

Measuring fertigation system performance

Introduction

The performance of fertigation systems depends on the injection type used and the application system. Correct injection rates and an application system that applies water uniformly are crucial to ensure that the distribution of fertiliser is uniform and effective.

Types of fertigation systems

- pressure differential (PD) tanks are tanks that connect to the mainline via an inlet and outlet hose. A pressure differential is used to push water into the tank. The tank itself is under pressure from the mainline flow and because the tank is closed the water mixes with fertiliser, then continues back into the mainline downstream. Water is constantly flowing through the tank, diluting the fertiliser concentration over time.
- venturi injection system uses a venturi to create a vacuum that draws the fertiliser out of a tank into the mainline. The venturi draws all the fertiliser until the tank is empty.
- positive displacement pump can also be used to push fertiliser into the mainline. It operates at a slightly higher pressure than the mainline to ensure positive flow. Again, the pump operates until the tank is empty.
- suction systems use a suction line connected between a tank and the pump suction line. Water and fertiliser is sucked through by the pump. There are two types of suction systems. The tank can be either emptied from full or water can be added from the pressure side of the pump to keep a constant water level within the tank. If the latter is done this system ends up with the same principles as a PD tank described above, that is that the fertiliser mix is continually diluting over time.

Testing fertigation performance

Before any test is started, the system must be operating at its normal operational

pressure. Once the system is running at the correct pressure you can start testing it. There are many indicators to measure performance. Nitrate test strips can be used with a nitrate fertiliser. This is simple as you do not need much nitrate fertiliser in the tank for it to be effective. One bag would normally be sufficient to get readings in the field. EC meters (salts), pool test kits (acid and chlorine), molasses and dyes can also be used to check the system.

Injection times and flushing procedure will vary between different irrigation blocks. Select the desired irrigation block to check and then start the injection process, being sure to make a note of the time.

Calculate the time it takes for the fertiliser to reach the first emitter in the block, first dripper or sprinkler in the stream flow. If fertiliser injection is done at the actual irrigation block this time will be minimal but if the fertiliser is injected at the pump some distance away it can take quite a while to get there depending on the sizes of mains/sub-mains.

Now measure the time it takes to get from the first emitter in the block to the last emitter in the block. This will be the furthest lateral on the sub-main and then the furthest emitter down that row. Take a note of this time as this time is relevant to your injection time at the fertiliser tank.

The duration of the fertiliser injection must take at least the same amount of time or longer than it takes for the fertiliser to move from the closest point to the furthest point. If the injection duration is shorter then not all the areas in the block will receive the same amount of fertiliser. The uniformity of fertiliser will be uneven with parts of the crop receiving more than others.

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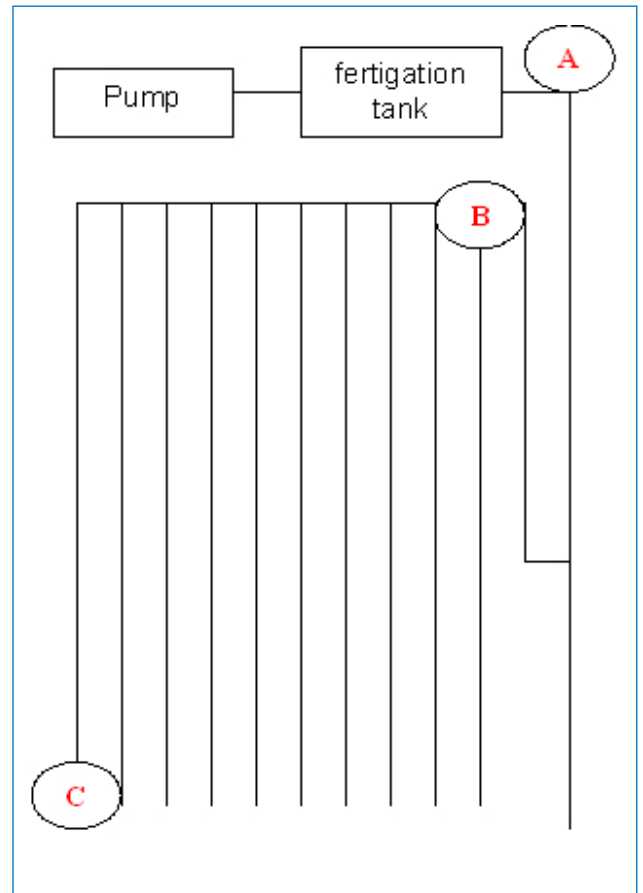
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Once the fertiliser is injected the system needs to be flushed for the correct amount of time. This is the same as the time it takes for fertiliser to get from the tank to the closest emitter in the block. If the irrigation system is not left running for this time or longer, fertiliser will remain in the main/sub-mains and not be correctly distributed in the block. Worse still you may change irrigation blocks too early and the fertiliser you assumed was going to one block actually ends up going to another block.

Rules of thumb

- fertilisers should be completely mixed before being injected into the system. Undissolved chemicals can cause emitter and mainline blockage resulting in uneven water and fertiliser distribution throughout the block. Ideally fertiliser injection points should be upstream of the filters. If filters are clogging due to fertiliser, too much is being injected at the one time.
- mainlines and drip laterals must be flushed for a suitable amount of time as described above. Visual inspection of the fertiliser tank is not adequate as some fertiliser may still be dissolved in the water.
- the amount of fertiliser being added to a system must match the solubility of the chemical and remain soluble in the fertiliser tank.
- if the fertigation system employed dilutes the fertiliser mix (PD tank or suction with float supply) there are important rules to remember. It takes six tank flushes for the fertiliser to be completely drawn from the tank. The time it takes to replace the full tank volume six times will be the injection time. Flow meters should be used to measure how many flushes have occurred.

Example:



A = fertigation tank

B = first emitter in block

C = last emitter in block

1. Minimum injection time: the time it takes fertiliser to move from B to C.
2. Minimum flushing time: the time it takes fertiliser to move from A to C when the tank is empty or six tank flushes have been completed on dilution systems.

For more details contact the Growcom members access line on 1800 654 222

Disclaimer: This information is provided as a reference tool only. Seek professional advice for irrigation specifics.

