



Project BioCrete

Task ID: 1
Date: 2006-11-22
Participant: AWS
Name: DK

Preface

“BioCrete” is the acronym for a LIFE supported project “Utilisation of ash from incineration of wastewater sludge (bio ash) in concrete production”. The project activities have been defined in 10 tasks, and the present report is the final report for one task, summarising purpose, task progress, results and experiences. The report is written by the task coordinator, as identified by initials for participant and name. The project period is June 2005 to December 2007, and the project includes 4 participants: Avedoere Wastewater Services (AWS) as beneficiary, Lynettefaellesskabet (LYNIS) and Unicon Ltd. (UNICON) as partners and Danish Technological Institute (DTI) as consultants.

Final report for Task 1

“Design and construction of facilities for handling of ashes at the sludge incineration plant”

Introduction

Bio ash is a very dusty product. As the normal way for disposal is dumping at controlled landfill sites, the bio ash has to be wetted as the last step before leaving the sludge incinerating plant. However, if the bio ash has to be transferred to a possible reuse in concrete production, the ash has to remain dry in order to maintain the pozzolanic properties just until the production of ready-mixed concrete.

Thus, the purpose of task 1 was to establish dry ash outlets at two sludge incineration plants located at the two largest Danish urban wastewater treatment plants (UWWTP). The first (operated by AWS) has a fluidised bed oven as the incinerator, and the bio ash has particle size characteristics like fly ash. The second (operated by LYNIS) has a conventional multiple hearth furnace as the incinerator, and the bio ash being a ‘bottom’ ash also include more coarse particles.

Task progress

The two dry ash outlets were established simultaneously by AWS and LYNIS respectively. The design was similar to the design used at known outlets for dry powders (e.g. cement or fly ash from coal fired power plants), and the equipment includes 3 major components:

1. An additional screw conveyor (capacity 30 – 35 t/h) connected to the existing ash silo system at the UWWTP, and which conducts the dry ash to
2. A flexible load bellows which fits to the openings in dry powder transportation vans.
3. Connection tubes to air suction ventilators (and dust filters), which ensures the removal of air from the van as well as a partial vacuum inside and a dust free working environment outside the ash transfer line to the van.

Both ash outlets were established and tested by February 2006. In the following months some final SCADA adjustments were being made as well as some finishing building works. Thus, both ash outlets have been integrated in the UWWTP's and are well functioning.

However, with respect to the bio ash from LYNIS UWWTP there were some preliminary difficulties connected to the transfer of ash from the van to the external receiving silo. This problem was attributed to the content of coarse particles in the bio ash, and therefore a bow sieve with interior arms for moderate crushing/degrading of the ash was installed in May 2006 between the ash silo and the screw conveyor at LYNIS UWWTP. The diameter of the holes in the sieve is 10 mm. After this improvement no more difficulties were experienced with respect to the external transfer of bio ash.

A serious problem has been identified. The present quality of the bio ash from LYNIS UWWTP is not acceptable for the production of bio ash concrete. This problem is also expected to be connected with particle sizes. Therefore some external studies are being planned on preliminary milling of the ash, and these studies are administrated as a supplementary activity to task ID 8.

From the viewpoint of the UWWTP's both ash outlet systems function well, and the purpose of task 1 must be considered fulfilled.

Results

Handling of dry bio ash at AWS UWWTP. According to the SCADA registrations approx. 1100 t of dry bio ash has presently been transferred via the new ash outlet, see Appendix 1. Almost the entire amount has been transferred to 3 UNICON factories (Avedore, Hedehusene and Ejby).

Handling of dry bio ash at LYNIS UWWTP. Due to the above mentioned serious problem only one batch of bio ash (approx. 20 t) has been transferred to a UNICON factory, and the total amount transferred via the new ash outlet has been less than 100 t.

Pictures of the new equipment. Some pictures of the 2 new installations are shown in Appendix 2 (AWS) and 3 (LYNIS). The common wall information sheet placed close to the ash outlets is shown in Appendix 4.

Experiences

The transfer of a batch (typically 20 – 25 t) of dry bio ash from the ash silo to the powder transportation van is programmed to be automatic. Thus, the transfer is handled by the van driver himself, and the presence of local WWTP personnel is not necessary. The load bellows sensor which registers when the van is full, functions very well by giving a signal to stop the screw conveyor and to close and elevate the load bellows. In general, the operation of the ash outlets is unproblematic.

There are only minor problems with respect to dust in the air or spilled ashes on the floor – very small when compared to the former normal operation of transfer of wetted ash to open trucks. Thus, the working environment has improved significantly.

Also, the new dry ash outlet has been very useful for the sampling and transfer of smaller amounts of bio ash: e.g. the 6 samples from each UWWTP to be used for task ID 4 – 6 tests were transferred to 220 liter drums, each amount being approx. 180 kg.

Cost of equipment

The total cost of equipment has been approx. 67.500 € and 75.800 € for the establishment of dry ash outlets at AWS UWWTP and LYNIS UWWTP respectively.

Contact

For a more detailed information or discussion, everybody is welcome to contact or visit the two UWWTP's. Please find our contact data via the project home page: www.biocrete.dk.

Appendices

1. Registration of the amount dry bio ash transferred via the new ash outlet at AWS.
2. Pictures of the new ash outlet system at AWS.
3. Pictures of the new ash outlet system at LYNIS.
4. Wall information sheet placed close to the ash outlets at AWS and LYNIS.

Spildevandscenter Avedøre I/S
J.nr. UD-0350-0033. BioCrete. Task 8.2

061114 (rev 061114). DK

Bioaske 2006 fra SCA til Unicon m.fl. (via nyt tørt askeudtag fra og med 2006-01-17)

Vægtmængder er opgjort såvel ved SCA askesilo-vejeceller, se Forbrændingens månedsrapporter, side 9 (efter 2006-02-18) som ved UNICON's vejesedler fra vognvægt.

Korrektionsfaktor er beregnet ved forudsætningen at UNICON's data er 'sande'.

Endvidere er vist datoer og mængder for udtagning af "prøve i blå tromle" til Teknologisk Institut (TI) samt leverancer til RGS 90

| Dato | Til UNICON, t | | | | | | Bemærkninger | Til andre modtagere | |
|------------|----------------|-------------------|-------------------|-------------------|-----|-----|--|---------------------|-----------|
| | SCA vejeceller | Unicon vejeseddel | Korrektionsfaktor | Modtagende fabrik | | | | TI, t | RGS 90, t |
| I alt | 1029,9 | 599,3 | | AVD | HEH | EJB | | 1,8 | 81 |
| 2006-01-02 | 21,2 | 18,00 | 0,85 | | x | | Afhentning via midlertidigt askeudtag | | |
| 2006-01-17 | 22,7 | 21,03 | 0,93 | ? | | | 1. afhentning via nyt askeudtag | | |
| 2006-01-26 | 24,1 | | 0,00 | ? | | | Manglende data fra Unicon | | |
| 2006-02-02 | 17,5 | 16,80 | 0,96 | x | | | | | |
| 2006-02-20 | 24,6 | 22,96 | 0,93 | x | | | | | |
| 2006-03-01 | 26,6 | 24,86 | 0,93 | x | | | | | |
| 2006-03-09 | 25,2 | 23,24 | 0,92 | x | | | | | |
| 2006-03-16 | 23,0 | 21,44 | 0,93 | x | | | | | |
| 2006-03-20 | 16,2 | 15,22 | 0,94 | | x | | | | |
| 2006-03-27 | 25,0 | 22,96 | 0,92 | x | | | | | |
| 2006-03-29 | 21,8 | 20,62 | 0,95 | | x | | | | |
| 2006-04-03 | 25,1 | 23,42 | 0,93 | x | | | | | |
| 2006-04-06 | 19,2 | 17,80 | 0,93 | x | | | | | |
| 2006-04-07 | 19,9 | 18,50 | 0,93 | | x | | | | |
| 2006-04-21 | 22,4 | 20,74 | 0,93 | x | | | | | |
| 2006-04-26 | 21,6 | 20,24 | 0,94 | | x | | | | |
| 2006-05-01 | 19,6 | 18,32 | 0,93 | x | | | | | |
| 2006-05-03 | 19,1 | 17,54 | 0,92 | x | | | Skulle have været losset i Hedehusene | | |
| 2006-05-10 | 21,3 | 19,24 | 0,90 | | x | | Endvidere diverse udtag 0,3 t | | |
| 2006-05-17 | 20,5 | 19,02 | 0,93 | x | | | | | |
| 2006-05-17 | 21,1 | 20,44 | 0,97 | x | | | | | |
| 2006-05-23 | 22,1 | 20,44 | 0,92 | | x | | JR aftale med PN. Til Hedehusene | | |
| 2006-05-24 | | | | | | | prøve til TI er afhentet af fragtmand (0,2 t) | 0,2 | |
| 2006-05-26 | 22,2 | 20,30 | 0,91 | x | | | | | |
| 2006-05-29 | 17,8 | 16,58 | 0,93 | x | | | | | |
| 2006-05-30 | | | | | | | prøve til TI er afhentet af fragtmand (0,2 t) | 0,2 | |
| 2006-05-31 | 23,6 | 21,72 | 0,92 | x | | | | | |
| 2006-06-08 | 23,0 | 21,54 | 0,94 | x | | | Ændring fra 15 til 23 t, jf. GF-mail 23/6 | | |
| 2006-06-12 | 15,8 | 14,88 | 0,94 | x | | | | | |
| 2006-06-12 | 13,8 | 12,62 | 0,91 | | x | | Til Hedehusene (iflg. Unicon) | | |
| 2006-06-14 | 20,9 | 19,32 | 0,92 | x | | | | | |
| 2006-06-19 | | | | | | | prøve til TI (0,2 t) | 0,2 | |
| 2006-06-20 | 16,9 | 15,64 | 0,93 | x | | | | | |
| 2006-06-21 | 20,7 | 19,32 | 0,93 | | x | | Til Hedehusene | | |
| 2006-06-23 | 14,7 | 14,50 | 0,99 | x | | | Unicons tal korrekte (?) | | |
| 2006-06-24 | | | | | | | Manglende data fra Unicon og fra SCA! | | |
| 2006-06-28 | | | | | | | Manglende data fra Unicon og fra SCA! | | |
| 2006-07-04 | 23,2 | | 0,00 | | | | | | |
| 2006-07-05 | | | | | | | 1. leverance til RGS90 | | 22,0 |
| 2006-07-06 | 20,1 | | 0,00 | | | | | | |
| 2006-07-07 | | | | | | | prøve til TI (0,2 t) | 0,2 | |
| 2006-07-17 | 23,7 | | 0,00 | | | | | | |
| 2006-08-18 | | | | | | | Diverse udtag 0,34 t | | |
| 2006-08-21 | 10,0 | | 0,00 | | x | | ca. 10 t "lys aske" til Hedehusene | | |
| 2006-08-21 | | | | | | | 2 prøver "lys aske" til TI (2x0,2 t), sendt 24/8 | 0,4 | |
| 2006-08-24 | 25,5 | | 0,00 | | | | | | |
| 2006-08-28 | 22,1 | | 0,00 | | | | | | |
| 2006-08-30 | 20,9 | | 0,00 | | | | | | |
| 2006-08-30 | 4,6 | | 0,00 | | | | | | |
| 2006-09-04 | 26,2 | | 0,00 | | | | | | |
| 2006-09-04 | 25,7 | | 0,00 | | | | | | |
| 2006-09-07 | 23,9 | | 0,00 | | | | | | |
| 2006-09-11 | | | | | | | RGS 90 12 t ? | | |
| 2006-09-12 | | | | | | | RGS 90 30 t | | 30,0 |
| 2006-09-14 | | | | | | | RGS 90 17,1 t ? | | |
| 2006-09-22 | | | | | | | RGS 90 | | 29,0 |
| 2006-09-25 | | | | | | | 14,6 t til UNICON? | | |
| 2006-09-28 | 16,1 | | 0,00 | | | | | | |
| 2006-10-06 | | | | | | | 2 tromler til TI, og slut med aske til RGS 90 | 0,4 | SLUT! |
| 2006-10-10 | 24,9 | | 0,00 | | | | | | |
| 2006-10-17 | 24,9 | | 0,00 | | | | | | |
| 2006-10-31 | 25,3 | | 0,00 | | | | Og tromle til TI | 0,2 | |
| 2006-11-07 | | | | | | | Diverse udtag 0,42 t | | |
| 2006-11-08 | 43,6 | | 0,00 | | | | 2 afhentninger | | |



AWS 060511. Key persons at the new ash outlet.



AWS 060530.
The bottom of the ash silo,
the new screw conveyor and
the new load bellows.



AWS 060421.
Filling a powder transportation van with dry bio ash.



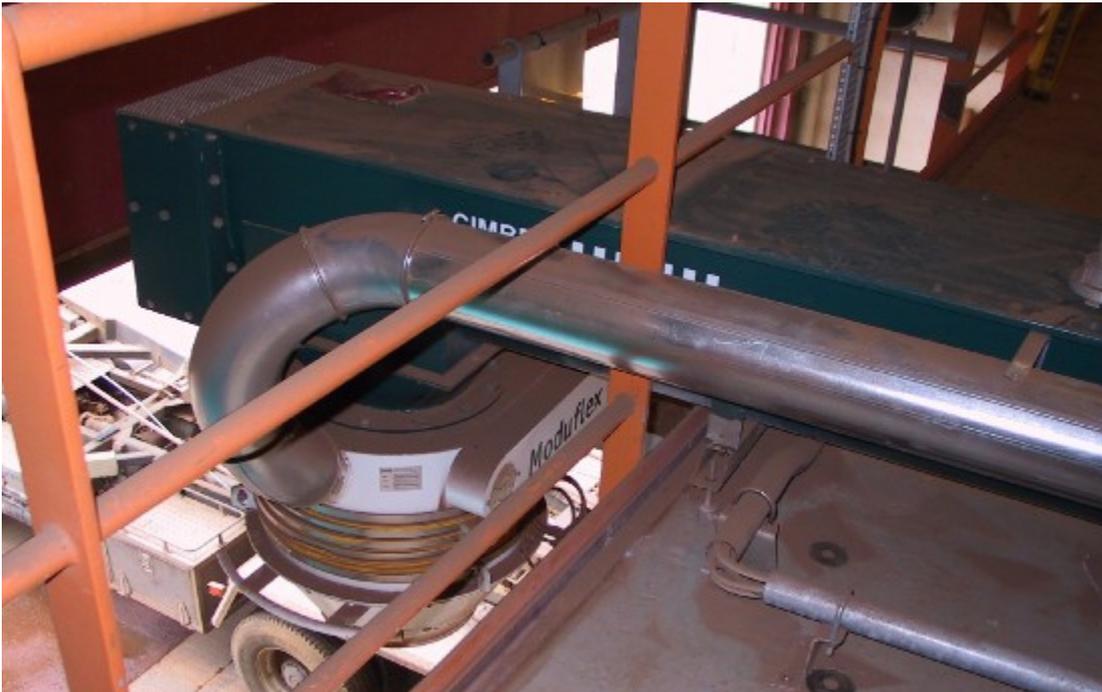
AWS 060530.
Filling a 220 liter drum with dry bio ash.



LYNIS 060622. The bow sieve (white) and the new screw conveyor along the floor.



LYNIS 060628.
The bow sieve
between the existing
ash silo system and
the new screw
conveyor.



LYNIS 060622. The end of the new screw conveyor, the load bellows and the connecting tube to the air suction ventilator.



LYNIS 060622. The load bellows seen from below.

Håndtering af tør bioaske

Nærværende udtag til tør bioaske er etableret med støtte fra Det Europæiske Fællesskabs finansielle instrument LIFE, og er en del af projektet "BioCrete".

Formålet med BioCrete er at øge genanvendelsen af aske fra forbrænding af spildevandsslam (bioaske) i forbindelse med fremstilling af beton. Projektet gennemføres 2005-2007 ved et samarbejde mellem Spildevandscenter Avedøre I/S, Lynettefællesskabet I/S, Unicon A/S og Teknologisk Institut, Betoncenteret.



Handling of dry bio ashes

The present outlet system for dry bio ashes has been established with financial support from LIFE, which is the European Community Financial Instrument for the Environment.

This outlet system is an integrated part of a project "BioCrete", the purpose of which is to increase the reuse of bio ashes from the incineration of WWTP sludges for the production of concrete. This project will be conducted June 2005 to December 2007 by the following 4 participants: Avedøre Wastewater Services, Lynettefællesskabet I/S, Unicon A/S and Danish Technological Institute.