FEED CIRCUITS

A well designed feed circuit will ensure all roots are fed and flushed, and not interrupted by blockages. Aim to make the feed circuit tidy and uncomplicated. To minimize the risk of leaks and blockages avoid junctions and restrictive feed outlets (e.g. drippers) and always use filters.

by Bob Taylor : Chief Chemist of Flairform

Material Selection

Avoid corrosion problems associated with metal. Plastic components are generally cheaper, more flexible and readily available and last longer.

Pipes: Flexible plastic tubing (e.g. polypropylene) is usually appropriate for all situations and reduces the need for junctions. Its cheapness provides the option of discarding it once it becomes internally contaminated.

Where junctions are required, push fit fittings (barbed) are common (*figure one*). These are quick and easy to install. At high pressures, however, they are prone to leaks and require securing with clamps.

Rigid plastic pipes, like PVC, can be preferable for the 'primary' circuit. However, the white variety is not opaque and inside walls are prone to algal growth. These generally require glued junctions, and although permanent, are resistant to leaks. Note: rigid plastics are relatively brittle and, therefore, inappropriate for high traffic areas.

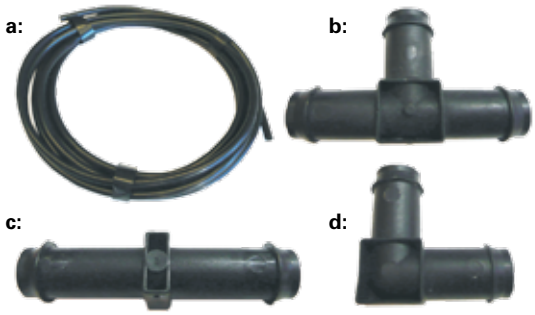

Figure 1:
Feed circuits are simple to construct using flexible plastic tubing and push-fit fittings (tee's, 180° and elbows).

Maximizing Flow Rate

Pipe diameter: Use large diameter pipes. Do not underestimate the degree to which small diameter pipes reduce flow rates, especially as the length of the pipe increases. Small diameter pipes are also more prone to blockages from salt build-up, dirt, algae, plant matter, etc.

Elbows (or tees): These also reduce flow rate (and increase the risk of blockages). In many situations, these can be avoided by using 'flexible' instead of 'rigid' pipes.

Equilibrating Outlet Flow Rates

To achieve equal flow rates from multiple outlets (often necessary for run-to-waste systems), use the following principles:

1. Use maximum diameter piping for the primary circuit.
2. Pipes joining the primary circuit to the feed outlets must be of equal length and diameter. However, using wider pipe will reduce the need for being consistent with this requirement. Outlets (drippers, etc) must be of equal type/specification. Ensure these components are maintained to avoid partial blockages (see following section).
3. If "pressure compensating" drippers are feasible, these will yield a preset flow rate (see "Feed Outlets").

Feed Outlets (Drippers, Jets, etc.)

Choice of feed outlet is crucial for making sure all roots are adequately fed. The choice will depend upon system type, system volume and flow rate requirement.

1. Bare hose end: Blockages are least likely. This is the preferable method for NFT, or any system where the outlet flow does not need to be sprayed (dispersed) or tightly regulated. Flow rate is adjustable via an in-line tap.
2. Flood and Drain: Specific valves are required for flood and drain systems.
3. Drippers (typically used for run-to-waste):

+ "Pressure compensating" drippers deliver a preset flow rate (*figure two 'a'*). These are ideal for run-to-waste systems for obtaining a specific percentage run-off.
+ "Adjustable" drippers permit the flow rate to be adjusted. However, because these are non pressure compensating, their output will vary with delivery pressure.

Figure 2a: This pressure compensating dripper delivers exactly one gallon per hour provided the delivery pressure is 100-400kPa.
Figure 2b: This dripper can be dismantled for cleaning.

NOTE: Drippers are prone to blocking so make sure they can be dismantled for routine cleaning (*figure two 'b'*).

4. Sprayers/Jets: (*Figure three*) Use these when top-feeding to achieve an even distribution of nutrient over the surface of pots (*figure four*). However, note they are prone to blockages, and will increase evaporation losses and salt build-up.

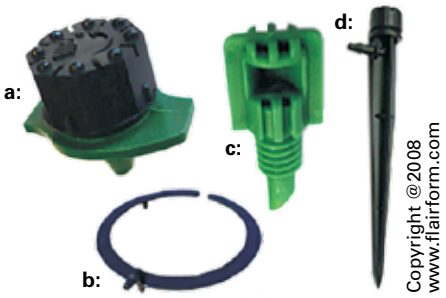

Figure 3:
Sprayers are available in many forms.
a: Adjustable rate with 360° coverage; **b:** 'Water-ring' provises multiple outlets; **c:** Fixed flow rate sprayer with 90° coverage; **d:** Adjustable rate with 360° coverage and stake.

Feed Circuit Blockages

- The feed circuit, especially restrictive outlets (drippers), can become blocked with salt build-up, dirt, algae, root growth, medium, etc. To minimize this problem:
- Employ a filter on inlet to the nutrient pump. Also, in re-circulating systems install a filter in the return line (*figure five*).
- Position plants to avoid roots being drawn into drain outlets.
- Maintain nutrient pH below 6.5 to help prevent precipitation.

"Routine 'dumping' and 'flushing' will help prevent the build-up of solids (insoluble salts, algae, plant debris)."

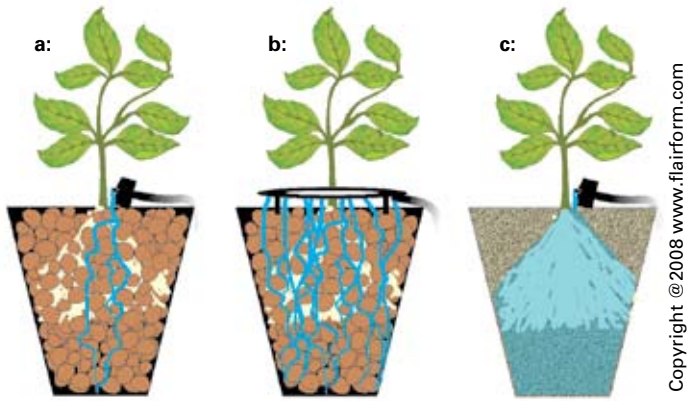

Figure 4: Problems with top-feeding.
a: Top fed nutrient moves mainly downwards causing roots off to the side to be unfed and unflushed. Also, if the medium's density is irregular, the nutrient will tend to 'channel' through zones of lower density. This is most evident with coarse media e.g. expanded clay. **b:** This problem can be reduced by delivering nutrient at multiple points via multiple outlets and/or sprayers, or by using a finer media e.g. perlite, rockwool, cocofibre (see figure **c:**).

- Routinely disinfect the nutrient solution to prevent the build-up of algae/slimes.
- Ensure nutrients are fully dissolved.
- Use stakes to secure outlets above and away from medium and roots to prevent them from becoming blocked.
- Where drippers or sprayers are used, allocate at least two outlets per plant and inspect and clean regularly.
- Use a regular maintenance schedule. Routine 'dumping' and 'flushing' will help prevent the build-up of solids (insoluble salts, algae, plant debris). Over the long-term, it is sometimes useful to perform a chemical flush to remove insoluble precipitates (*figure six*).

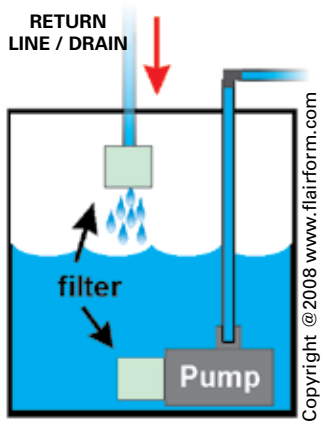

Figure 5: Nutrient Reservoir
Placement of filters on the pump and return line (re-circulating systems) will help prevent feed circuit blockages.

Figure 6:
During post harvest clean-up, an acid wash is effective for removing salt buildup from plumbing.

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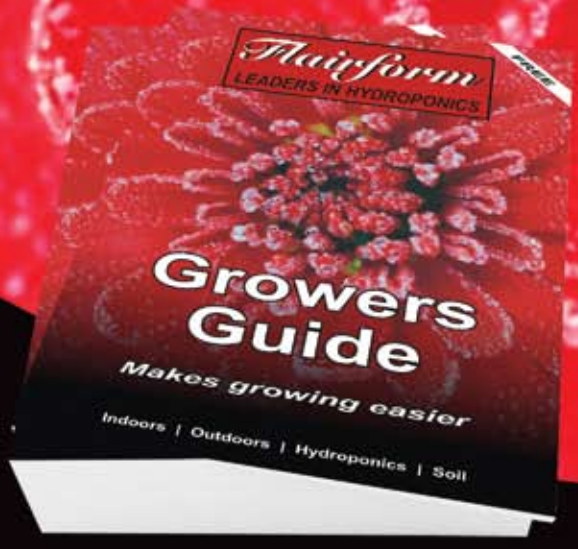

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