Contract/Proposal No. 019988

POLYSMART

POLYgeneration with advanced Small and Medium scale thermally driven Air-conditioning and Refrigeration Technology

Integrated Project

Call: FP6-2004-TREN-3

Priority: SUSTDEV-1.1.4 - POLYGENERATION Demonstration Projects

D3-21 SP1b-System Assembled

Due date of deliverable: month 14

Actual submission date: 2008-07-22

Start date of project: 2006-06-12 Duration: 48 months

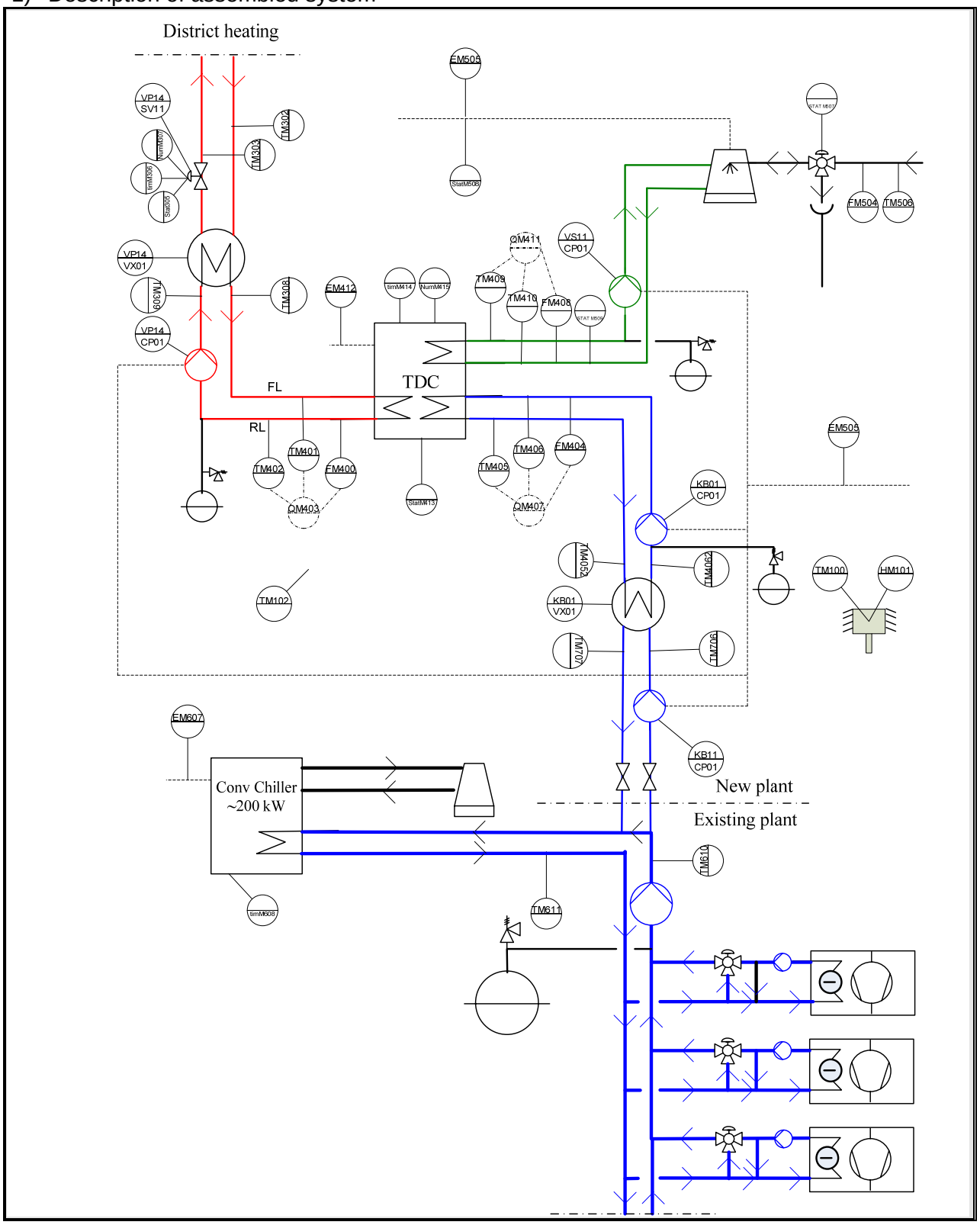
Organisation name of lead contractor for this deliverable: SERC

Revision [Final]

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Subproject SP1b – system assembled/erected

1) Description of assembled system



The SP1b system has been added to an existing building with district heat supplying hot water and space heat, and a compression chiller supplying cooling via air handling units. The SP1b system is also driven by district heat and supplies only cooling to the existing cooling system.

Kind of load, building description

The building served by SP1b is the city hall for the municipality of Borlänge, Sweden. The building, built in 1976 to the then current building regulations, comprises six wings with a total floor area of 15.600 m^2. Approximately 330 people work there in an office environment. The total annual heat load is approximately 1.600 MWh and electricity demand 1.700 MWh. No statistics are available for the cooling load. Active cooling is only required when the ambient temperature is above ~15°C.

Heat and cold distribution system

Space heating and hot water is supplied from a district heat substation in the basement of one of the wings. The heat is distributed via a radiator system to the whole building (six wings) using an ambient temperature controlled flow temperature. Cooling is supplied via air handling units, one for each of the six wings, using chilled water supplied from the central chiller system, located in the same technical room as the district heat substation. The cooling distribution system is designed for 12°C supply temperature and is in operation between 06:00 and 17:00 weekdays. The SP1b system is an addition to this existing system and is connected to the cooling supply only, via heat exchanger KB01-VX01, the heating system being unaffected. The TDC is only used for cooling.

Heat rejection

The heat rejection for the SP1b system is with a dry cooler (Flexcoil VTHD) with design capacity of 25 kW at 27°C ambient temperature with 25/30°C fluid temperatures at a flow rate of 0.5 kg/s. It is equipped with a spray function that sprays water into the inlet air stream (upward going). The dry cooler fan (560 W) is controlled on/off to maintain a return temperature of 26°C (hysteresis 4°C).

mCHP

The system is supplied with district via a heat exchanger (VP14-VX01) and there is no micro-CHP unit in the system. Flow from the district heat network is only turned on when the TDC is being charged.

TDC

The TDC is a ClimateWell 10 from 2007, comprising two identical barrels each with reactor, condenser/evaporator and stores for water and salt (LiCl). The machine operates in batch mode with one barrel being charged while the other can supply cooling. The cycle times of the charge/discharge cycle is of the order of 5-8 hours due to the large storage capacity (25 kWh cool) for each barrel. The nominal cooling capacity of the TDC is 10 kW, but for the given boundary conditions of the system it is only 8 kW. The TDC chills the return water from the main cooling supply via a heat exchanger, and thus precools the water to the main chiller (200 kW).

Storage

The TDC has integral storage of 25 kWh cool per barrel and so there is no additional storage in the system.

Data acquisition system

A Campbell CR10X data logger is used with two multiplexers: one for temperature measurements and the other for flows. Heat power is calculated from the temperature and flow measurements. Electrical meters are connected to measure the instantaneous power and

energies are derived by time integration. Measurements are made every 10 seconds, but average values for each minute are stored.

Sensors

PT100 sensors are used for the temperatures to and from the TDC and are in direct contact with the heat transfer fluid. Thermocouples are used elsewhere, and are mounted on the pipes. Inductive sensors are used for flow measurements. Flow and temperature sensors were calibrated before installation, together with the logger. Heat power is calculated from this raw data. Special ambient temperature and humidity sensors are installed in a Stevenson screen next to the dry cooler. The location and numbering of the sensors is shown in the hydraulic diagram for the system, with details available in the Specific monitoring system (SMS) for the SP1b system.

2) Pictures of assembled system

Main compression chiller (left) and TDC (right).

Entrance to the city hall (one of six wings).

Dry cooler and Stevenson screen for sensors.

Heat exchangers for district heat and cold supply.