GROUND-MED WP3 COORDINATION MEETING at STADT HAAG

Date: Wednesday 25 August 2010; at 9:00 - 15:00 hours

Place: Ochsner Wärmepumpen Factory, A 3350 Stadt Haag, Ochsner-Straße 1

Participants:

Karl Ochsner,	OCHSNER,	Manufacturer
Thomas Ciepiela,	″	″
Christian Brenner,	″	″
Gerald Lutz,	″	″
Prof. Gabriel Bendea,	U-ORADEA,	Demo site owner
Codruta Bendea,	″	″
Peter Kralj,	GEJZIR,	Demo site partner
Prof. Davide del Col,	U-PADOVA	WP3 leader
Dimitrios Mendrinos,	CRES,	Coordinator

Absent:

Vassilios Ramoutsakis,	EDRASIS,	Demo site owner

MINUTES

Heat pump prototype design parameters

	ORADEA	GEJZIR	EDRASIS
Heat Pump	GMWW 38 HK	GMWW 23 plus, subc., el. exp.v.	DWWP 56 with el. exp. valve
Indoor system	Wall heating / cooling	Radiators, air handling unit	Fan-coils, air handling units
BHE fluid	brine	water	water
Peak heating: T-supply to the building	35 °C ΔT = 10 °C	45 °C ΔT = 10 °C	40 °C ΔT = 5 °C
Peak heating: T-from BHE	8 °C ΔT = 3 °C	8 °C ΔT = 2 °C	10 °C ΔT = 2 °C
Peak cooling: T-supply to the building	15 °C	18 °C ?	10 °C
Peak cooling: T-from BHE	25 °C	20-35 °C	30 °C

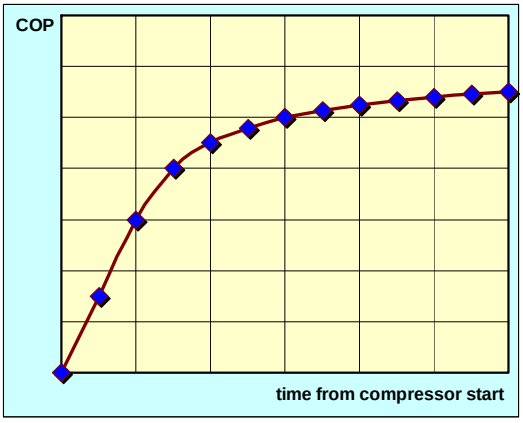
All prototypes will operate in heating, active cooling and passive cooling modes. No sanitary water will be provided.

Heat Pump Control
For best operation and for diagnosis and corrective action in case of alarm it is necessary and desired for OCHSNER to control the heat pump through the Internet.

The temperature compensation function of the OCHSNER controller will be activated. This requires the presence of two temperature sensors: one indoor at a reference space and one outdoor.

An antifreeze function will be provided, which will turn-on the pump for BHE-circuit antifreeze protection, and/or the heat pump for building circuit antifreeze protection.

OCHSNER will send to participants the pdf manual of the heat pump controller.



As COP needs some time from compressor start in order to reach the normal operation value (see graph to the left) the compressor cycles per hour should be kept at the minimum possible level.

Copeland allows a maximum of 6 compressor cycles per hour for safety purposes.

The recommended number is 2 on-off compressor cycles per hour.

Release test of each heat pump prototype
Immediately after the completion of each prototype a release test will be performed in order to evaluate the SPF of the machine. The release test will comprise a series of COP tests at 4 operation points for heating and cooling respectively, assuming the peak design parameters listed in the table above. The SPF evaluation will be performed according to the standards EN-14511 and PrEN-14825:2009 considering both $\Delta T=5°C$ and $\Delta T=10°C$. A copy of the specifications for the release tests will be provided by Prof. Davide del Col from the University of Padova to OCHSNER.

Prototype delivery times
Absolute priority will be given to the prototype of the University of Oradea, which will be delivered (including release tests) on 31 October 2010.

The other two heat pump prototypes will be available for delivery on 31 December 2010 (including release tests), and will be stored in Ochsner factory until the construction and installation works at the demonstration sites reach to the completion level, which is necessary in order to accommodate the machine.

Heat pump prototype technical details
Each heat pump prototype will be equipped by a hydraulic kit for flow reversal at the water side. Benedikt (Gejzir) and Edrasis heat pump prototypes will be flow-reversible only, while the Oradea heat pump prototype will be both refrigerant and flow reversible.

Each heat pump prototype will be equipped with 4 pipes for the BHE and building systems. The connection dimensions will be 1½“ for Benedikt (Gejzir) and Oradea and 2“ for Edrasis.

A flow switch safety will be included.

All prototypes will be equipped by electronic expansion valves. In addition a thermostatic expansion valve will be used in the Oradea prototype for cooling mode only.

Refrigerant charge will be kept to minimum possible level, in order to minimise the starting compressor period (see graph above) and improve heat pump COP.

Refrigerant Distribution system
Heat exchangers will be equipped by a refrigerant distribution system, which will ensure uniform refrigerant flow among the heat exchanger channels. The system will be optimized for Ground-Med for maximum heat exchange efficiency and higher heat pump COP.

Measurements and measuring points
According to the Ground-Med data acquisition and monitoring system, only the following refrigerant cycle parameters will be recorded on an optional basis: Pevap (evaporation pressure), Pcond (condensing pressure), Tout-evap (temperature exiting the evaporator) and Tout-cond (temperature exiting the condenser). OCHSNER will provide connection points for these measurements; for pressure the measuring point valve will be 7/16” in dimension.

CRES to distribute the data acquisition Excel files to all participants.

OCHSNER heat pumps are equipped with built-in monitoring system, with additional data recorded by OCHSNER through the internet. OCHSNER will make these data available to interested partners upon request.

Optimization of the hydraulics
The volume of the buffer will be recommended by OCHSNER.

The pump will be sized for the maximum pressure to overcome. For the ΔP calculation a pressure drop at the heat exchangers of 0,1-0,3 bar should be considered.

Variable speed pumps of high efficiency will be selected, which will be set to run at a fixed speed, which can be different between heating and cooling.

The Ochsner heat pump controller can provide on-off control to 8 water circuits for heating and cooling. It will be able to control the speed of the pumps as well from next year. If pump speed control is desired, it should be done by the external Ground-Med control system, usually as a function of temperature difference. In the case of Benedikt, where at system start a few meters pillow of 35°C water is encountered within the BHE, overheating of the heat pump evaporator in winter can be avoided by controlling the speed of BHE pump as a function of temperature.

Heating/cooling water distribution system has been already designed in Oradea.

Installation, Commission and Maintenance

The BHE water should contain inhibitors in order to eliminate carbonate scaling. Brine specifications for the Oradea demo site will be provided by OCHSNER. In addition, OCHSNER will provide the name of the Norm according which the heat pump water circuits have to be filled.

A technician from OCHSNER will commission the machine.

Local partner will nominate a supervisor, which will be trained by OCHSNER in heat operation and control for system optimization.

ANNEX

DRAWINGS OF HEAT PUMP PROTOTYPES HYDRAULIC CONNECTIONS AT EACH GROUND-MED DEMO SITE

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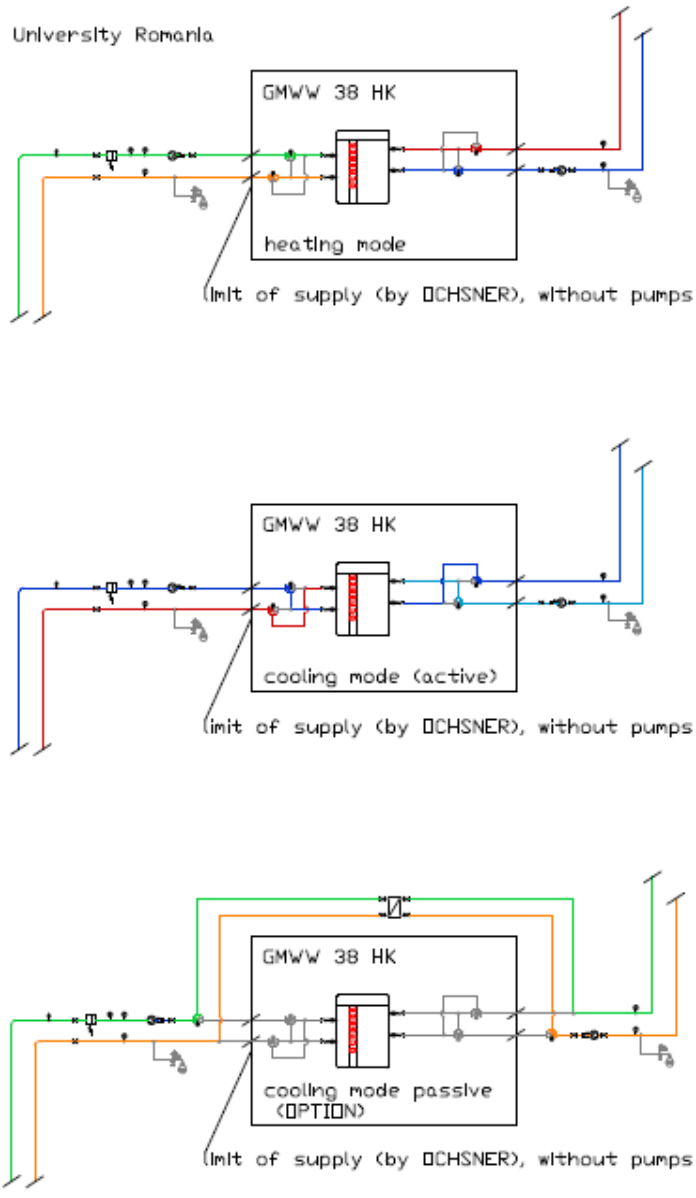

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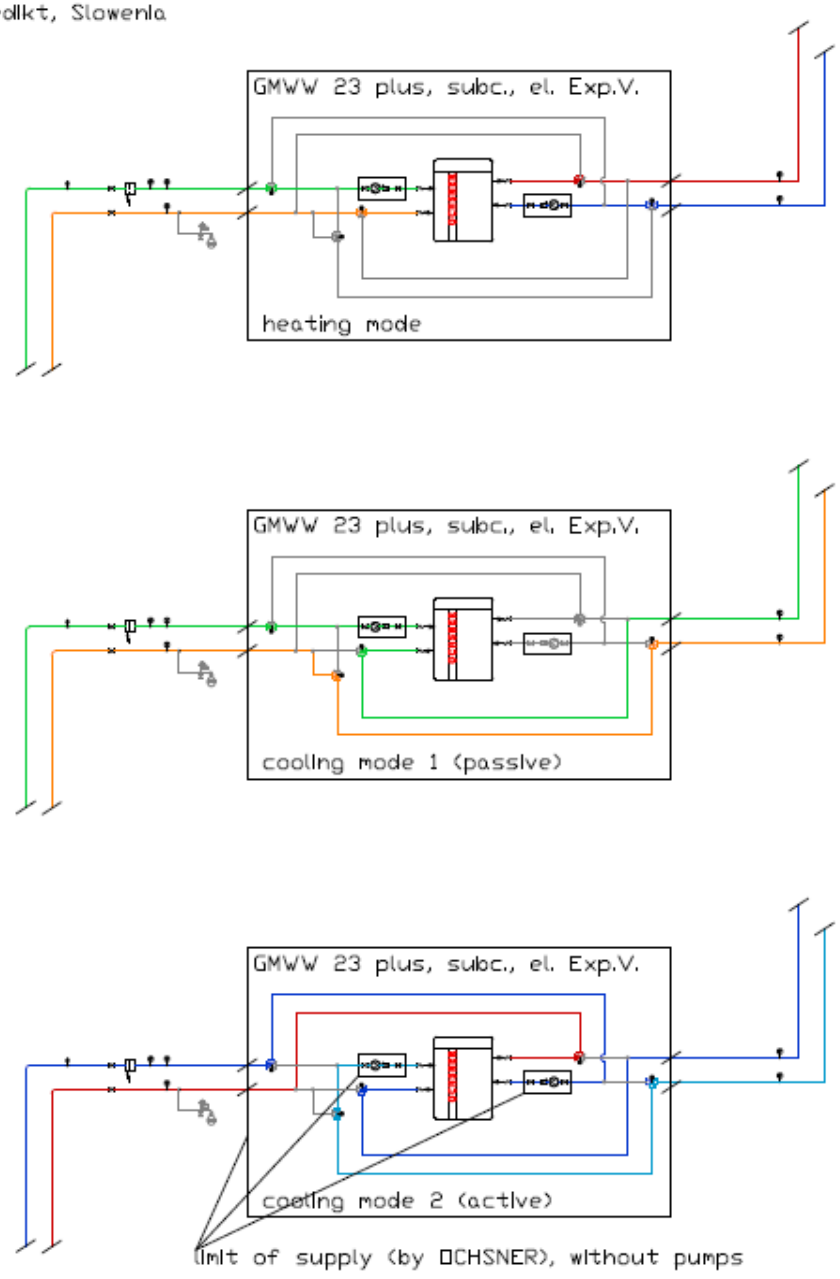
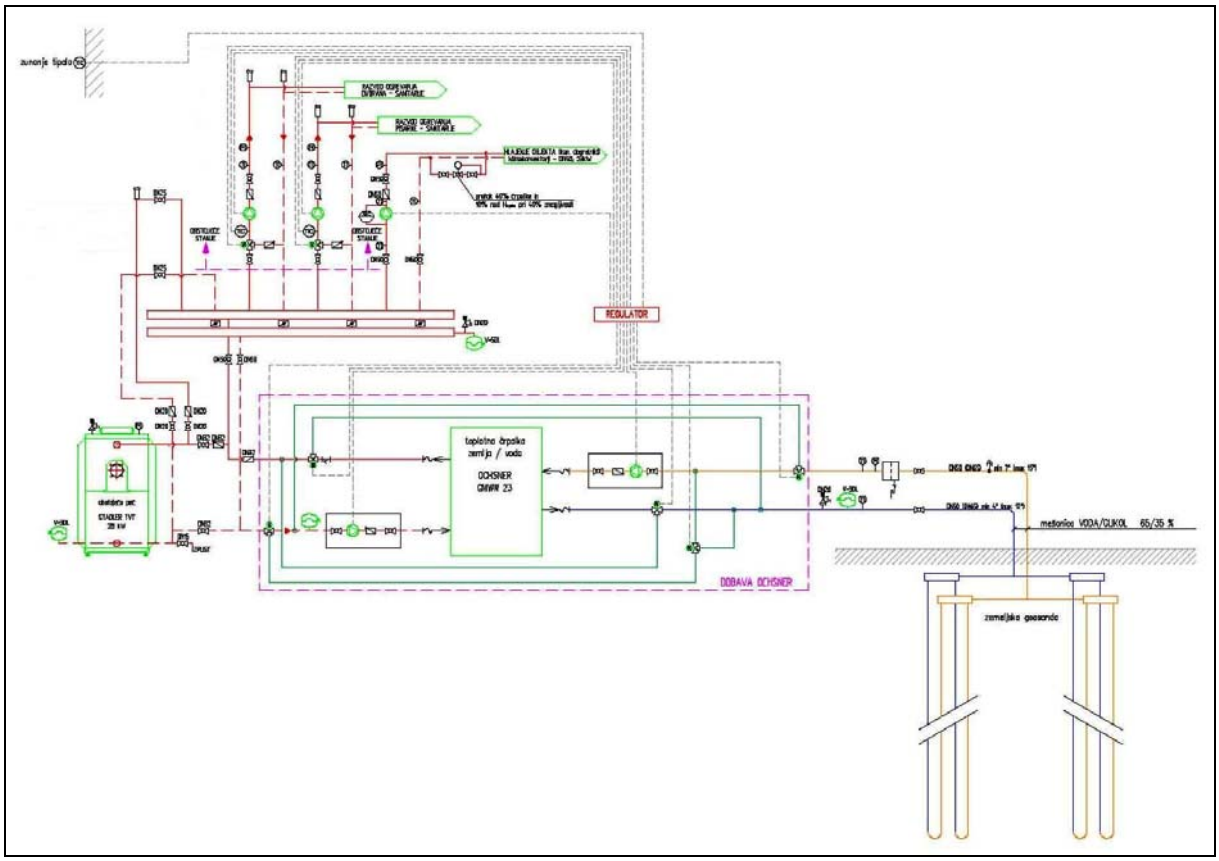
Benedikt, Slovenia





Detail of hydraulic piping at Benedikt demo site (without sanitary water).

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EDRASIS, Athen