**Pumping test**

A **pumping test** is a field experiment in which a well is pumped at a controlled rate and water-level response ([drawdown](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Drawdown)) is measured in one or more surrounding observation wells and optionally in the pumped well (control well) itself; response data from pumping tests are used to estimate the hydraulic properties of aquifers, evaluate well performance and identify aquifer boundaries. **Aquifer test** and **aquifer performance test** (APT) are alternate designations for a pumping test. In petroleum engineering, a pumping test is referred to as a **drawdown test**.



The goal of a pumping test, as in any [aquifer test](http://www.aqtesolv.com/aquifer-tests/aquifer-tests.htm), is to **estimate hydraulic properties** of an aquifer system. For the pumped aquifer, one seeks to determine [transmissivity](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Transmissivity), [hydraulic conductivity](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Hydraulic_Conductivity) (horizontal and vertical) and [storativity](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Storativity) (storage coefficient). In layered systems, one also uses pumping tests to estimate the properties of [aquitards](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Aquitard) (vertical [hydraulic conductivity](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Hydraulic_Conductivity)and [specific storage](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Specific_Storage)). Pumping tests can identify and locate recharge and no-flow [boundaries](http://www.aqtesolv.com/pumping-tests/pumping-tests-in-bounded-aquifers.htm) that may limit the lateral extent of aquifers as well.



*Fig Estimation of aquifer properties by matching Theis (1935) type-curve solution to time-drawdown data collected in an observation well during a constant-rate pumping test in a nonleaky confined aquifer*

Typically, aquifer properties are estimated from a [constant-rate pumping test](http://www.aqtesolv.com/pumping-tests/constant-rate-pump-tests.htm) by fitting mathematical models (type curves) to drawdown data through a procedure known as **curve matching** (Figure 2). **Diagnostic tools** such as [derivative analysis](http://www.aqtesolv.com/pumping-tests/derivative-analysis.htm) are useful for identifying flow regimes and aquifer boundaries from a pumping test prior to performing curve matching.

Prior to performing a pumping test in the field, one should spend time in the office developing a thorough plan for the test. Proper planning includes the [design of the test](http://www.aqtesolv.com/pumping-tests/pump-tests.htm#Pumping_Test_Design), acquisition and preparation of [field equipment](http://www.aqtesolv.com/pumping-tests/pump-tests.htm#Field_Equipment_Checklist), measurement and control of [flow rates](http://www.aqtesolv.com/pumping-tests/pump-tests.htm#Pumping_Rate_Measurement), measurement locations and schedules (with pre- and post-test collection periods) for [water levels](http://www.aqtesolv.com/pumping-tests/pump-tests.htm#Water_Level_Measurement_and_Frequency), [disposal of pumped water](http://www.aqtesolv.com/pumping-tests/pump-tests.htm#Disposal_of_Pumped_Water) and [test duration](http://www.aqtesolv.com/pumping-tests/pump-tests.htm#Test_Duration).

**Types Of Pumping Tests**

Common types of **pumping tests** that you may perform include the following:

* [Constant-rate tests](http://www.aqtesolv.com/pumping-tests/constant-rate-pump-tests.htm) maintain pumping at the control well at a constant rate. This is the most commonly used pumping test method for obtaining estimates of aquifer properties.
* [Step-drawdown tests](http://www.aqtesolv.com/pumping-tests/step-drawdown-tests.htm) proceed through a sequence of constant-rate steps at the control well to determine well performance characteristics such as well loss and well efficiency.
* [Recovery tests](http://www.aqtesolv.com/pumping-tests/recovery-tests.htm) use water-level ([residual drawdown](http://www.aqtesolv.com/aquifer-tests/glossary-of-aquifer-testing-terms.htm#Residual_Drawdown)) measurements after the termination of pumping. Although often interpreted separately, a recovery test is an integral part of any pumping test.