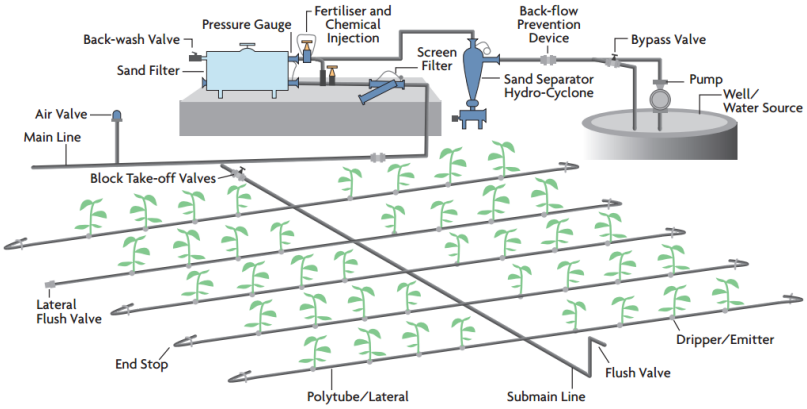
Understanding your irrigation system

WE CAN'T MANAGE IF WE DON'T MEASURE

Measurement of flow rate and pressure are critical to understanding the performance of your irrigation system

Pressurised irrigation systems generally have complex hydraulic components, including pumps, valves, filters, non-return valves, elbow, t-piece, expansions, etc. Each of these components affects the water flow.

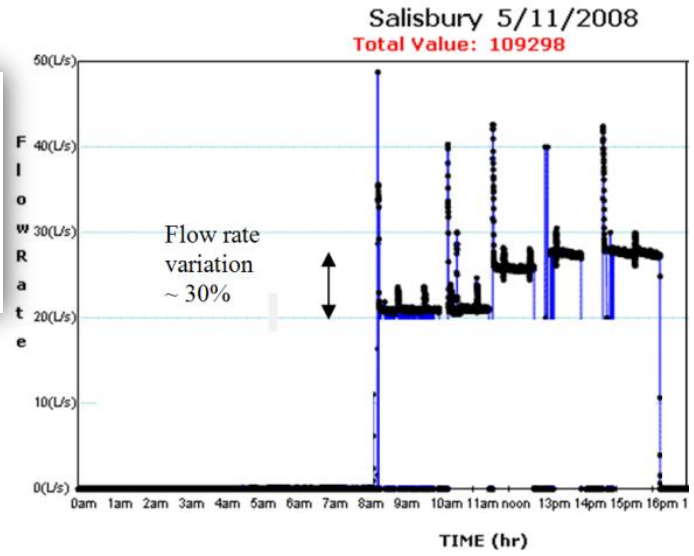


Good distribution uniformity (DU) is a key property of an effective irrigation system. This can be determined at the farm, plot or glasshouse scale. It is simply a measure of the lowest 25% of emitter flow divided by the average.

DU value - 70 % : bad
70 – 90% : good
>90 % : excellent

<u>Farm scale uniformity assessment</u>

At both the plot and glasshouse scale, the use of water meter to measure the flow rate (or volume applied) can identify opportunities to improve the uniformity of the irrigation system. The example below shows that in vegetable crops with the <u>same</u> **plot area**, same **irrigation time**, same **number of sprinklers** and same **supply pressure at the pump** that there can be a 30% variation in flow to the plots.



Plot scale uniformity

Sprinkler system

Ensuring you have good distribution uniformity is important. Maintaining the correct pressure level across the entire system is critical. A variation of more than 10% in pressure and 5% in flow rate causes poor irrigation efficiency. There are two field assessments that can be carried out:

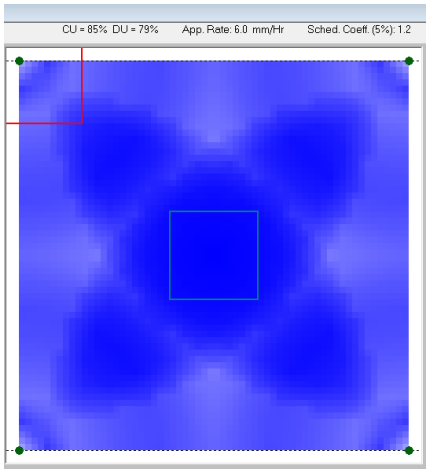
1. A pressure or flow rate test at the sprinkler or emitters. The pressure test will require a pressure gauge and fittings to suit the sprinkler or emitter. A flow rate test should be conducted if a pressure test is not possible. The flow rate test will require a measuring container and timer.

2. A distribution uniformity test

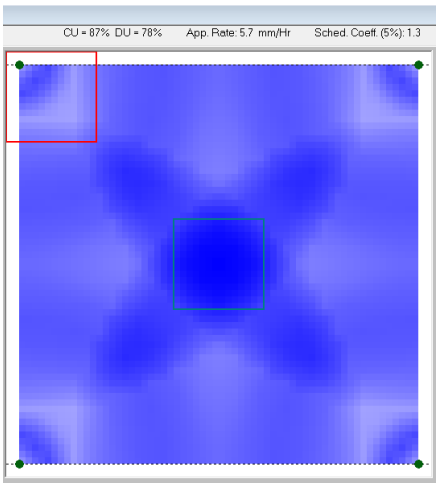
The is test requires the use of 16 to 20 catch cans (containers) spaced in a evenly distributed grid pattern between four sprinklers. The test should run for between 30 and 60 minutes (the longer the better). Weigh or measure the water each container and compare the average of the lowest 4 containers with the average of the all the cans. A difference of less than 10% indicates good uniformity.

A system with poor distribution uniformity will require additional irrigation to be applied to ensure the minimum water application is achieved at the driest location. For example, a system running with a pressure drop 50 kPa will decrease the distribution uniformity and the irrigation will need to be run for an additional 10% resulting in an equivalent increase in water consumption.

200 kPa 7.0 x 7.0 m spacing
DU = 79 Ave flow rate = 6 mm/hr



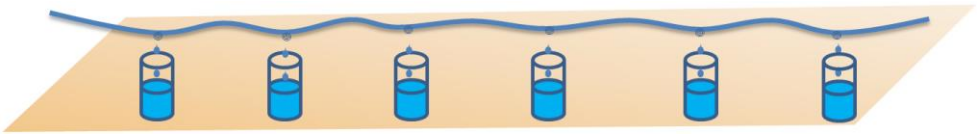
150 kPa 7.0 x 7.0 m spacing
DU = 78 Ave flow rate = 5.7 mm/hr



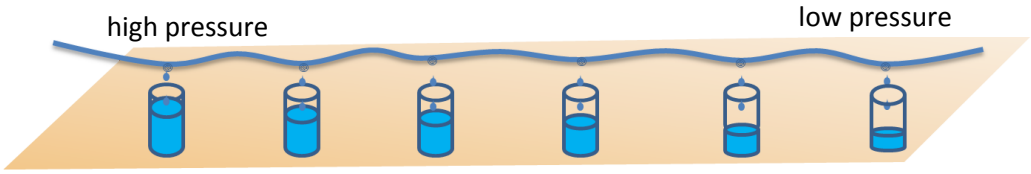
Dripper system

Pressure and flow measurements are critical for determining dripper distribution uniformity. Pressure is less important in systems with pressure compensated dripper emitters. Flow can be measured by placing catch cans below the emitter and recording the time for the duration of the test. Cans can be placed sequentially or all at one time (by moving the dripper line over the cans).

Good uniformity

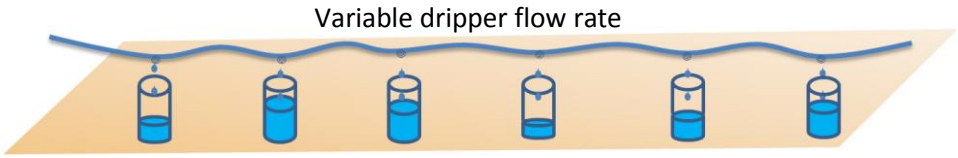


Poor uniformity due to pressure variation



Pressure compensating drippers are better.

Poor uniformity due to variable dripper flow rate



System analysis

Always check that your flow rates are what you expect. Make sure the pump is operating at its recommended setting. Use a water meter to check flow rates. Installation of pressure gauge on the pump outlet is useful for monitoring whether changes in pressure over time are due to variable pump performance. Don't assume variable speed pumps operate at the same flow rate every time, especially when there are multiple pumps in series.

Four irrigation events showing a variation (up to 30%) in flow rates from a series of variable speed pumps.