aggregate properties often cause that concrete mix design shall be composed with a certain additional amount of binder in order to compensate for aggregate variations. If the aggregate manufacturers were able to produce aggregate with less variation, concrete production can be carried out closer to the limits in norms and standards.

# Minutes of the ECO-SERVE Cluster 3 workshop

## 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

### Conclusions on the first item

CLN summarised the following:

- The investigation of the use of blended cement and blending cement shall be an issue in the baseline report and the work carried out in Cluster 2 is therefore very interesting for Cluster 3 as well. It is obvious that there are very different traditions and know-how with regard to use of blended cement with or without other supplementary materials. The national application rules shall be taken into consideration when the baseline on this item is established. FB pointed out that there are no clear rules for how to use blended cement together with supplementary materials. What is on the market? - what are the k-values and how shall they be taken into account?. The BAT report could include some of these issues.
- It seems to be a Scandinavian “thing” to focus on reducing clinker content in concrete in order to improve the environment. In the southern part of Europe the concrete mix designs are composed mainly to meet the specifications with the lowest possible cost.
- Fly ash and silica fume is used in many European countries. There are no traditions for using other supplementary materials for concrete, besides limestone filler due to its performance in self-compacting concrete.
- FB pointed out that looking at the official costs of concrete could be helpful information to include in the baseline report.

### **Item 2: The use of waste for concrete production**

#### Recycling of wastewater

Recycling of wastewater for concrete production is known within most European countries and do not cause any technical problems. The utilisation of recycling of wastewater is a question on the taxes on water compared to the expenses related to establishing the production facilities.

In Denmark it has been considered to use dried out concrete slurry for cement production, but transport costs seems to be the reason why this has not been done yet.

The problem with hydrocarbons in concrete slurry, which was presented by Jørn Bødker, DTI in plenum is obviously not considered elsewhere in Europe. There are no requirements for registration of these substances.

#### Use of C&DW in concrete

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

In Spain and in Denmark it is not allowed to use C&DW for structural concrete purposes.

In UK a 20% replacement of natural aggregate is allowed.

Germany divides C&DW into four types Type 1 - Type 4. A guide DIN 4226 for using recycled aggregate exists.

In Poland recycled aggregate is mainly used for roads, car parks and foundations.

JS informed about a very interesting method for waste handling in Slovenia. Waste generating companies is paid dependent on the quality of the waste at a recycling plant. The C&DW is then crushed and recycled into low-grade application. FB noted that this sort of arrangement is only possible as long as the natural aggregate suppliers allow it.

Someone (my notes does not tell who) raised the question about if it is environmental friendly to recycle C&DW in concrete when the transport distances are taken into account. Furthermore, C&DW is normally used for road construction so why focus on using it for concrete? This discussion shall be written in the baseline report.

FB raised a question on the responsibility for recycling. Why is it so that it is the concrete producers who are responsible for recycling of concrete or C&DW? FS compared with the car industry where the individual suppliers of tyres, dashboards, etc. have no responsibility for recycling the cars after scrapping them.

### **Item 3. Working environment**

The utilisation of self-compacting concrete is a major step towards improved working environment. A status around the table was given with respect to the utilisation of self-compacting concrete in various part of Europe.

Self-compacting concrete is more or less introduced in all European countries. There are still technical challenges connected with self-compacting concrete.

In Spain self-compacting concrete cannot be used for floor purposes due to crack problems, and in contradiction to that the most common use of self-compacting concrete in Denmark is for floor purposes. This emphasise the differences within Europe and these differences are caused by different aspects (e.g. political, climate conditions, legislation, economic, technical etc.)

In Poland self-compacting concrete has been used for 4 years but only for special applications.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

It was concluded that getting an overview of the use of self-compacting concrete could be interesting as an indicator for working environment.

### **Item 4. Environmental indicators**

Each cluster of ECO-Serve has to define environmental indicators in co-operation with Task 2 of the management part of ECO-Serve. The purpose of that is to be able to some extent to evaluate and calculate the environmental improvement by introducing different “green” technologies.

The main objective is to set up practical indicators where data is available. DMA presented the indicators and the material unit proposed for concrete:

The material unit for concrete could be: 1 m<sup>3</sup> of a specific concrete mix in accordance with EN 206-1 and 1 m<sup>2</sup> of a concrete panel.

The suggested indicators are:

- CO<sub>2</sub> emission
- Energy consumption
- Surplus cement content
- Use of mineral based form release agents
- The use of SCC
- Noise, dust
- Costs
- No of employees.

There was a discussion on if it is possible to ask for concrete mix designs. FS's opinion was that it can be difficult to get the data but asking for the mass balance (what goes in and what comes out) is possible data to get. The conclusion was that Cluster 3 try to collect data on specific mix designs in various part of Europe. This will be done by preparing a simple questionnaire and underline to the concrete manufactures that the information will be handled confidently.

Each indicator was discussed with regard to the availability of collecting data.

- CO<sub>2</sub> emission: The overview of the use of blended cement in various part of Europe compared with the national application rules and available data on cement production will make it possible to use the CO<sub>2</sub> emission as an indicator. The questionnaire shall ask for the type of cement used for production.
- Energy consumption: It should be possible to get data on energy consumption. The questionnaire shall ask for this information.

## Minutes of the ECO-SERVE Cluster 3 workshop 2-3 February 2004 at DTI

22 March, 2004  
DMA/jga

---

- Surplus cement content. To be able to calculate the packing of the aggregate it means that aggregate properties shall be known, and it seems impossible. It was decided not to use this as an indicator.
- Use of mineral based form release agents. The questionnaire will ask for this information.
- The use of SCC. The questionnaire will ask for this information.
- Noise, dust. It seems difficult to collect data on dust. With regard to noise the questionnaire shall ask for the limit value for noise impact at production plant.
- Costs. It might be difficult to get information of the costs of concrete product, but the questionnaire shall ask for the official costs.
- No of employees. Data should be available.

CLN summarised the conclusions from the group discussion in plenum.  
of aggregate production worldwide and also in European countries