



Newsletter – *May 2013*

ASB Systems Pvt. Ltd.

Authenticated Data Current Profiler

In continuation to our series on ADCPs, in this issue we focus on the data collection aspect of deploying an ADCP for discharge measurements. A discrete collection of Do's and Don'ts for this Hydrological application.

As the title aptly describes, the big advantage of ADCP....No guesswork in Discharge measurements.

No more relying on formulae, extrapolation and “estimates” of current meters. With an ADCP assigned to the complex task of discharge measurements, one can now be assured that the result will be the truth and nothing else but the truth!! An ADCP will provide its user with consistent, quality discharge data.

But as any good offer is valid only if its terms and conditions are met, same applies for ADCPs...accurate data delivery is possible, provided the nominal pre-conditions are satisfied.

These are presented below in the form of standards and guidelines to be followed in an ADCP survey, so that flow ambiguity exists only in the water....not in your measurements!

In this issue...



TELEDYNE
RD INSTRUMENTS
A Teledyne Technologies Company

ADCP – 2nd
Newsletter of the
ADCP series



ADCP in
Hydrology –
Discharge
measurements

Data collection
Do's and Don'ts



Customer satisfaction is our prime objective

Standards

ADCP Depth:

- The ADCP depth, or vertical distance between the water surface and the centre of the transducer faces, must be measured to within 1 cm.

Correlation:

- The correlation of water velocities must be done using 4 beam solutions.

Diagnostic Test:

- The instrument must be subjected to and pass the most complete instrument check routine available prior to every discharge measurement.

Discharge Computation:

- Discharge must be the average of at least two pairs of reciprocal transects (4 transects) within 5% of their average.
- Two additional pairs of reciprocal transects must be obtained when the two pairs are not within 5% of their average and no critical problem can be identified and documented for the difference. Under such conditions, once transects are validated, the discharge measurement becomes the average of up to 8 transects.
- Discarding and replacing a transect can be done only if a critical problem is identified and documented for it. e.g., False start.

Extrapolation Method

- Top and Bottom: The discharge extrapolation method for velocities near the surface and the bed must be “power” with 1/6 as exponent. The use of any other method must be demonstrated and documented during data review.
- Edges: 10 ensembles must be used at the transect start/end points to extrapolate velocity data toward the edges.

Magnetic Variation:

- The internal ADCP compass must be calibrated when using a GPS. It is good practice to do it before each measurement.
- An accurate value for the local magnetic declination must be used when using a GPS.

Moving Bed:

- A moving bed test must be performed prior to every discharge measurement.

During a moving bed test, the ADCP must record data in steady position for at least 10 minutes. Performing a moving bed test can be avoided only if it was confirmed and documented that this phenomena does not exist at the site for conditions encountered.

- The moving bed effect is considered significant when there is perceived upstream displacement of the boat and the ratio of “moving bed velocity” versus “test site mean velocity” is greater than 0.01.
- When a significant moving bed is detected, differential GPS must be used to compute boat velocities.
- If it is not possible to use a differential GPS, an alternative discharge measurement method should be used. Otherwise, at least 3 moving bed tests spread evenly across the river must be performed.
- If the quality of data produced by estimating the bias from a moving bed effect is deemed acceptable by reviewers, a comment relative to the correction method must be documented.

Ensembles:

- Ensembles must be averaged outside of the ADCP. Only single water pings must be used to produce ensembles, with exception for specialized modes designed to operate differently.
- No more than 2 bottom pings can be used to produce ensembles.

Salinity:

- Water salinity can be set to 0 when working in fresh water environments. It must be measured when working in estuaries or anywhere with potential saltwater intrusions.

Software Version:

- Only an officially accepted version of TRDI WinRiver can be used to produce discharge measurements.

Temperature:

- Water temperature must be measured with a thermometer near the ADCP prior to each discharge measurement.

Time:

- The ADCP time must be set to clock prior to every discharge measurement.

Guidelines

Boat speed:

- Boat speed should not exceed water speed during a measurement. Above all, what is important is to have a smooth boat operation with as little acceleration as possible.

Edge Integrity:

- To prevent side-lobe interference and other acoustic contamination from vertical channel walls, start/stop points of transects must be no closer to a wall than the depth of water near that wall. (e.g., if the depth at the vertical wall is 4 m, the transects should start/stop no closer than 4 m to the wall).
- Ensembles closest to the edge should contain at least 2 valid bins.

Transect Quality:

- Transects should have less than 10% bad ensembles and 10% lost ensembles
- Transects should have less than 25% bad bins
- Transects should have a ratio of Measured/Total Discharge greater than $\frac{1}{2}$. Factors influencing the measurement such as the shape of the cross section must be considered while assessing the quality of a transect based on these guidelines.

Pitch and Roll:

- The average pitch and roll angles should be less than 5° throughout a transect.

Temperature:

- An ADCP should be checked if a difference larger than 5°C persists between the ADCP temperature probe and the value measured by thermometer during the measurement.

GPS Quality:

- The trajectory defined by GPS should contain no large irregularities (large drifts and spikes) and, overall, be similar to the one defined by Bottom Track, within the errors caused by a potential moving bed effect.
- HDOP should be less than 4.
- Delta Altitude should remain less than 3.5 m.

The above standards and Guidelines alongwith General survey "Ground rules" will ensure that your Teledyne RDI ADCP will "Discharge" its duties..... efficiently!