



Measurement of Loss Rates From Bunds

During the test the bunded area is flooded with water and a measurement of loss rate is made and adjusted for any evaporation and rainfall. Measurements of evaporation and rainfall are carried out by setting up a rainfall gauge and paddling pool sized evaporation pond adjacent to the bund. Electronic level sensors monitor the rainfall and the level of water in the bund and paddling pool. The resolution of these sensors is better than can be achieved by manual reading. This is of value where loss rates are low.

The level sensor located within the bund wall is intrinsically safe and is connected to a computer interface located in an adjacent safe area. The interface is fitted with an intrinsically safe transformer isolated barrier which electrically isolates the position sensor from the other electronics. Sensors and barriers are certified to appropriate standards for use with Class IIa vapours.

Electronic gauges are used to record weather conditions (wind speed and direction, rainfall, air temperature, pressure and humidity) during the test and data from these were used to calculate cumulative rainfall and evaporation. This data is useful in interpreting changes in the bund and control levels and in calculating the collection ratio for the bunded area (see below).

Manual rainfall and evaporation measurements are also made to verify the electronic data. Rainfall is measured using a 100mm diameter Hellmann style gauge and the evaporation rate is calculated from changes in level of a paddling pond adjacent to the weather station after correction for rainfall.

Where a test is carried out without electronic monitoring, readings are generally taken at six hour intervals. The electronic system is able to monitor the test continuously without any requirement for site visits. In general, the equipment and site are checked twice daily and manual level monitors are read (these provide a check on the electronic systems).

While the electronic system monitors the test continuously we generally record data at one hour intervals as this gives sufficient resolution to monitor changes effectively without generating excessive amounts of information.

During rainfall events the water level in the bunded area will generally rise by more than the depth of rainfall. This is because the collection area for water within the bund is greater than the surface area of the ponded water. Water collected from the tank roofs and the sloping portions of tank foundations and the bund wall all becomes ponded within the bund. To analyse the results the collection ratio must either be estimated from site drawings or derived from the recorded data. Because the electronically recorded data is taken at short intervals it is possible to obtain the collection ratio directly by observing the increase in height of the bunded water during a rainfall event and comparing it to the observed rainfall. During this time humidity is generally high and evaporation is thus negligible. This option is not available where manual readings are spaced many hours apart.

Once the bund levels have been corrected for rainfall they must also be corrected for evaporation. The levels of the evaporation pond corrected for rainfall, give a measure of the evaporation during the test. Once this correction is applied to the bund levels any remaining change must be due to leakage.

Generally at some stage during the test evaporation levels are low and there are no rainfall events. Any change in level during this time is a direct measure of the leakage rate. One advantage of the electronic system is that it has high resolution and a continuous on site presence so that data from such periods is collected and can be compared to data from the test as a whole.

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