UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

A GENERIC MATHEMATICAL MODEL FOR ESTIMATING WATER CONSUMPTION IN RESIDENTIAL PREMISES

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

Modelling domestic water usage involves several components of water usage activities. Therefore, in general, the model consists several different variables depending on the water usage activities that are performed by the household. This leads to difficulties in estimating domestic water usage by using online water usage calculator. In this research, a new mathematical model is developed which offers flexibility in term of variable representing a component of domestic water usage. Additionally, the total water usage for each micro-components can be determined by using any function, $f(t)$ where t representing the duration (time) of each water usage activities. It may also contain the frequency of water usage activities.

The developed model has been tested using a set of consumers' data consisting water components variable related to domestic water usage activities. The finding shows water consumption predicted by the developed model are comparable to total water consumption based on per capita consumption (PCC) provided by the authority and average monthly meter reading provided by the consumer. Based on the result of validation, the differences between the value of error of the total consumption based on the proposed method with the total PCC and the average monthly meter reading did not show big changes. Meanwhile, the gap of the validation result between the two selected existing online water usage calculators with the total PCC and the average monthly meter reading are large. These results indicate that the proposed method produced reliable result and suitable to be used in estimating domestic water usage. The proposed method can also potentially be used to predict possible water leakage problem by conducting analysis between estimated water consumption between the proposed method and the water consumption is known as the average monthly meter reading.