

Pressure losses occur when water flows through a pipe network because of friction losses in the pipes and fittings. Pressure changes also occur as water flows uphill (pressure loss) or downhill (pressure gain) in a pipe network. If a micro irrigation system is poorly designed or improperly installed, pressure losses may be excessive because components are too small for the design flow rates or slopes are too steep for the components selected. For these reasons, water application uniformity may be greatly affected by the design of the pipe network.

This bulletin presents procedures to separately evaluate the uniformity of water application due to pressure variations in the pipe network (hydraulic uniformity) and the variations due to the emitter characteristics (emitter performance variation). Knowing both of these factors will help an irrigation system manager identify the causes of low application uniformities and the type of corrective action that may be required to improve the uniformity of water application.

These procedures should be performed on newly installed micro irrigation systems to verify the quality of designs and installations and to provide a reference for future evaluations. Also, evaluations should be conducted at least annually to determine the effects of emitter plugging or changes in other system components on system performance.

Hydraulic (pressure) Uniformity

The hydraulic uniformity refers to the effects on uniformity of pressure variations which occur in a micro irrigation system. Hydraulic uniformity, U_{sh} , is defined similar to Equation (1):

$$U_{sh} = 100\% (1 - V_{qh}) \quad (2)$$

where U_{sh} = hydraulic uniformity based on pressure distributions,
and

V_{qh} = statistical coefficient of variation of pressures.

A low value of U_{sh} is most often due to improper design. However, improper installation of components or the installation of the wrong components can also reduce U_{sh} . Low values of U_{sh} may be due to pipe sizes that are too small, laterals that are too long, laterals that are incorrectly oriented with respect to slope, improper emitter selection, or other characteristics of the hydraulic network. All of these system characteristics must be properly selected and sized based on the system flow requirements.

The hydraulic uniformity of a micro irrigation system is estimated by measuring pressures at points distributed throughout each irrigated zone. Measure pressures to the nearest pound per square inch (psi).