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EXPERIMENTAL RESEARCH AT A PLANT THAT USES SOLAR ENERGY TO PRODUCE DOMESTIC HOT WATER AT A HOTEL UNIT IN THE BRAN-MOECIU AREA.

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Abstract: *This paper presents the experimental researches carried out at a solar installation for the preparation of domestic hot water at a hotel unit in the Bran-Moieciu mountain area. The experimental researches were carried out in May - June, thus it is possible to observe the influence of the outside temperature on the thermal agent from the solar installation.*
Keywords: *installation with solar collectors, outside temperature, heat agent*

1. INTRODUCTION

In this paper, the experimental research was carried out at a solar installation for the preparation of domestic hot water at a hotel unit in the Bran - Moieciu area. The hotel unit is located in a mountainous area, the height regime of the construction is ground floor and 3 floors, and the materials from which the construction is made are: reinforced concrete foundations, structure of pillars and reinforced concrete beams, the walls are of masonry. brick, the floors are made of reinforced concrete and the cover is made of ceramic tile.
The hotel unit has the capacity of 15 rooms, 1 dining room, 18 bathrooms, a technical space equipped with heating equipment, installation with solar collectors with vacuum tubes for domestic hot water preparation, the construction is fitted and a thermal power plant with a bivalent boiler for the heating agent in the heating system.

2. TECHNICAL REQUIREMENTS

The experimental researches at the solar installation were carried out in the months of May-June and the equipment used to measure the parameters of the installation are the following:
The VT 300 thermohygrometer anemometer is a multifunctional instrument, compatible with all SMART PRO probes and all K-type thermocouples [1]. SMART PRO probes are provided with a calibration certificate, so when they are connected to the device it displays the date of the last calibration.

Figure 1: Thermo-hygro-anemometer *VT 300* [1]

All probes are automatically recognized when they are connected and interchangeable.

The notations in figure 1. represent: 1 - thermo-hygrometer-anemometer VT 300; 2 - thermo-anemometer with hot wire; 3 - thermocouple with penetration probe; 4 - hot-wire telescopic thermo-anemometer; 5 - K type thermocouple; 6-PV 107 type anemometer.
The technical characteristics of all the probes attached to the thermo-anemometer VT 300 are presented in table 1.

Table 1. The technical characteristics of the thermo-hygrometer-anemometer attachment probes VT 300

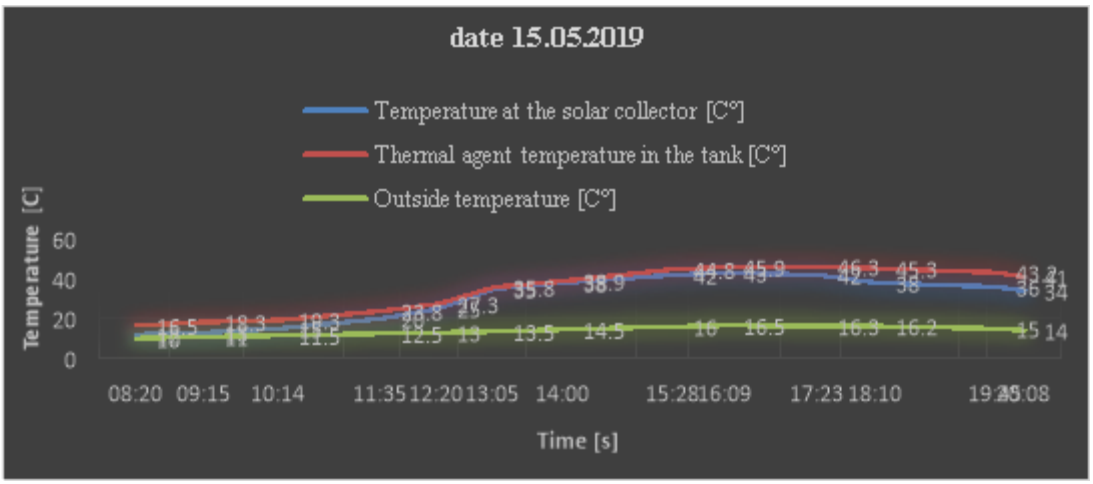
Probe		**Unit of measurement**	**Measuring range**	**Precision**	**Resolution**
Thermo-hygrometer	Humidity	*% RH, g/kg*	3...98 *%*	±1% from reading ±1,5% *RH*	0,1% *RH*
	The dew point	^0C, ^0F, *K*	-20...+80^0C	±2% from reading ±0,1 ^0C	0,1 ^0C
	Ambient temperature	^0C, ^0F, *K*	-20...+80^0C	±2% from reading ±0,1 ^0C	0,1 ^0C
Thermometers	transducer PT 100 (with 2 channels)	^0C, ^0F, *K*	-100...+400^0C	±2% from reading ±0,1 ^0C	0,1 ^0C
	Thermocouple type K (with 2 channels)	^0C, ^0F, *K*	-200...-40^0C -39...+999^0C +1000...+1300^0C	±1% from reading ±1,2 ^0C ±0,5% from reading ±0,8 ^0C ±1% from reading ±1,2 ^0C	0,1 ^0C 0,1 ^0C 1 ^0C
Speedometer	Optical	*Tr/min, rpm, m/min, ft/min, ln/min*	60...50000 *tr/min*	±0,5% from reading 1 *m/min*	1 *tr/min*
	Contact		4...2500 *m/min* 30...20000 *tr/min*	±2% from reading ±1 *m/min*	0,1 *m/min* 1 *tr/min*

This device has a 66x33 mm magnification with automatic screen illumination, a weight of 450 g and a shock resistant housing made of ABS / PC, with Elastomer edges and keyboard. It has 4 keys and a rotary control knob. Communication with the PC is carried out through an RS 232 port.

Measurements at the solar installation were made during May-June 2019

Table 2. Measurements made on the date 15.05.2019

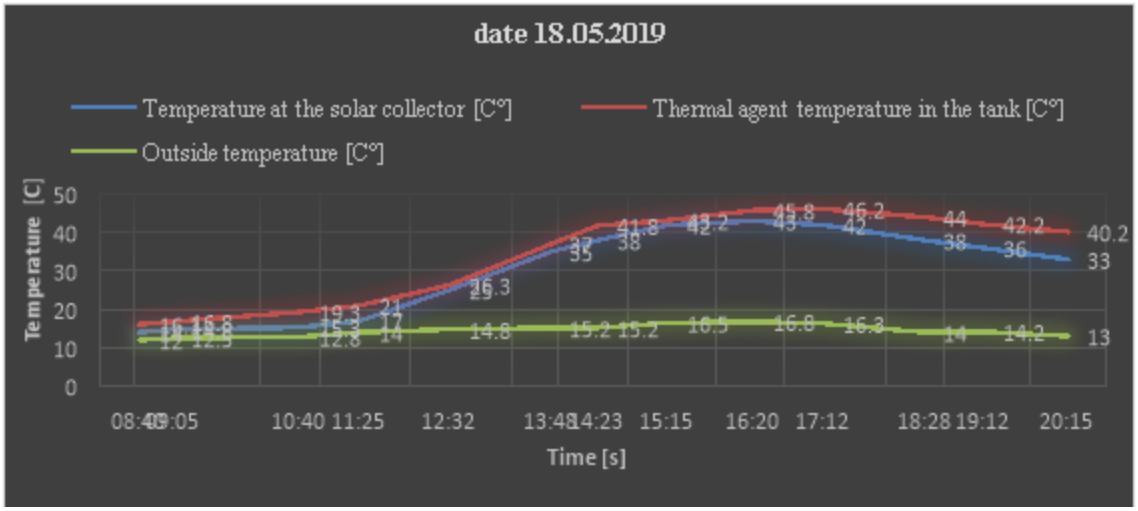
Temperature at the solar collector [C°]	12	13	15	20	25	35	38	42	43	42	38	36	34
Thermal agent temperature in the tank [C°]	16,5	18,3	19,3	23,8	27,3	35,8	38,9	44,8	45,9	46,3	45,3	43,2	41
Outside temperature [C°]	10	11	11,5	12,5	13	13,5	14,5	16	16,5	16,3	16,2	15	14
Time [s]	08:20	09:15	10:14	11:35	12:20	13:05	14:00	15:28	16:09	17:23	18:10	19:45	20:08



Graph 1.

Table 3. Measurements made on the date 15.05.2019

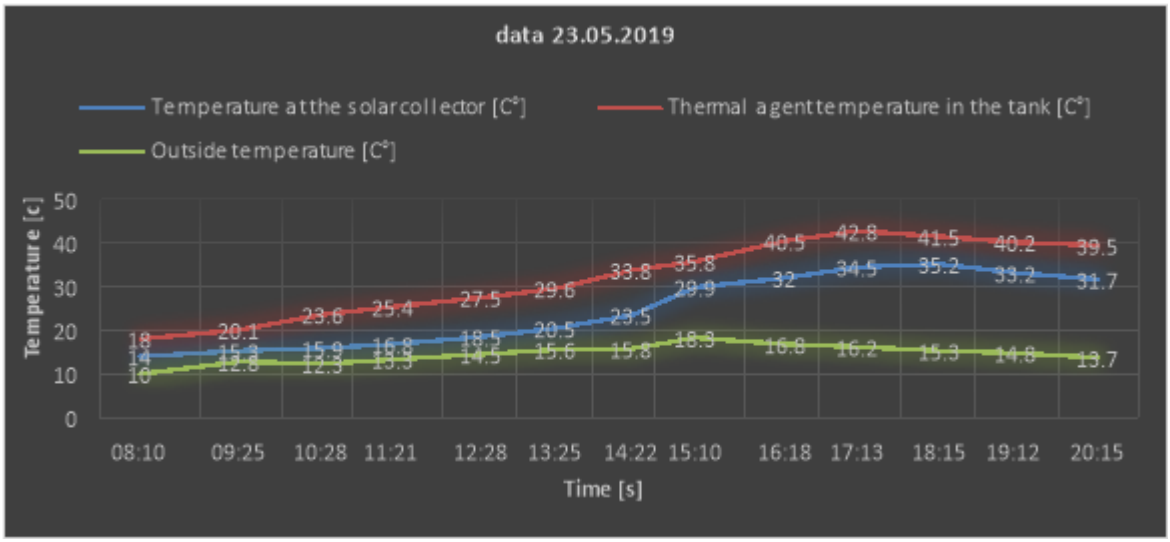
Temperature at the solar collector [C°]	14	14,8	15,3	17	25	35	38	42	43	42	38	36	33
Thermal agent temperature in the tank [C°]	16,1	16,8	19,3	21	26,3	37	41,8	43,2	45,8	46,2	44	42,2	40,2
Outside temperature [C°]	12	12,5	12,8	14	14,8	15,2	15,2	16,5	16,8	16,3	14	14,2	13
Time [s]	08:40	09:05	10:40	11:25	12:32	13:48	14:23	15:15	16:20	17:12	18:28	19:12	20:15



Graph 2.

Table 4. Measurements made on the date 23.05.2019

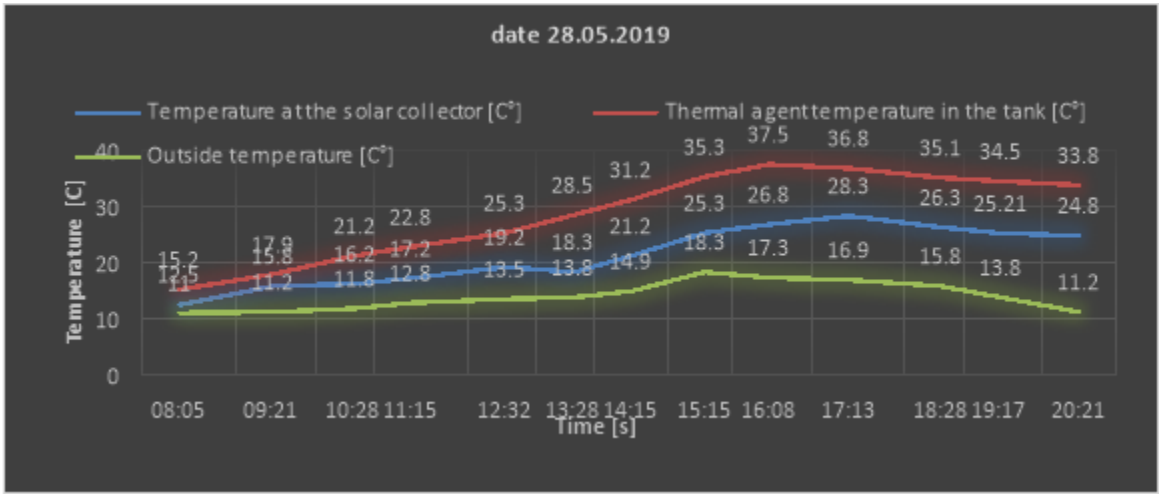
Temperature at the solar collector [C°]	14	15,3	15,9	16,8	18,5	20,5	23,5	29,9	32	34,5	35,2	33,2	31,7
Thermal agent temperature in the tank [C°]	18	20,1	23,6	25,4	27,5	29,6	33,8	35,8	40,5	42,8	41,5	40,2	39,5
Outside temperature [C°]	10	12,8	12,3	13,3	14,5	15,6	15,8	18,3	16,8	16,2	15,3	14,8	13,7
Time [s]	08:10	09:25	10:28	11:21	12:28	13:25	14:22	15:10	16:18	17:13	18:15	19:12	20:15



Graph 3.

Table 5. Measurements made on the date 28.05.2019

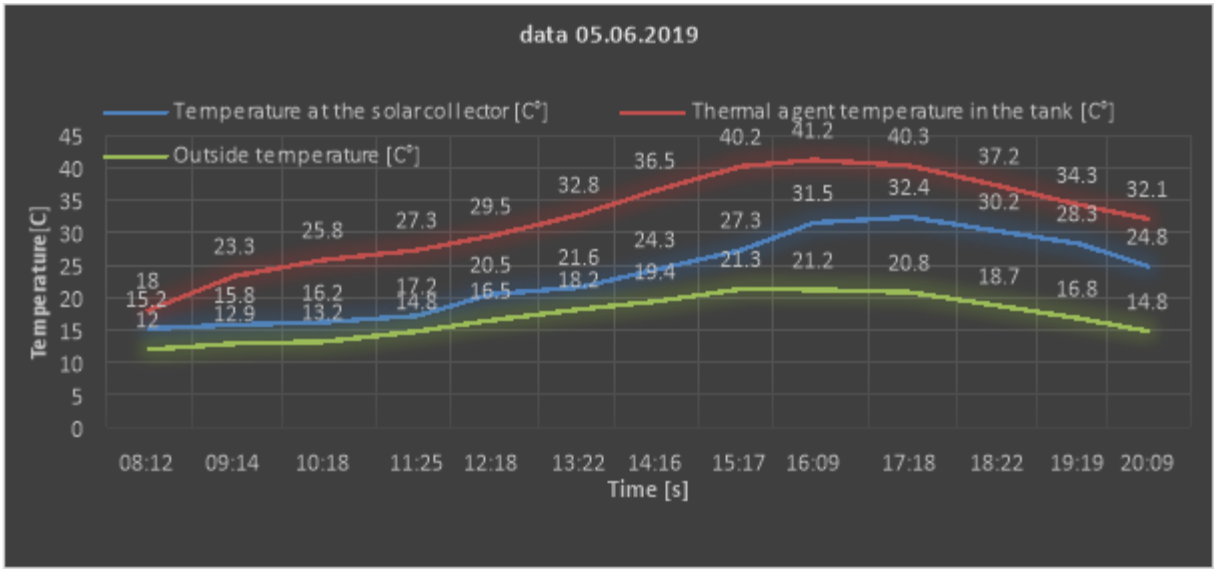
Temperature at the solar collector [C°]	12,5	15,8	16,2	17,2	19,2	18,3	21,2	25,3	26,8	28,3	26,3	25,21	24,8
Thermal agent temperature in the tank [C°]	15,2	17,9	21,2	22,8	25,3	28,5	31,2	35,3	37,5	36,8	35,1	34,5	33,8
Outside temperature [C°]	11	11,2	11,8	12,8	13,5	13,8	14,9	18,3	17,3	16,9	15,8	13,8	11,2
Time [s]	08:05	09:21	10:28	11:15	12:32	13:28	14:15	15:15	16:08	17:13	18:28	19:17	20:21



Graph 4.

Table 6. Measurements made on the date 05.06.2019

Temperature at the solar collector [C°]	15,2	15,8	16,2	17,2	20,5	21,6	24,3	27,3	31,5	32,4	30,2	28,3	24,8
Thermal agent temperature in the tank [C°]	18	23,3	25,8	27,3	29,5	32,8	36,5	40,2	41,2	40,3	37,2	34,3	32,1
Outside temperature [C°]	12	12,9	13,2	14,8	16,5	18,2	19,4	21,3	21,2	20,8	18,7	16,8	14,8
Time [s]	08:12	09:14	10:18	11:25	12:18	13:22	14:16	15:17	16:09	17:18	18:22	19:19	20:09



Graph 5.

3. CONCLUSION

The experimental researches carried out at the solar collector installation from the hotel unit in the Bran Moeciu area, have revealed that the parameters of the solar installation are influenced by the outside temperature.
By means of the realized graphs it is possible to observe the temperature variations of the thermal agent in the solar installation depending on the temperature of the external environment.
The calorific power of the thermal agent in the solar system is influenced by the outside temperature.

REFERENCES

[1] *www.kimo.fr*