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Programme 1st Course:
Training the trainers

GEO-EDUCATION FOR A SUSTAINABLE GEOTHERMAL HEATING AND COOLING MARKET

Project: IEE/07/581/S12.499061

FIRST COURSE: TRAINING THE TRAINERS

Venue:

**Swedish Geological Survey (SGU)
Villavägen 18
Uppsala, Sweden
10-12 June 2009**

Aim of the course:

Geotrainet project is supported by the European Commission: IEE programme – Altener, to establish a European training framework for GSHP designers and drillers. The long term aims of the project include the raising of standards in this growing industry with a view to the protection of the environment and to a high quality for the consumers, www.geotrainet.eu

These training courses will be of interest to those with experience in the design and installation of shallow geothermal systems AND in the delivery of training and dissemination of these subjects to practitioners:

- trainers of designers
- trainers of drillers

Delegates will be provided with presentation material to assist in the development of training courses in their own countries. This will be part of an ongoing process towards the creation of a European certification Framework for shallow geothermal installers, and raising and coordinating national and European standards in GSHP systems.

PROGRAMME FOR DESIGNERS (1)

Programme - 10 June 2009	
09:00	Section A: Introduction (3h)
09:00	Overview Shallow Geothermal Systems - <i>Burkhard Sanner</i>
09.30	Limiting conditions - <i>Olof Andersson</i>
	<ul style="list-style-type: none"> • Energy sources • Geology • Hydrogeology • Climate • Environmental issues • Costs • Regulations
10.30	--- COFFEE BREAK ---
10.40	Design fundamentals - <i>Göran Hellström</i>
11.50	Course overview - <i>Burkhard Sanner</i>
12.00	--- LUNCH ---
13:30	Section B: Elements (4,5h)
13.30	Geology - <i>Iñigo Arrizabalaga</i>
14.00	Drilling (methods, costs, limitations, risks) - <i>Iñigo Arrizabalaga</i>
14.30	Borehole heat exchanger - <i>Göran Hellström</i>
14.45	Installation and grouting - <i>Walter J Eugster</i>
15.00	--- COFFEE BREAK ---
15.30	Ground loops - <i>Göran Hellström</i>
	<ul style="list-style-type: none"> • Configurations • Manifolds • Tubing and fittings • Heat carrier fluid • Circulation pumps and flow rates
16.15	Heat pump technology - <i>Paul Sikora, Javier Urchueguia</i>
17.00	Functional and quality control - <i>Walter J Eugster</i>
	<ul style="list-style-type: none"> • System control (leakage, pressure, temperature) • Testing, commissioning and documentation • Maintenance • Monitoring

PROGRAMME FOR DESIGNERS (2)

Programme - 11 June 2009	
08:00	Section C: GSHP System Alternatives (2h)
08:00	Small systems (heating/cooling only), <i>All (ed. Hellström)</i>
	Small systems (heating and cooling)
	Small hybrid systems
	Large systems (heating/cooling only)
	Large systems (heating and cooling)
	Large hybrid systems
	System control
09:50	--- COFFEE BREAK ---
	Section D: Regulations (2h)
10:00	European legal framework - <i>David Norbury, Radu Polizu</i>
	European norms
	Energy-efficiency building codes
	Environmental issues
	<ul style="list-style-type: none"> • Water quality protection • Hydraulic influence (third-party interests) • Thermal influence
	Incentives
	Sources of information and support
12:00	--- LUNCH ---
13:30	Section E: GSHP Design (4,5h)
13:30	Concept study - <i>Burkhard Sanner</i>
14:00	Feasibility study - <i>Burkhard Sanner</i>
14:30	Site investigation – <i>David Banks, Göran Hellström, Javier Urchueguia</i>
	<ul style="list-style-type: none"> • Ground conditions (thermal response test, pumping test) • Licenses and permits
15:00	--- COFFEE BREAK ---
15:30	Detailed design and optimization - <i>Göran Hellström, Javier Urchueguia</i>
	<ul style="list-style-type: none"> • Energy load - <i>Javier Urchueguia, Paul Sikora, Göran Hellström</i> • Available ground area - <i>Javier Urchueguia, Paul Sikora, Göran Hellström</i> • System design alternatives - <i>Iñigo Arrizabalaga</i> • Design criteria (excl. start-up procedures) - <i>Walter J Eugster, Paul Sikora</i> • Ground loop sizing - <i>Göran Hellström</i>
17.40	An example - <i>Iñigo Arrizabalaga</i>

PROGRAMME FOR DRILLERS (1)

Programme - 10 June 2009	
09:00	Section A: Introduction (3h)
09:00	Overview Shallow Geothermal Systems - <i>Burkhard Sanner</i>
09.30	Limiting conditions - <i>Olof Andersson</i>
	<ul style="list-style-type: none"> • Energy sources • Geology • Hydrogeology • Climate • Environmental issues • Costs • Regulations
10.30	--- COFFEE BREAK ---
10.40	Design fundamentals - <i>Göran Hellström</i>
11.50	Course overview - <i>Burkhard Sanner</i>
12.00	--- LUNCH ---
13:30	Section B: General topics (4h) <i>Olof Andersson</i>
13.30	Shallow geothermal configurations and applications
14.15	Boundary conditions
15.00	--- COFFEE BREAK ---
15.30	Drilling methods
17.00	Test drillings for groundwater wells and BHE applications
17.30	Environmental concerns

PROGRAMME FOR DRILLERS (2)

Programme - 11 June 2009	
08:00	Section C: Specific items for BHE applications (4h) <i>Jörg Uhd and Oliver Mielenz.</i>
08:00	Performance of test drillings -
08.20	Performance of TRT (thermal response test)
08.40	Safety aspects
09.00	Drilling aspects
09.50	--- COFFEE BREAK ---
10.00	Installation of BHE (and monitoring equipment, if required)
10.30	Connection plastic welding
11.00	Filling with heat carrier and de-aeration
11.30	Functional testing (recommendation of documentation)
12.00	--- LUNCH ---
13:30	Section D: Specific items for groundwater applications (4h) <i>Olof Andersson</i>
13.30	Geo-documentation from test wells (MWD, geophysical logging)
14.00	Performance of pumping tests, data collection
14.20	Production wells - types and construction methods
15.00	--- COFFEE BREAK ---
15.30	Tests after completion
15.50	Well installations (pump, reinjection pipe, monitoring equipment)
16.40	Over-structure. Mains and fittings
17.00	Functional tests of total systems and documents required
17.30	Maintenance instructions and service

PROGRAMME FOR DESIGNERS AND DRILLERS (3)

Programme - 12 June 2009	
Section F: Technical Tour (3,5h) <i>Olof Andersson</i>	
08:30	Bus leaves from SGU, Uppsala
09.30	Arrival at Arlanda airport for visiting a large ATES plant
10.15	Leaving Arlanda
10.45	Arrival IKEA Uppsala for visiting a large BTES plant
11.45	Leaving IKEA for lunch at SGU
12.00	--- LUNCH ---
Section G: Final discussions (1,5h) <i>All teachers</i>	
13.30	Questions and answers (panel discussions)
14.45	Course evaluation (format to be filled)
15.00	Coffee and end of course

LIST OF TEACHERS

Title	Name	Affiliation
Dr.	Olof Andersson	Lund University, Sweden
Mr.	Iñigo Arrizabalaga	Water Resources, Basque Board of Energy, Spain
Mr.	David Bands	Newcastle University, UK Director, Holymoore Consultancy Ltd., UK
Dr.	Walter J Eugster	Polydynamics Engineering Zurich, Switzerland
Dr.	Göran Hellström	Lund University, Sweden
Mr.	Oliver Mielenz.	GWE pumpenboese GmbH, Germany
Mr.	David Norbury	David Norbury Limited, UK
Dr.	Radu Polizu	RGS, Romania
Dr.	Burkhard Sanner	EGEC a.i.s.b.l., Bruxelles, Belgium UBeG GbR, Wetzlar, Germany
Dr.	Paul Sikora	EcoCute Limited, Ireland
Mr.	Jorg Uhde	Bauer Resources GmbH, Germany
Dr.	Javier Urchueguia	Universidad Politécnica de Valencia, Valencia, Spain