TRANSLATION from Swedish

CIT Energy Management AB
A Chalmers Industrial Technology Company

Determination of the temperature efficiency of heat exchanger of the brand Regenair, model RG5400

Commissioned by
Regenair AB
Box 680
13526 Tyresö

Made by
Cit Energy Management AB
41296 Gothenburg

March, 2005

Mail address
CIT Energy Management AB
41296 Gothenburg
Address for visitors:
Chalmers Vasa, building 8
www.cit.chalmers.se

Telephone:
031-772 11 63
Fax : 031-772 49 00

Reg.No. 556329-1342

Summary
The commission comprises measurement of air temperatures to determine the temperature efficiency on the supply side of the heat recovery unit specified below and adjustment and control measurement of the air flows prior to the control measurements.
The job, commissioned by Ola Wiehager, Regenair AB, has been done by Tommy Sundström and Lars Ekberg CIT Management AB.

During the measurements the supply air volume and the exhaust air volume were equal (about 4 600 m³/h). The temperature efficiency on the supply side was determined to be 90 % when the temperature increase caused by the fans was included in the estimate.

At an assessment made in 1989, when the unit had been in operation about one year, the temperature efficiency was determined to be 95 % inclusive of and 89 % exclusive of the fan heat. See report of measurement called "Bestämning av temperaturverkningsgrad för värmeåtervinnare", Department of Installation Technology, Chalmers Institute of Technology, dated 1989-06-21.

Object of Measurements
The object of the measurements is a heat recovery unit of the Regenair make, model RG5400 installed in office building SSPA, Chalmers, Gothenburg. The nominal air flow of the unit is 5400 m³/h and it was installed at the turn of the years 87/88. Thus the unit has been in operation for about 17 years. Some days before the measurements were made, technicians of Regenair serviced the unit and cleaned the heat transferring surfaces.

The unit has two heat packs which by turns take up and give away heat. In one position of operation, pack 1 is warmed-up by the exhaust air while pack 2 is warming the supply air. In the second position of operation, the air flow is changed so pack 1 warms-up the supply air and the exhaust air warms-up pack 2. These operational positions are changed every minute by an arrangement of dampers.

In the supply air, just after the recovery unit, a heater is installed. To eliminate the risk of a measurement fault because of heat radiation from the heater, the heater was off during measurements.

Method of measurement and instrument
The air temperature was measured with an instrument of the type Swema Air 300, provided with a sensor of the model SWA 31 (serial number 382989, calibrated 2004-05-27). According to the supplier of the instrument, the inaccuracy of this instrument is ±0.3°C. Temperature measurements were also dobne with an instrument of the Dostmann make, model P650 serial number 65003110141 calib rated 2004-09-27. According to the supplier of the instrument, the measurement inaccuracy of this instrument is ±0.02 %.

The air flows were determined by measuring pressure dop over four fixed flow measuring instruments of the Stifab make, model CRM-040. Two of the instruments are in the supply air channel and two in the exhaust air channel connected to the recovery unit. The k-factor of the instruments I 95.6.

Pressure differences over the flow measuring instruments was measured with an instrument of the type Swema Air 300 with sensor model SWA 10 (serial number 362309 calibrated 2004-05-27). According to the supplier of the instrument, the measurement inaccuracy is ±1 % of the indicated value ±0.3Pa.

Period of measurement
The measuring was made the 28th February, 2005, outdoors temperature close to ±0.

Results
Below the results of air flow measurements, temperature measurements and measurements of pressure conditions in the recovery unit are reported in that order.

Air flows
After setting, the flows indicated in Table 1 were measured. The difference between supply air flow and exhaust air flow is negligible.

Table 1. Air flows measured.

Place	Donet´s denomination	Perssure difference (Pa)	Air volume (m³/s)
Supply air duct	MP3a	45.2	2 315
	MP1	45.0	2 308
	Total	-	*4 623*
Exhaust air duct	MP3b	43.6	2 272
	MP2	47.2	2 365
	Total	-	*4 637*

Temperature measurements
The outdoors temperature during the measuring was in average -0.3°C. When the measuring started it was -0.5°C and at the end of the measuring +0.1°C.

The temperature in the exhaust air before the exhaust air fan was in average 20.7°C.

The temperature in the supply air after supply air fan.
This measuring was done with the instrument of the type Swema Air described above and it logged the temperature once per second during 2 minutes. The measuring was repeated twice and measurement no. 1 gave the average figure of 18.6°C (maximum 19.9°C, minimum 16.4°C and standard deviation 0.72°C) and measurement no. 2 gave the average figure of 18.5°C (maximum 20.0°C. minimum 16.1°C and standard deviation 0.96°C).

Temperature efficiency
The temperature efficiency was determined in accordance with the following relation:

$$\eta_{supply\ air} = \frac{\text{supply air temperature - outdoors temperature}}{\textit{exhaust air temperature – outdoors temperature}}$$

and the temperature efficience including the temperature increase by the supply air fan:

ηsupply air = (18.6 - -0.3) / (20.7 – 0.3 = 90 %.

Gothenburg 2005-03-11

Lars Ekberg
CIT Energy Management AB

Tommy Sundström
CIT Energy Management AB