

The Effect of Air Temperature on Water Temperature via Traditional and Statistical Experimental Design In Johor Bahru (Malaysia)

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Abstract The temperature of water in each area is related to the variety of Natural factors in that area. Naturally, any changes in these conditions can influence the temperature of water and change it. However, some Human factors have noticeable impacts on it, too. Allegorically, all actions that can be taken during the process of producing drinking water can cause difference in temperatures of the water. This paper aims to provide some information about water temperature in Johor Bahru and compare it with the weather temperature at the same time. With this information, we can explore the humans' roles in changing water temperature.

Keywords: water temperature, area temperature, Johor Bahru (JB).

I. Introduction

Water temperature is largely controlled by air temperature; however, a number of other factors have an important influence on water temperature (Table 1). Due to climate changes, water temperatures are predicted to get warmer, potentially changing the types and amounts of plants and animals that live in the Credit River Watershed [1- 4].

The human impacts also can change this temperature. Thermal pollution caused by human activities is one of the factors that can affect water temperature [5]. Many industries use river water in their processes. The water is treated before it is returned down the river, but it is warmer than it was before. This study is intended to focus on the human's role in drinking water temperature and its measurement in Johor Bahru [6-7]. All information, related to this research, was directly obtained through field studies and tests performed. Water temperature was measured by measurement devices (thermometer) conventional and laser guns in 24 hours. Furthermore, the data obtained related to water temperature were compared with the data about weather temperature collected by the mythology department in Johor Bahru city (JB) in south of Malaysia simultaneously (15th April 2013). The site of the study, was the JB. Water treatment and measurement were done every hour in the site of the study. The water main tank was 2 meters deep, and it was away from the sunlight. This measurement was performed from the top vent of the tank. Other studies on this subject include [8-15].

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.

II. The case study

2.1. Measurement

There are a variety of techniques for measuring the water temperature parameter that can potentially yield different results because different elements are actually being measured. But there are some rules to be highly considered .If the timber thermometer (pic 1) is used, the thermometer must be located in the shade all

the time, and be read as soon as possible after taking it out of water to avoid the effect of environmental temperature. While reading the temperature of water samples, avoid warming the thermometer with your hands or by the sun. Read the temperature measurements to the nearest 1/2.

But for laser thermometer, this rule is not necessary because the thermometer can work in sunlight. Also some of the laser thermometers can show the temperature degree in Tenth grade.

In this research, both conventional and laser thermometers were simultaneously used. The simultaneous use of two thermometers can reduce the percentage of errors, and using the strengths of both of them, we can obtain more accurate information. In this study, ordinary timber thermometer was used with alcohol in it (Pic1), also the laser gun used in this research was thermometer Model "Digital Temperature Thermometer Laser Point - 58 ~ 1022F."(Pic 2)



Pic 1 (Timber thermometer)



Pic2 (leaser gun thermometer)

2.2. The study site

We can divide the data collection into two parts. Collecting data about water and collecting data about weather. All of information about water was obtained in The Gunung Pulai water treatment plant in Johor Bahru and the data about whether were collected in the Meteorological official website. The most important of this information are information about water and air temperatures, and their measurement times.

This data obtained after 24 hours:

Table 2: 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	24.8	06.00 am	24.6	12.00 pm	24.4	06.00 pm	25.2
01.00 am	24.6	07.00 am	24.4	01.00 pm	24.4	07.00 pm	24.8
02.00 am	24.6	08.00 am	24.2	02.00 pm	24.4	08.00 pm	24.8
03.00 am	24.8	09.00 am	24.7	03.00 pm	24.2	09.00 pm	25.2
04.00 am	24.8	10.00 am	24.6	04.00 pm	25.2	10.00 pm	25.2
05.00 am	24.6	11.00 am	24.6	05.00 pm	25.4	11.00 pm	25.0

Table 3: The water temperature obtained by Timber thermometer

Time	WATER Temp. C°	Time	WATER Temp. C°	Time	WATER Temp. C°	Time	WATER Temp. C°
00.00 am	24.6	06.00 am	24.7	12.00 pm	24.3	06.00 pm	25.0
01.00 am	24.6	07.00 am	24.4	01.00 pm	24.2	07.00 pm	25.0
02.00 am	24.6	08.00 am	24.2	02.00 pm	24.2	08.00 pm	25.0
03.00 am	24.7	09.00 am	24.6	03.00 pm	24.2	09.00 pm	25.0
04.00 am	24.6	10.00 am	24.5	04.00 pm	25.0	10.00 pm	24.8
05.00 am	24.7	11.00 am	24.6	05.00 pm	25.0	11.00 pm	24.6

Table 4: 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	26.9	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

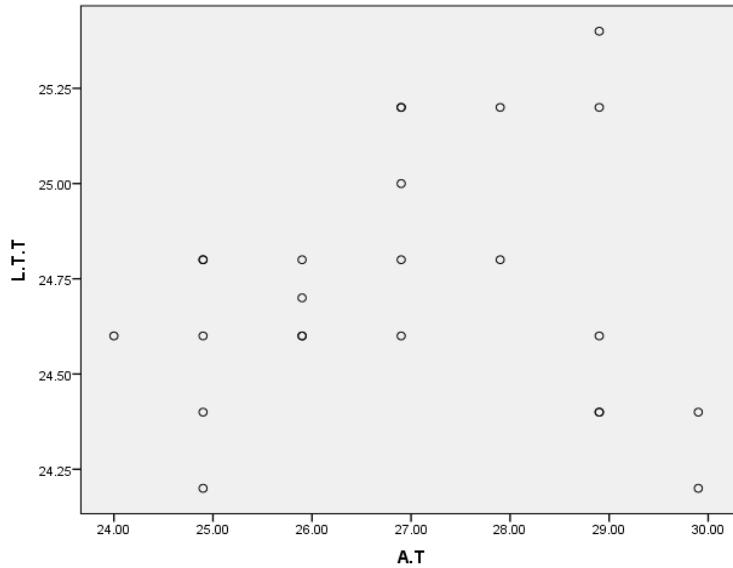


Fig 1 : L.T.T (Leaser Thermometer Temperature) & Air Temperature

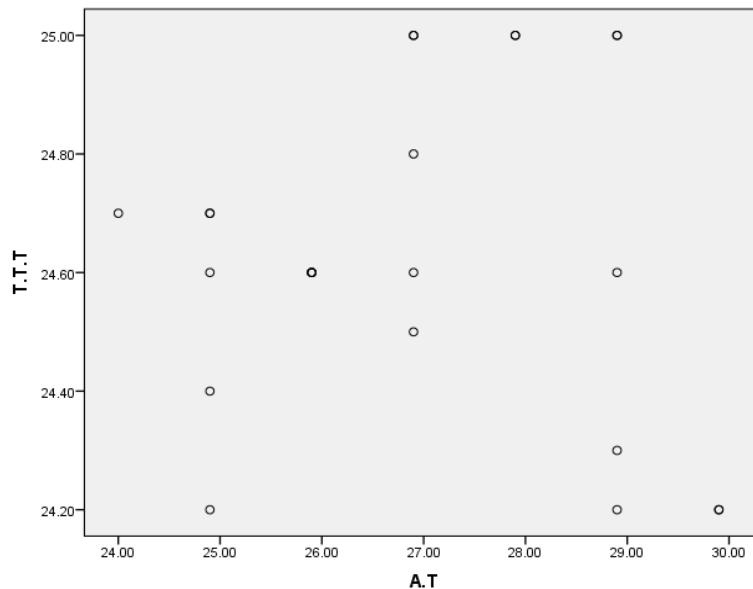


Fig 2 : T.T.T (Timber Thermometer Temp.) & Air Temp.

According to the analysis by SPSS software as Figure 1, 2 shows, there is no correlation between the two variables. In other words, the air temperature and water temperature are totally independent completely.

Table 5: Correlations coefficients

		L.T.T	A.T
Pearson Correlation	L.T.T	1.000	.071
	A.T	.071	1.000
Sig. (1-tailed)	L.T.T	.	.371
	A.T	.371	.
N	L.T.T	24	24
	A.T	24	24

Table 6: Correlations coefficients

		T.T.T	A.T
Pearson Correlation	T.T.T	1.000	-.081
	A.T	-.081	1.000
Sig. (1-tailed)	T.T.T	.	.353
	A.T	.353	.
N	T.T.T	24	24
	A.T	24	24

The coefficients obtained through correlation analysis also confirm that the variables are not correlated and behave separately (See Table 5, 6).

III. Conclusion

According to the above mentioned information, it is shown that in the studied range of the temperature, (24.2c to 29.9 c) the parameters of water temperature and air temperature in Johor are independent of each other. Since some of the natural factors which can affect the water temperature (like sunlight, wind) are removed, their effect can't have any roles on the level of the water temperature. Also other human factors (like chemical changes, and all steps of the process of providing drinking water) have effects on the water temperature. Although we are sure about this independence, in other ranges, these parameters maybe show signs of dependence. Finding the answer of this question needs studies on other ranges of water and air temperature.

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