



MONITORING, GAUGING & DIAGNOSTIC TECHNOLOGIES & SERVICES

ADFM ACCURACY TESTS SUMMARY

Bureau of Reclamation Water Resources Research Laboratory

The ADFM was tested in two separate channels at the Bureau of Reclamations Water Resources Research Laboratory. The channels were rectangular in shape and had widths of 4' and 12'. Each of the channels is fed by the lab's water supply line, which provides a constant rate of water flow once equilibrium is established. The flow rates are measured by a Venturi reference meter. This meter is calibrated on a regular basis and is considered to be accurate to within 0.8% of actual flow rate. Three separate tests were conducted with the ADFM. A flow rate was established, and regular readings of the reference meter were made and compared to the ADFM measured flow rates over several hours for each test. The resulting differences between the ADFM measured reading and the lab reference meter readings were 1.72%, 0.97% and 1.85% for the three tests.

Contact – Tracy Vermeyen, US Bureau of Reclamation Water Resources Research Laboratory

Onondaga County M5 Dye Study

During the summer of 2002 Brown and Caldwell (BC) performed assessment monitoring for Onondaga County. Assessment monitoring included installing an alternative flow meter in a 72" combined interceptor sewer (location M5) and comparing the results of this alternative meter to the previously installed flow meters. The ADFM flow meter was chosen as the alternative meter because it is considered a technologically-advanced meter. It will measure flow more accurately than other meters for larger diameter pipes. A dye-dilution study also was performed by BC to assess the performance of the ADFM in measuring sewer flow. The study was performed by continuously injecting non-toxic fluorescent dye at a known metering location. This study showed the ADFM meter was able to measure flow to within approximately 2% of the dye-dilution method.

Contact – Dan Davis, John LaGorga, Brown & Caldwell

Sacramento 108" Sewer Line

The Sacramento Regional County Sewer District performed a rhodium dye test of an ADFM installation site. The site was a 108" diameter reinforced concrete pipe. The test was conducted by Brown and Caldwell Engineers. The dye test is considered to be accurate to within 2% of actual flow rate.

The dye test was performed over two (2) days, during the 6 hours of peak flow from early morning (approximately 7:00 a.m.) to mid-day. The ADFM measurements averaged a difference of 1.8% to the dye test measurements. This average difference was observed over the range of flows experienced during the tests.

Contact – Rhys McDonald, Brown and Caldwell Engineers

Pima County WMD - 15" Flow Test Loop

The Pima County Wastewater Management Department tested the ADFM, and other flow meter technologies, over a several month period. All systems were tested in a 15" PVC test loop. The test line reference meter was a NIST traceable magnetic flow meter with a certified accuracy of 0.25%. Flow depths within the 15" line were varied from 4" to full pipe. Tested velocity range was from 0.1 to 0.7 feet per second. These low flow speeds were selected because of the specific conditions of interest in the WMD collection system. Flow data during surcharged conditions (backwater, with low flow velocities) is considered critical for WMD's operations.

The ADFM averaged a difference of 1.5% from the 0.25% NIST traceable meter. This average was measured over a one-week period. During this period, the depth and average velocities were randomly changed over the ranges stated above. The ADFM was the only meter tested that was able to measure within the 2% range stipulated by WMD personnel. The next closest meter averaged approximately 6% in error.

Contact – Mike Willett, Pima County Wastewater Management Department

Salt River Project - Arizona Canal

The ADFM was installed in the Salt River Project's Arizona Canal for a four-week period. The ADFM was installed in the canal on a temporary "L" shaped bracket that allowed installation and removal while the canal was under operation. The ADFM's flow measurements were compared to measurements obtained from a broad-crested weir located downstream in the canal. The weir has thousands of profiling calibrations measurements taken over the years. The weir is considered to be a 2% device because of all the calibration data.

Over the four-week period the ADFM totalized measurements differed by 0.5% from the weir's totalized measurements. This data include two days of low stage flows in the canal. During these low flows, the calibration of the weir is not as well understood, and the differences between weir and ADFM were greater during these periods of time. When the canal flowed at typical stage levels, the difference between a week's worth of ADFM totalized data and weir data was less than 0.1%.

Contact – Curt Kennedy, Salt River Project

USDA Water Conservation Laboratory

The ADFM was tested at the United State Department of Agriculture's Water Conservation Laboratory in Mesa, Arizona. The ADFM was installed in a 30" concrete pipe test line. The lab has a constant head tank that provides a constant flow rate through the test line once equilibrium is established. A specific flow rate was established, and the flow rates were periodically checked by a 0.2% NIST traceable weight tank on the downstream end of the test line.

Over an 8-hour period the ADFM measured flows were compared to the flow rates measured by the weight tank. An average difference of 1.5% was observed between the ADFM measured flow rates and the weight tank measured flow rates.

Contact – John Replogle, Ph.D., USDA Water Conservation Laboratory

Utah Water Research Laboratory

The ADFM was tested at the Utah State University's Utah Water Research Laboratory in Logan, Utah. The ADFM was installed in a 48" concrete pipe, 36" rectangular channel and an 84" rectangular channel. The tests were for the qualification round of a municipal bid process for Pima County. The facility's test loop has a NIST traceable accuracy of 0.2%. Tests were run from depths of 10 to 48" over a velocity range of -3.5 to 12 feet per second. The ADFM displayed an average difference of 0.1% over all tests. The error for individual flow rate tests varied from 0.0 to 2.6%.

Contact – Michael C. Johnson, Ph.D., P.E.