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NEW APPROACH REGARDING A CONCEPTION AND LEADING OF THE GEOTHERMAL TERMIC POINT. CASE STUDY

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Abstract. The aim of the research was to presented the contribution regarding the validation of the conception of the ensemble and strategy of leading for the termiuc point from University of Oradea and condition of extended the heated places with aprox 62.000m^3. Conception of ensemble presume utilization in cascade of geotermal energy in termic point and the lead strategy is unitary. Also we study the posibility to stabilised the type PID regulator pharameters through GM component (Graphic Modeller) and ACSL language (Advanced Continuous Simulating Language).

Overall conception and the administration of the thermal poin from the University of Oradea

The Oradea Unviersity Campus contains multiple buildings with a total surface of approximately 70.000m^2 (built volume $V_{cl.tot}$=155.000m^3). A part of the existing buildings can be considered old. The total surface of these old buildings is approximately 32.000m^2 ($V_{cl.vechi}$=125.000m^3), and the built surface of the new buildings ($V_{cl.noi}$=30.000m^3) is 7.600m^2. These buildings contain educational spaces, didactic and research laboratories, research-design offices, gyms, administration offices, two student hostels, the university cafeteria, etc.

In the University of Oradea development plans, are sheduled, among others, the building of a new library, with a total surface of 5.900m^2 ($V_{cl.bibl.}$=32.000m^3); student hostels with a capacity of 400 persons, with a total surface of 9.900m^2 ($V_{cl.cămin.}$=30.000m^3); a pool with geothermal water; a green house for Horticulture students practice. The thermal energy consumers included in the University of Oradea's development plans will have the following characteristics according to the tehnical projects: total volume: $V_{cl.tot}$=62.000m^3; medium quantity of hot water: 6 m^3/h

After performing the analysis the proposed solution the waterfall geothermal energy usage system. We also mention that in the present moment waterfall geothermal energy usage systems don't exist. According to the mentioned above, the following scheme is proposed:

- the utilization of a 140m^3/h (39l/s) geothermal water debit, with temperatures varying between 85/50°C (entrance/exit), for the heating of the existing buildings using a secondary static heating agent (DH1 system);

- the utilization of a 30m^3/h (8,5 l/s) geothermal water debit, with temperatures varying between 85/50°C (entrance/exit), for the preparation of the hot water (20 m^3/h for the existing buildings, 10 m^3/h for the future users) (DHW system);
- the utilization of a 170 m^3/h (47,5 l/s) geothermal water debit, with the temperature of entrance in the heat changer of 50°C, for the heating of the future buildings (the library and the hostels) using a secondary floor heating system (DH2 system).

The principle scheme is presented in figure nr 1, containing the automatization loops of the waterfall geothermal water usage system of the thermal point.

Figure 1.The thermal point conducting loops scheme (waterfall system)

The simulation of the thermal point functioning, having as a purpose the validation of the overall concept and the proposed running strategy

For the implementation of the program of the simulation for the thermal point in the University of Oradea the GM (Graphic Modeler) component of the ACSL (Advanced Continuous Simulating Language) (MGA Software, 1995), (MGA Software, 1996/1)has been used, in the realization of a hierarchical level model structured on the constructive-functional interconnected modules.

The compiling of the simulation program

After the implementation of the thermal point simulation program it has been compiled, having as a goal the proposed objectives(the verification of the proposed running system and the tuning of the PID regulators). In the following are presented a few of the sceneries taken into account in the elaborate study.

The transitory regime at the start-up of the thermal point

The transitory regime for the DH1 heating system

Regarding the DH1 geothermal energy user, at the start-up of the thermal point, two circulation pumps are controlled(P5-P7) witch insure the secondary agent debit for the Dh1 circuit. The TT8 temperature translator, witch measures the temperature of the secondary agent at the exit from the heat changer, sends the according message with the measured temperature to the RG5 regulator witch (according to the external temperature measured by the TT14 temperature translator and the wind velocity measured by the WT1, external temperature and wind velocity determine the necessary temperature for the exit of the secondary agent from the heat changer) controls the opening of the CV2 tap. The tuning process (CV2 tap control commanded by thel RG5 regulator) ends when the temperature at the exit of the secondary heating agent corresponds with it's necessary temperature.

Thanks to the simulation process the way to reach a stationary regime at the start-up of the thermal point has been determined and the modification of the corresponding parameters of the RG5 regulator has been realized so that the necessary time for reaching a stationary regime will be in concordance with the functional parameters resulted from practice.

Figure 2 presents the evolution of the primary parameters until the reaching of the stationary regime, the exit temperature of the secondary agent from the heat changer (*HEHETRHEDH1TS*), the exit temperature of the geothermal water from the heat changer (*HEHETRHEDH1TP*), when the external temperature is –12°C (*OUTTETEMP*). The regime stabilizes after approximately 7.200 seconds (120 minutes), time witch corerspondes to the data resulted from practice. In this case the parameters at witch the system stabilizes are 70°C for the secondary agent 50°C for the geothermal water.

Figure 2.The evolution of the primary and secondary agent for the DH1 geothermal energyuntil the reaching of the stationary regime

Conclusions

The primary objectives of the program were: checking and validating the quality of the running strategy proposed for thermal point from the University of Oradea, by studying the behavior of the parameters that define it's functioning and at the same time the determination of the PID type regulator parameters.

After the identification of the thermal point start-up conditions and possible perturbations, the verification of the simulation program proceeded, cheching many variants, every variant having different sets of values for the start-up conditions and the considered perturbations. In all of the cases the direct influence of the perturbation over one variable dimension affect the functioning of the thermal point. In consequence a reciprocal influence of the tuning loops manifests. Every action, in essence, has a stabilizing character.

The values of the regulator's parameters for the presented variants witch have been stored will be used in the first stage in the automation program. Their values will be definitive only when the DH2 geothermal user will start functioning.

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