Small Scale Biomass Utilisation
ManagEnergy Study Tour– 4 - 5 September 2002

The aim of the study tour was to give good examples of small scale biomass utilisation. We visited a range of bio energy fuelled installations in the west of Sweden, plants for pellets, wood chips, straw and briquettes, with effects between 250 kW-5 MW. We also got a presentation of a 25 kW burner for grains. We were 34 participants from 7 European countries: Ireland, Sweden, Estonia, UK, Germany, Slovakia, and Spain (for participants please see list at end of account).

Participants at the Study tour in front of the bus

Wednesday 4 September

The study tour started in Stockholm, at 16.30 at the end of the workshop at Norra Latin, with a joint walk to the Central Station. We departed at 17.10 with the fast train X2000 for transportation to Skövde Central Station. This is a two hours journey and since the greater number of the participants was seated in the same wagon this hopefully gave an opportunity to start networking. At arrival in Skövde at 19.15 a bus waited to take us to Lundsbrunn Conference & Spa. After having checked in the group was joined in the restaurant. Here a three-course dinner was served, during which the participants could continue getting to know each other and share experiences. The evening finished off with coffee in the lounge.

Thursday

The tour continued after breakfast at 08.00 with a stroll down to the heating central for **Lundsbrunn Conference & Spa,** which is a **450 kW wood pellets heating plant**. Bengt Nilsson from Kvänum Energi, operating the plant, gave the details of Kvänum Energi, how the heating plant is operated and how the pellets are delivered. He also showed the boilers and the storage facilities.

In Lundsbrunn 4 heating centrals fuelled by oil and electricity has been replaced by a heating central with 3 pellet boilers driven by Kvänum Energi. A culvert system supplies all the buildings at Lundsbrunn Conference & Spa with the heat produced in the central. In 2001 the heating central produced 2 400 MWh from 600 metric ton pellet and approximately 20 m^3 oil.

The heating central consisted at first of 2 boilers, one pellet burner and one oil burner. The oil burner is normally not in operation, only when extra heat is needed. The pellet boiler is modified for a pellet burner and ash handling. The central also include 2 silos, 25 m^3 each, where the pellets are stored.

By replacing 300 m^3 oil with pellet fuel, the emissions of CO_2 are reduced with 780 tonnes per year. Emissions of NO_X and S have also decreased with approximately 160 kg and 43 kg respectively per year.

The emissions from the pellet boilers have an average of 100 ppm of CO, and 15 % of CO_2. Emissions of particles are under 80 mg/Nm^3. The system manages the government's demands very well.

Bengt Nilsson from Kvänum Energi shows where the pellets are delivered.

Inside the plant at Såtenergi

At 08.45 we went by bus approximately 10 minutes to another heating central in Lundsbrunn, this one was a **300 kW wood chips** heating plant. The plant is heating a nearby school and a home for the aged. It is co-owned and run by three farmers. Tomas Andersson, one of the farmers described how they have organised the operation, maintenance and wood chips deliveries. The plant calls for one-hour maintenance every day and a weekly delivery of fuel. The whole set up is run by the farmers.

On the way to the next site visit, we made a short detour into the town Lidköping for a coffee break at the foreshore to Lake Vänern, the largest lake in Sweden.

We arrived to the Swedish air force base **Såtenäs** to visit a **4 MW straw heating plant**. The air force base has been heated with **straw, grass and wood chips** supplied by the local farmers since 1994. Straw is in surplus in the area as 4000 metric tonnes was used for the burner out of 200 000 metric tonnes. In Såtenäs we

got a presentation by Sven-Göran Green, Vice President of the heating plant. The presentation considered the ownership, organisation and other details of how the plant is managed. He also gave some details of how the straw is delivered and how the plant is operated and maintained. The whole system had converted from oil to biofuels and the heating plant made a lot of money.

Stråbränslenergi Väst supplies the straw through an agreement on an annual delivery of 4000 metric tonnes of straw from the 40 members. The farmers with their own tractors carry out the transports. The farmers also invested in the plant when it was built and by owning a part of it they have an incitement for bringing the straw, and taking care of the ashes. Air force personnel handle the operation and control. The biomass plant is connected to the district heating grid and delivers 20 000 MWh of energy annually.

Sune Andersson who is working with the operation and maintenance of the plant gave a tour around the plant and showed the storage of the straw, the reserve fuel, the boilers and the operating room. In the operating room the temperatures of the outgoing and incoming water from the district heating system was considered.

The 4 MW biomass furnace has a moving grate and is equipped with a cleaning system consisting of cyclones and fabric filters. The plant is equipped with storage and handling systems with a shredder for the straw and a container for the wood chips and cereal residues. The fuel is mixed and fed into the boiler in correspondence to the heat load.

The requirements for the plant at maximum effect allow 100 mg/nm^3 of dust emissions. With the system installed for flue gas cleaning, the emissions have been essentially lower than the requirements, approximately 15 mg/nm^3. The decrease of oil use, 1700 m^3, has lead to decreased emissions of sulphur dioxide of 9 tonnes per year and the CO_2 has decreased with 4000 tonnes per year.

The ashes were recovered by the farmers and spread on the fields as fertilizer. The only thing to add was Nitrogen.

A presentation of a burner for grain (mainly for oats), called the AgroTec and giving an effect of 25 kW, was given by Lee-Jan Ceberbrink, sales manager for EcoTec AB manufacturer of the AgroTec. EcoTec is one of many Swedish producers of burners for pellets and grain.

Presentation of burners for oats, 25 kW

The burner is primarily aimed to burn oats but it can also burn barley with a fine result. The burner is not very sensitive to the quality of the fuel but the moisture content should not exceed 15 % for best result.
The visit finished off by going into the air force base at Såtenäs for lunch at the mess restaurant.

Next stop was a **5 MW briquette heating plant** in Floby, Falköping. Ivar Karlsson, Vice President for Brikettenergi Värme AB, who owns and operates heating centrals and district heating centrals in Sweden. Brikettenergi Värme AB is totally owned by Brikettenergi AB, manufacturer of briquettes and pellets.

Ivar Karlsson gave a brief outline, outside the plant, of the organisation of Brikettenergi and how the plant was operated to the whole group. Thereafter we looked inside the plant.

Ivar Karlsson giving a presentation outside the plant

Floby has an installed effect of totally 9.5 MW. The heating plant was built in 1992 and has no permanent employees, only on-call duty employees.

The briquettes are obtained from Brikettenergi and delivered to the district heat plant in self-unloading containers that are stacked at the plant and used as storages. A replacement system is used whereby the truck delivering a full container from the factory returns with an empty one. The energy content of each delivery is 160 MWh, which means that at full effect (winter time) new deliverance of fuel is done with an interval of 6 days.

The plant is equipped with mechanical flue gas cleaning, so-called multi-cyclones, and the dust emissions by the latest measuring was 55 mg/Nm^3 or 22.8 mg/MJ fuel.

After this last visit transportation back to Stockholm.

Discussion

The overall impression of the study tour is that it was a very enthusiastic group asking a lot of questions and taking a lot of notes. Both the group and the contact persons at each plant seemed to be very pleased with the site visits. The guides at each plant were very helpful and tried to answer all questions, only for a few technical terms translation help was needed. Since we were visiting four different examples of bio mass utilisation, even if everybody was not equally interested in all four examples hopefully everybody could find at least one of special interest.

Contacts

Lundsbrunn Conference & Spa
Contact: Bengt Nilsson, Kvänum Energi AB
Tel: + 46 512 79 70 70

Lundsbrunn, wood chips plant
Contact: Tomas Andersson
Mob: + 46 706 71 74 68

Såtenergi AB
Contact: Sven-Göran Green
E-mail: sven-goran.green@lantmannen.se
Tel: + 46 708 71 74 68

AgroTec burner for grain
Contact: Sahlins EcoTec AB
E-mail: info@ecotec.net
Tel: + 46 708 14 78 30

Floby
Contact: Ivar Karlsson, Brikettenergi Värme AB
E-mail: ivar.karlsson@brikettenergi.se
Tel: + 46 36 38 78 70

Participants

Berglind, Anders	Swedish Energy Agency, Sweden	anders.berglind@stem.se
Bruton, Charlotte	TV Energy, UK	charlotte.bruton@tvenergy.org
Buckley, Jim	Seed Technology Ltd, Ireland	jbuckley@foragesystems.ie
Buckley, Pearse	Sustainable Energy,, Ireland	Pearse.buckley@irish-energy.ie
Clark, Robert	Kirklees Metropolitan Council, UK	environment.unit@kirklees.gov.uk
Devaney, Sean	Irish Power Systems Ltd, Ireland	hq@irishpowersystems.ie
Dominguez, Puy	APET, Spain	apet.diputoledo@terra.es
Fallon, Garret	Irish Power Systems, Ireland	fallong@iol.ie
Foley, Niamh	Institute of Technology, Ireland	niamh.foley@ittralee.ie
Green, Emma	Tipperary Energy Agency, Ireland	tippenergy@eircom.net

Grepmeier, Klaus	ZREU, Germany	grepmeier@zreu.de
Hecl, Vladimir	Energy Centre Bratislava, Slovakia	hecl@ecbratislava.sk
Hickey, Sinead	South Western Environmental Services, Ireland	Sinead.hickey@sws.ie
Isak, Aavo	AS SB Kesküttеseadmed, Estonia	aavo@esbe.ee
Jennings, Fiona	Renewable Energy Information Office, Ireland	biomass@reio.ie
Kay, Tony	University of Limerick, Ireland	tony.kay@ul.ie
Keane, Paddy	Irish Power Systems, Ireland	hq@irishpowersystem.ie
Kellet, Paul	Renewable Energy Information Office, Ireland	paul@reio.ie
Kerrigan, Joe	The Centenary Co-op Creamery Society, Ireland	info@centenaryco-op.com
Leavy, Seamus	Ballydaly, Ireland	+353 506 41689
Liib, Aili	Environmental Technologi, Sweden	aililiib@hotmail.com
Little, Con	Willamette Europé Ltd.	clittle@willamette-europe.com
Maher, Jim	The Centenary Co-op Creamery Society, Ireland	info@centenaryco-op.com
McKeever, Orla	Drenagh Sawmills, Ireland	orlamckeever@hotmail.com
McKenna, Paul	Balcas Kildare, Ireland	engineering@balcas.com
O'Neill, Raymond	Seed Technology, Ireland	roneill@seedtech.ie
Ottosson, Camilla	Swedish Energy Agency, Sweden	camilla.ottosson@kanenergi.se
Ottosson, Pernilla	Renewable Energy Information Office, Ireland	wind@reio.ie
Picardo, Valez	Enterprise Ireland, Ireland	valez.picardo@enterprise-ireland.ie
Potter Elmu	Regional Energy Centres, Estonia	elmupotter@hot.ee
Segerborg-Fick, Ann	Swedish Energy Agency, Sweden	ann.segerborg.fick@stem.se
Walsh, Liam	Ballydaly, Ireland	+353 506 41689
Wågdahl, Kaj	Mälardalen Energy Network, Sweden	kaj.wagdahl@malarnet.org
Zidek, Ladislav	Regional Energy Management Agency in Zilina, Slovakia	remazilina@stonline.sk