

The Relationship between Air Temperature and Water Temperature under Traditional and Experimental Measurement in Johor Bahru (Malaysia)

¹Mohd Hamdan Ahmad, ²Malsiah Hamid, ³Mehdi Hanafi Koumleh,
⁴Mohammadreza Askaripour lahiji

^{1,2,3}Department of Architecture, Faculty of Build Environment, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia

⁴Department of Mathematics, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia

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ABSTRACT

One of the most important factors affecting the surface-water temperature is the weather temperature. It is observed that water temperature depends on weather temperature due to heat transformation between the water and air. But there is a theory based on experimental research stating that drinking water does not follow the same principles at the scope of 22C°- 25 C° for water temperature and 24 C°-30 C° for weather temperature with high humidity[1]. The aim of the research is to investigate the relationship between the weather temperature and drinking water in Johor Bahru in Malaysia in the range of water temperature between 16 C and 19 C° and weather temperature between 24 C° and 30 C° with high humidity.

KEYWORDS: water temperature, weather temperature, Johor Bahru (JB).

1. INTRODUCTION

It is observed that water temperature is basically restricted by air temperature. In table 1, several factors are considered as important factors influencing water temperature. As a result of climate changes, water temperatures are estimated to get warmer, possibly changing the types and amounts of plants and animals that live in the Credit River Watershed [2- 5].

This temperature can change by the human impacts. Thermal pollution is one of the factors that can influence water temperature due to human activities [6]. River water is applied by many industries in their processes. The temperature of water increases before returning to the river so that it gets warmer than before.

This research aims to focus on the human's role in drinking water temperature and its measurement in Johor Bahru [7-8]. All information, related to this work, was directly achieved through field studies and tests performed. Water temperature was calculated by laser guns in 24 hours. In addition, the obtained data were related to water temperature which were compared to the data related to the weather temperature. The temperatures were collected by the mythology department in Johor Bahru city (JB) in south of Malaysia simultaneously (15th April 2013). The site of the study, was in JB. Water treatment and measurement were achieved every hour in the site of the study. The water main tank was 2 meters deep away from the sunlight. This measurement was carried out from the top vent of the tank. Other studies on this subject include [9-16].

The present paper is organized as follows: In section 1, we introduce the subject. In section 2, we demonstrate the case of the study related to the measurement and the study site. In order to evaluate the relation between water and air temperature, the data collected in this case study were transferred into SPSS software. Then, a correlation test was employed for analyzing the data. A brief explanation is given in section 3.

Table1. Important factors influencing water temperature

| Factor | Potential impact on water temperature |
|--------------------------|---|
| Climate | Warmer air temperatures can increase water temperatures. |
| Groundwater | Groundwater input can reduce summer water temperature. |
| Riparian cover | Trees provide shade for streams and reduce maximum water temperature. |
| Stream morphology | Deep and narrow streams are generally cooler than shallow and wide streams. |
| Land use | Impervious cover can increase the temperature of surface runoff to streams. |

2. The Case Study

2.1. Measurement

In this research, laser thermometers were utilized. The laser gun applied in this paper was thermometer Model "Digital Temperature Thermometer Laser Point - 58 ~ 1022F. Pic 1



Pic 1 (leaser gun thermometer)

2.2. The Study Site:

In this section, the data collection process is divided into two parts to collect data about water and weather. All information about water was achieved in The Gunung Pulai water treatment plant in Johor Bahro and the data about weather were accumulated in the Meteorological official website. The most essential of this information is information about water and air temperatures, and their measurement times. This data were obtained after 24 hours:

Table 1: The water temperature obtained by leaser thermometer

| Time | WATER Temp. C° | Time | WATER Temp. C° | Time | WATER Temp. C° | Time | WATER Temp. C° |
|----------|----------------|----------|----------------|----------|----------------|----------|----------------|
| 00.00 am | 17.80 | 06.00 am | 19.60 | 12.00 pm | 17.00 | 06.00 pm | 17.90 |
| 01.00 am | 18.10 | 07.00 am | 19.40 | 01.00 pm | 17.90 | 07.00 pm | 17.00 |
| 02.00 am | 17.30 | 08.00 am | 19.20 | 02.00 pm | 16.00 | 08.00 pm | 18.00 |
| 03.00 am | 18.90 | 09.00 am | 18.70 | 03.00 pm | 16.20 | 09.00 pm | 17.90 |
| 04.00 am | 19.00 | 10.00 am | 19.00 | 04.00 pm | 17.20 | 10.00 pm | 18.20 |
| 05.00 am | 18.90 | 11.00 am | 18.00 | 05.00 pm | 16.95 | 11.00 pm | 18.10 |

Table 2: The data is obtained by Board Casting Office in Senai ,Johor (Malaysia)

| Time | Temp. C° | Time | Temp. C° | Time | Temp. C° | Time | Temp. C° |
|----------|----------|----------|----------|----------|----------|----------|----------|
| 00.00 am | 25.9 | 06.00 am | 24.0 | 12.00 pm | 28.9 | 06.00 pm | 27.9 |
| 01.00 am | 25.9 | 07.00 am | 24.9 | 01.00 pm | 28.9 | 07.00 pm | 27.9 |
| 02.00 am | 25.9 | 08.00 am | 24.9 | 02.00 pm | 29.9 | 08.00 pm | 26.9 |
| 03.00 am | 24.9 | 09.00 am | 25.9 | 03.00 pm | 29.9 | 09.00 pm | 26.9 |
| 04.00 am | 24.9 | 10.00 am | 26.0 | 04.00 pm | 28.9 | 10.00 pm | 26.9 |
| 05.00 am | 24.9 | 11.00 am | 28.9 | 05.00 pm | 28.9 | 11.00 pm | 26.9 |

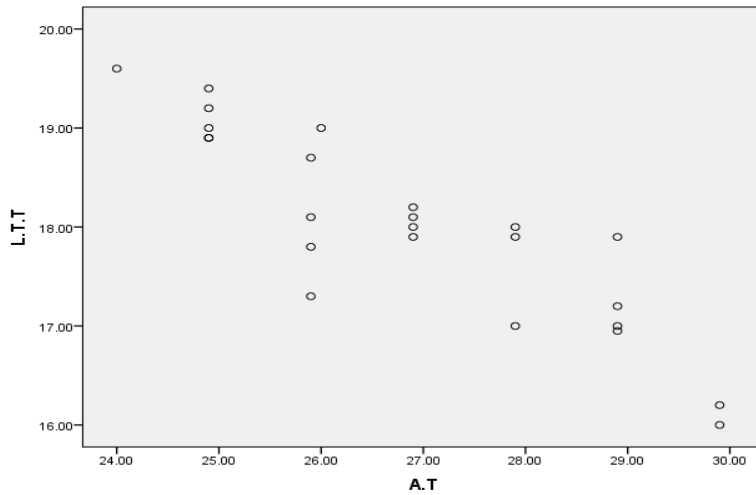


Fig 1: L.T.T (Leaser Thermometer Temperature) & Air Temperature (A.T)

According to the analysis by SPSS software, as Figure 1 shows, there is a correlation between the two variables. In other words, the air temperature and water temperature depend on each other totally.

Table 3: Correlations coefficients

| | | L.T.T | A.T |
|-------|---------------------|---------|---------|
| L.T.T | Pearson Correlation | 1 | -.888** |
| | Sig. (2-tailed) | | .000 |
| | N | 24 | 24 |
| A.T | Pearson Correlation | -.888** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 24 | 24 |

*. Correlation is significant at the 0.01 level (2-tailed).

The coefficients obtained by correlation analysis also confirm that the variables are correlated (See Table 3).

Table 4: Regression coefficients

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|-------|-----------------------------|------------|---------------------------|--------|--------|
| | B | Std. Error | Beta | | |
| 1 | (Constant) | 31.266 | 1.467 | 21.318 | .000 |
| | A.T | -.493 | .054 | -.888 | -.9056 |

a. Dependent Variable: L.T.T(Leaser gun Thermometer temperature)

Based on the consequences of the regression analysis in table 4, it could be defined that, generally, there exists a distinguished relation between the variables. Thus, the equation, based on unstandardized coefficient, can be offered as follows:

$$Y(L.T.T) = -0.493 X(A.T) + 31.266$$

3. CONCLUSION

This study showed that, in some ranges, the drinking water temperature depended on the weather temperature with high humidity. In this research, the temperature range was 16 C°- 19 C° and 24 C°-30 C° for the water temperature and the weather temperature with high humidity, respectively. Although, some of the factors such as sunlight and wind, are not considered in underground and drinking water; there are some factors playing roles in balancing the temperature transformation of the drinking water and weather temperature.

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