



## ABSTRACT

Hydraulic conductivity value can be determined by a variety of techniques, including calculation from formulas, laboratory method and pumping tests of the wells. In 1988, Sunjoto developed an analytical equation which was derived by integration to compute the depth of water on the recharge well it is called built up. In 2002, he developed the F, the parameter of the equation under confined and unconfined aquifer with full and partial penetration test respectively. The F, shape factor has been focused on the geometry of well, unlike pump test. He also modified this equation in 2014 to compute the drawdown and coefficient of permeability on pumping test and furthermore it's called Sunjoto Method. This method doesn't need table or graphics, it need only equation which is computed by trial and error or iteration solution. However, the Sunjoto method required to do a lot of research to approve because of the new method. Therefore, the researcher decided to approve the Sunjoto equations by doing the comparison with other pumping test method. The physical experiment tank has been conduct to take the data measurement under pump test and the data analyzed by Theis method. The main goal of this research is to prove Sunjoto equations and methods. At the first step, the researcher tried to prove Sunjoto equation by using pump test and related equations. After doing the pump test at the laboratory and data analysis, there have many error and problems has been found. There are conditional error, computational error, assumption and derivational error. The boundary method has been used to solve the conditional and computational error. Moreover, the computation getting more complicated to solve. Therefore, the researcher has tried to do the analysis by using the data from the field outside area. The pump test data has been analyzed and compared between Sunjoto method and Theis method by using one way ANOVA method. In the analysis of pump test data, the F crit has a smaller than F calculated value. Hence, the null hypothesis was accepted. Even the conditional error could be solved and acceptable there still has the assumption error that pump test always mainly considered on the environment of the well and Sunjoto method is focused on the well condition only. In this step, Hvorslev equation has been found as the basic



assumption and derivation of Sunjoto equation instead of Forchheimer equation. The main focus of this equation is to consider detail conditions around the well. This equation can be used under slug test method not in pump test method. According to the many reasons, the slug test has been decided to use for the next test. A slug test is different from standard aquifer tests, which typically involves well pumping at a constant flow rate, and monitoring the response of aquifer in monitoring wells nearby. The slug tests are preferably to be performed instead of constant rate test, because the slug tests do not require pumping and there is no need to take too much time for test. Different from pump test, the slug test only requires the measurements for around the well dimension. The slug test has been conducted using experiment tank in the laboratory of hydraulic, Department of Civil and Environmental Engineering, Universitas Gadjah Mada. This research only uses full penetration of well under unconfined aquifer. Moreover, the researcher also used the slug test data from the field outside area for the comparison. The one-way ANOVA method was used for the comparison result. The Sunjoto method result has greater than Hvorslev method under slug test even the difference is not too much. In the slug test the alternative value has been acceptable, since the  $F_{crit}$  has greater than calculated value. This means that each method has different assumptions and different hydraulic conductivity values. The recommendation for the research is the slug test method can decided the correct and appropriate method for Sunjoto equation than pumping test method. The other important factor is the time value has required adjusting in Sunjoto equation. Moreover, the constant head test method cannot compare with Sunjoto equation because of the different assumptions. Therefore, the researcher would like to suggest that Sunjoto equation can used under slug test and compare with falling head test method only.