

BIFGA Technical Day

New Leaf Irrigation Ltd

Drought – The Warning Signs are there



Defend your Business Against Drought

Why Irrigate?

Why Fertigate?

Irrigation Hardware & Costs

Why irrigate?

Irrigation is part of a drive to intensify UK fruit production to help British growers to expand their businesses with sustainable profitability

The Opportunity

How can we meet the Great British Apple 2030 Strategy to increase the UK market share from the current 40% to 60% in 11 years?

Extending the British fruit marketing period by;

- VARIETIES
- STORAGE
- DEMAND

British growers have to make a profit from this additional production to make this viable

Irrigation - driving yield to drive profit

What is Yield?

Yield is not just total picked weight

Growers are now paid for the number of fruit at optimum size

Growing units to fit pack sizes

Irrigation allows us to manipulate the fruit to realise the trees full potential without having to thin the fruit to achieve optimum size

Drive Yield of Class 1 Apples

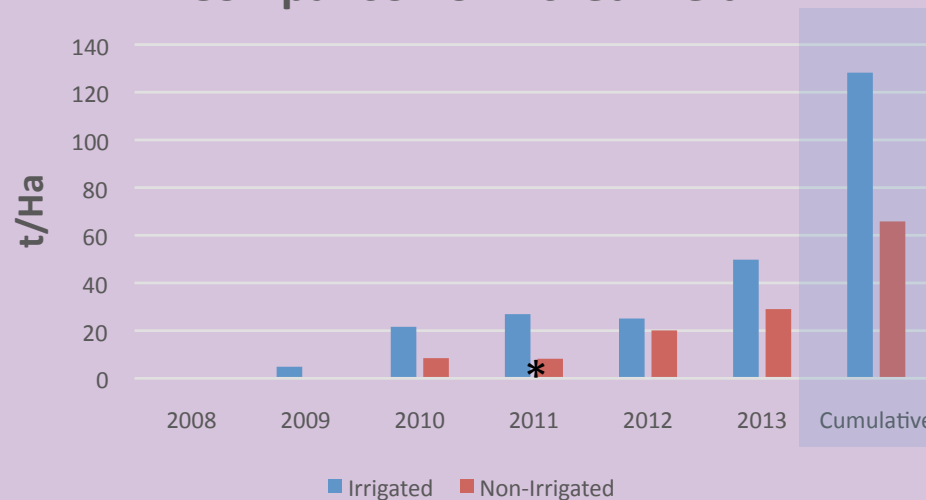
Irrigated vs non-Irrigated

Both orchards had the same planting density, both converted to increased height of cropping since initial orchard establishment, both mechanically pruned and thinned.

Over these 5 years irrigation increased the cumulative yield by 62t @ £300/t = £18500 per Ha extra value.

1mm extra size = 1 tonne/Ha extra yield.

Comparison of Picked Yield



* Issue due to frost damage

Drive Yield of Class 1 Apples

A grower has stated 15 to 30% more yield each and every year based on experience since 1993.

5mm extra size = 15% more yield.

If achieve £750 per tonne for your produce and achieve 20% extra yield = £4500 extra income per Ha every year.

Another grower commented:

Fruit Size (mm)	Yield Increase	Fruit Weight g
55 > 60	25%	100
60 > 65	20%	120
65 > 70	17%	140

Or in other words:

Increasing a 60mm diameter apple to 65mm increases weight by 20% to 120g

With 160 apples per tree = 20 gm x 160 = 3.2 kg extra yield per tree x 2500 trees = **Extra 8 tonne per hectare**

Drive Yield of Class 1 Apples

In a trial on Cox in 1993 drip irrigation increased yield by 50% compared with unirrigated.

Total Harvest Yield and Yield of Class I >65mm fruit (kg/tree)		
Treatment	Total	Class I > 65 mm
No Irrigation	7.7	2
Irrigation	11.5	3.1

Irrigation allows us to manipulate the fruit to realise the trees full potential without having to thin the fruit to achieve optimum size

Climate Change

- Weather extremes – hottest, coldest, wettest, driest
- Extremes of water availability – flooding and droughts
- Even when there is rainfall, consistent application of water is the ideal
- The ultimate frustration is;

Growing the right variety planted at the right spacing on the right soil, with the right number of fruit supported by the right leaf to fruit ratio

THEN IT DOESN'T RAIN

New Plantings

Establishment of plantings is the most important for use of drip irrigation and fertigation. This builds the foundations of the tree through years 1-3 to support it throughout the subsequent years

An irrigated tree will start returning on the investment in the second year. The enhanced health of the tree through good establishment has a knock on positive effect on each and every subsequent year

“Together fertigation and irrigation result in much greener and better growth”

Once the tree has been established after 5 years it becomes less dependant on irrigation but still allows us to fertigate and retain a safety net for dry summers

“Makes a good tree amazing, but not a rubbish tree!”

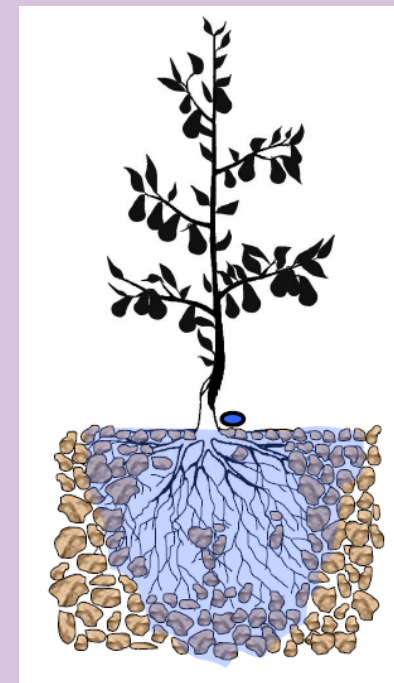
Husbandry Benefits

Irrigation allows us to counteract root death after a wet winter

Intensive cropping at >3000 trees/Ha = less soil per tree

Effectively the soil has become primarily rooting substrate meaning irrigation is definitely required and now we are farming the top 35cm of soil

More flexibility when it comes to planting new orchards at late planting



How Much and When?

Consider water availability and constraints

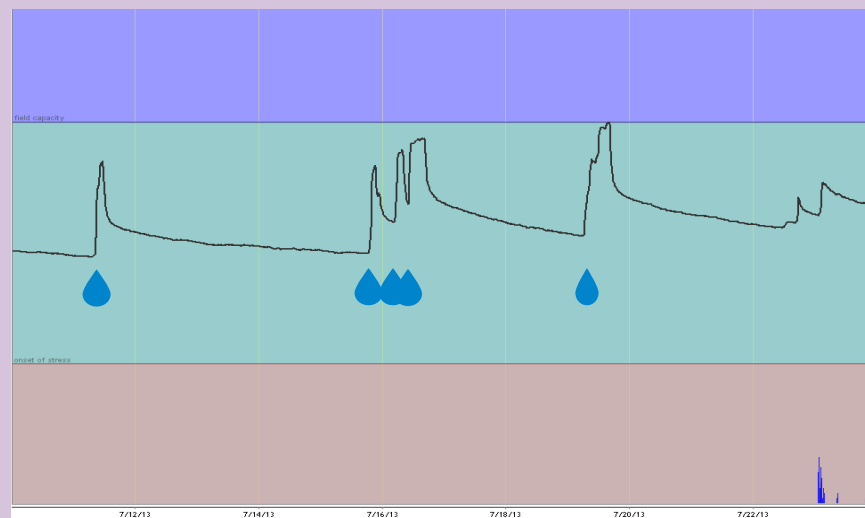
Prioritize which orchards on soil type and varieties will benefit most from available resources

Modern trees require approx. 2 litres each per day

Use a decision support tools to plan irrigation (neutron probe, capacitance probe, water budget spreadsheet)

Aiming to keep the orchard close to field capacity during flowering to increase fruit size **but** you must only administer to what the fruit potential on the tree needs. Otherwise you prejudice next years fruit bud set.

Avoid times of low water availability stressing the tree



Thinning and Fruit Size

Fruit will expand at 3mm per week if conditions are correct and consistent – which is achievable by using irrigation

With a target fruit size at harvest we can calculate the thinning size using the calculation of 3mm per week

With a target size at harvest of 60mm on 15th June you would thin to 24mm, a week later thin to 27mm and so on throughout thinning

Irrigation allows you to reliably produce the right sized fruit

Yield Limitations

What is the next Benchmark in Yield?

- Currently Gala yields 60tonnes/Ha is high in the UK
- Some farms average 65 tonne/Ha over the whole farm
- 75 tonne/Ha is possible in the UK (in NZ 100 tonnes/Ha but we get 72% of the light)

How can we reach these targets?

Grower experience suggests that without irrigation the only tool left to control fruit size and therefore yield is thinning. This can reduce a potential 65t/ha crop to 50t/ha. This is a 30% yield deficit

Irrigation allows us to manipulate the growing environment which affects fruit size

Why Fertigate?

Why do one without the other?

Fertigation

- What is Fertigation?
 - Adding and mixing fertiliser to irrigation water
- Why fertigate over broadcast?
 - Spoon feeding
 - Placement
 - Timing
 - Dissolved nutrient availability to tree
 - Tailored blends according to crop stage
 - Reduction in wastage
 - Enabling you to deploy your knowledge

Fertigation

Some general GROWER comments:

Broadcast fertilizer lays on the surface during a dry year doing very little. Crop receives a spike in fertiliser supply when it rains. Then it's gone again. Weekly small doses of feed keep the orchard at the optimum for fruit production.

Allows consistent cropping all years and reduces any tendency to biennialism.

"Fertigation is more important than irrigation on a reasonably watered retentive soil type"

With a combination of broadcast, foliar and drip the tree can be satisfied when required.

Base P and K indices treated by broadcast in the autumn.

Soil, leaf, and fruit analysis used to steer the feed regime to suit throughout the season either through foliar or fertigation

Trials have shown that fertigation can dramatically effect fruit quality, up to 15% increase in colour on Mondial Gala

Irrigation System Hardware & Costs

It's not as expensive as you may think

Infrastructure – Typical costs

Comprising:

- Water Storage Tank
- Pump
- Filtration
- Fertiliser Injection System
- Control and Automation
- Mainline, Header Pipes & Solenoid Valves
- Drip Line

£3000/Ha or £1.25 per tree assuming 2400 trees per Hectare. Based on a 10Ha application.
Excludes electrical supply & connection, borehole/filling, and labour.

Compared with the cost of establishing an orchard.

£25000 to £30000 per hectare all in.

By the end of year two £35000/Ha?

Establishment cost of £8.00 to £10.00 per tree station.

Irrigation Infrastructure - Detail

Water Storage

- Above ground steel tanks.
- Used to balance incoming/outgoing
- Supply/source - Mainly borehole and mains water.



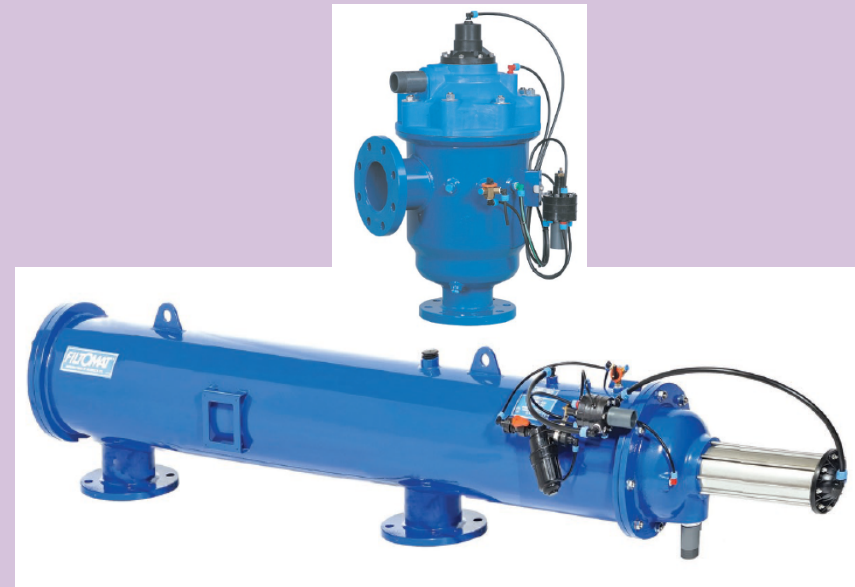
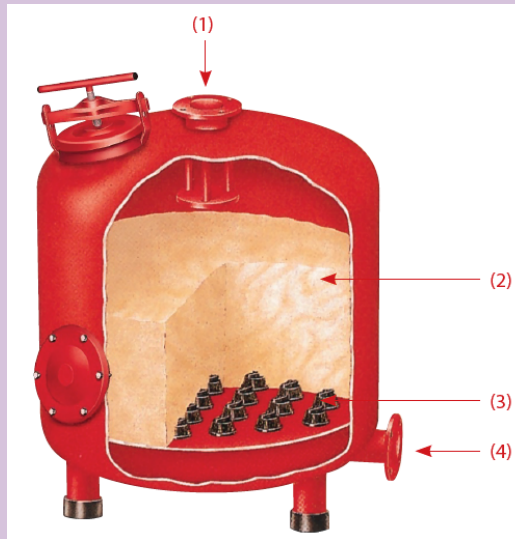
Pumps

- Sized accordingly to cropped area, water availability and topography of the farm.
- Availability of electricity – mains or generator.
- Purpose built bespoke pump systems.

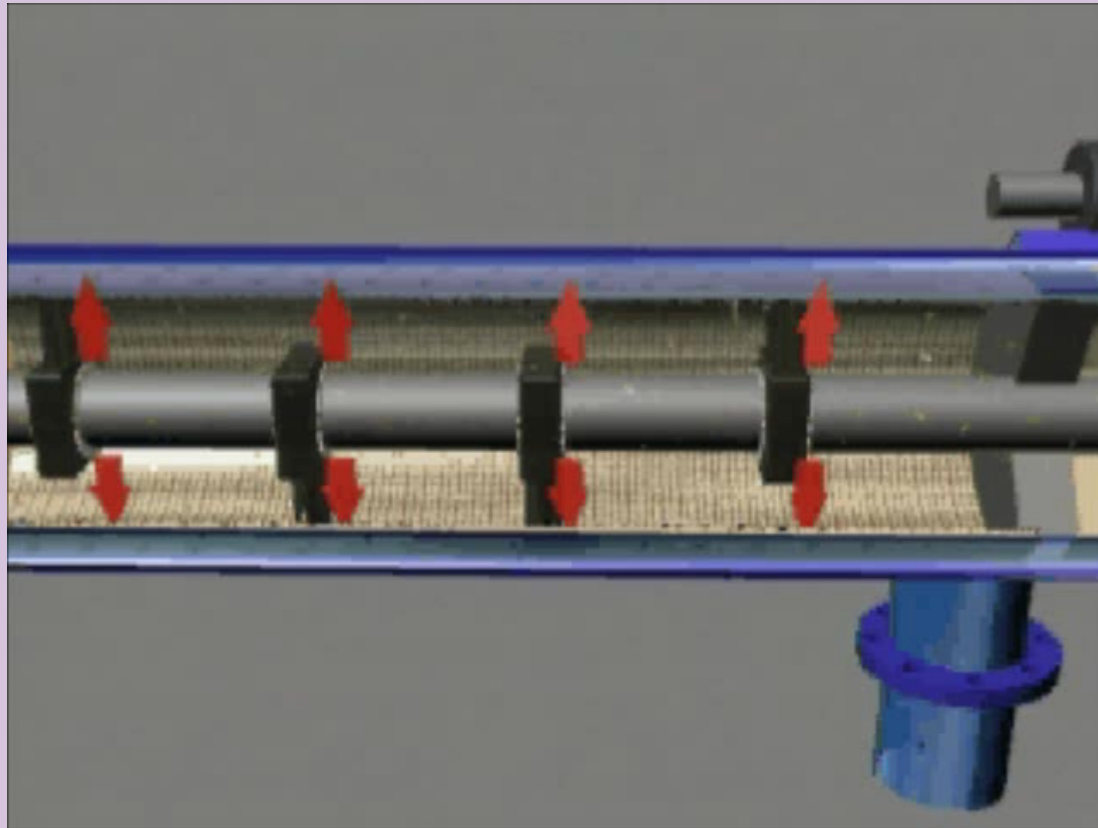


Filtration

- Mechanism to remove water borne debris, in an effort to prevent blockage of drippers, and giving drip lines longevity of life.
- Sized according to flows as well as quality of source of water.
- Move towards automatic cleaning filters even on clean water sources.



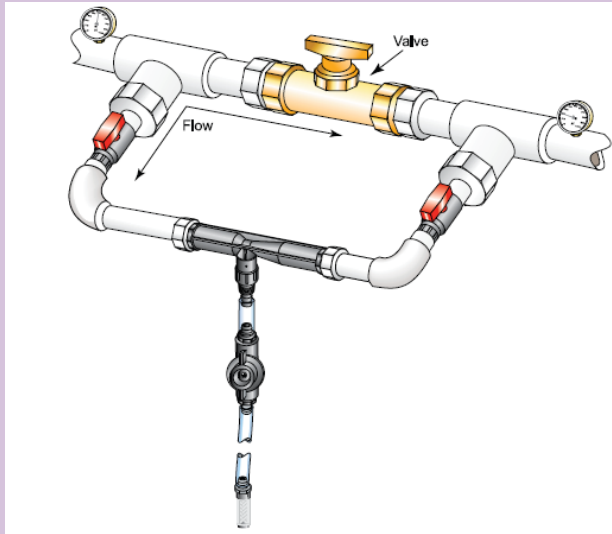
How The Automatic Filter Works



Fertiliser Injection Systems

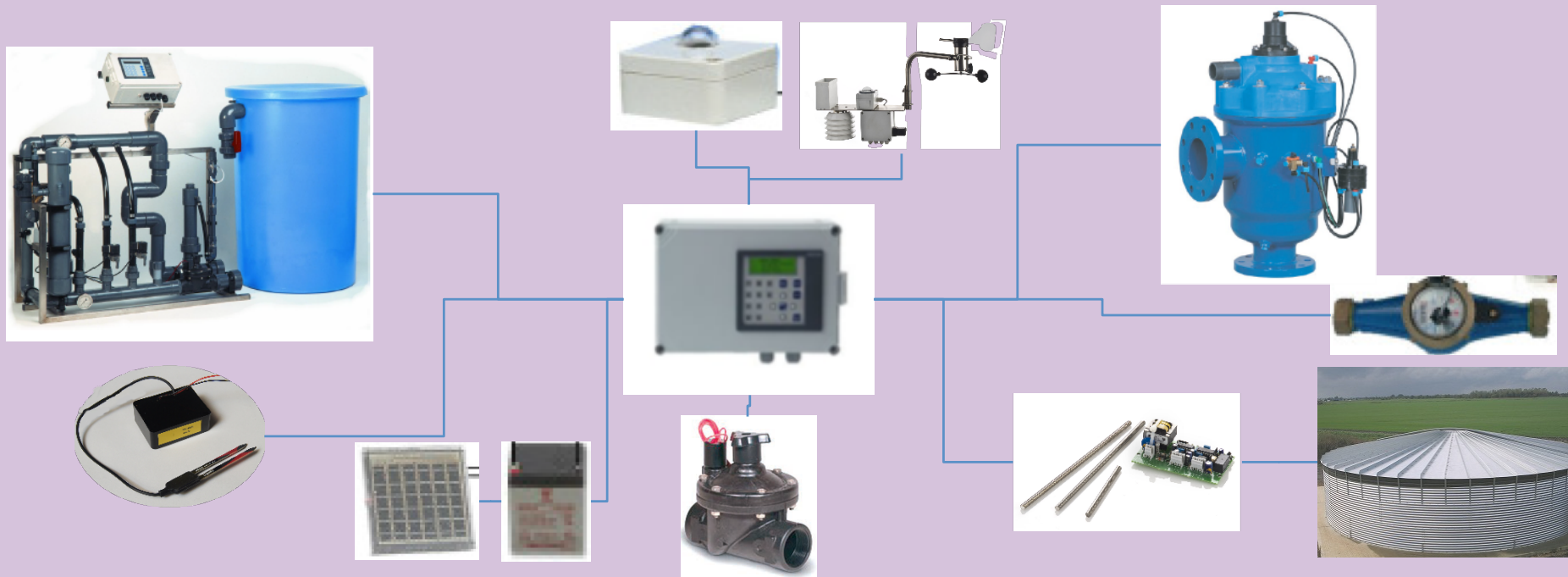
Orchard fertigation hardware is becoming more sophisticated:

- Venturi on each irrigation block
- Dosatron
- Simple EC rig
- Bulk dosing of feed.



Control and Automation

- Timer control of valves infield an absolute minimum
- Fully automated irrigation scheduling and monitoring systems are already here – system will automatically maintain your required moisture level, as now taking off in UK soft fruit.



Mains Pipes

- Sized to flow rate and distance.
- Proper hydraulic calculations required to size correctly.



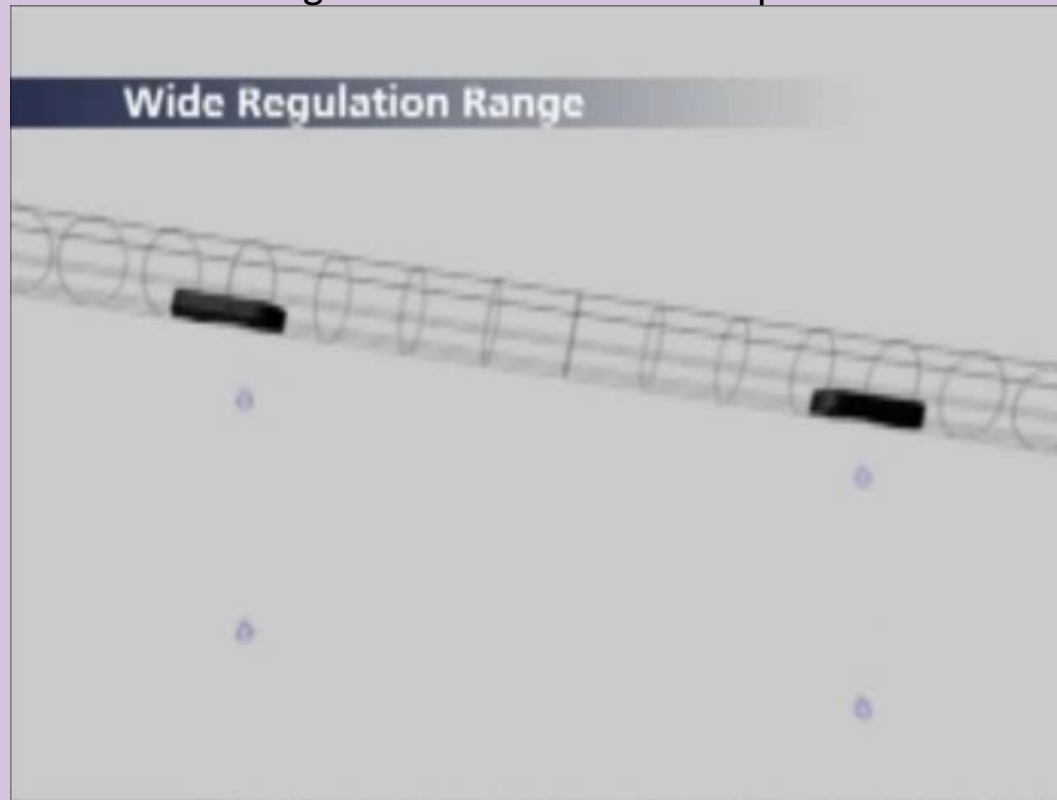
Drip Line

- Dripper manufactured in separate process.
- Diaphragm laser cut and injected into dripper unit during dripper manufacturing process.
- Complete dripper “welded” to inner wall of drip line during manufacture of drip line.



Pressure Compensating

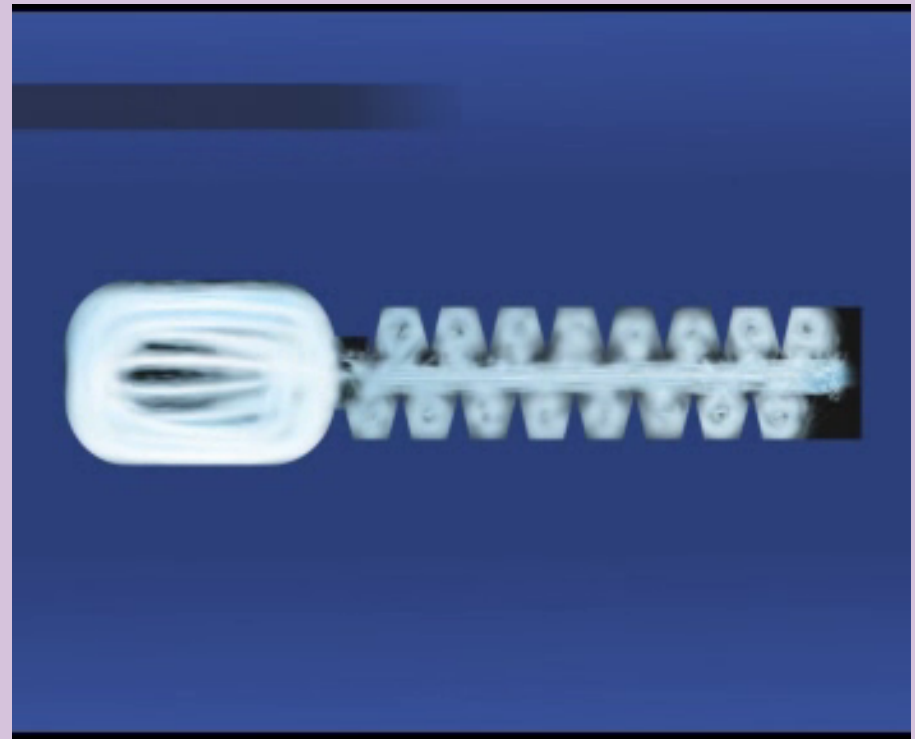
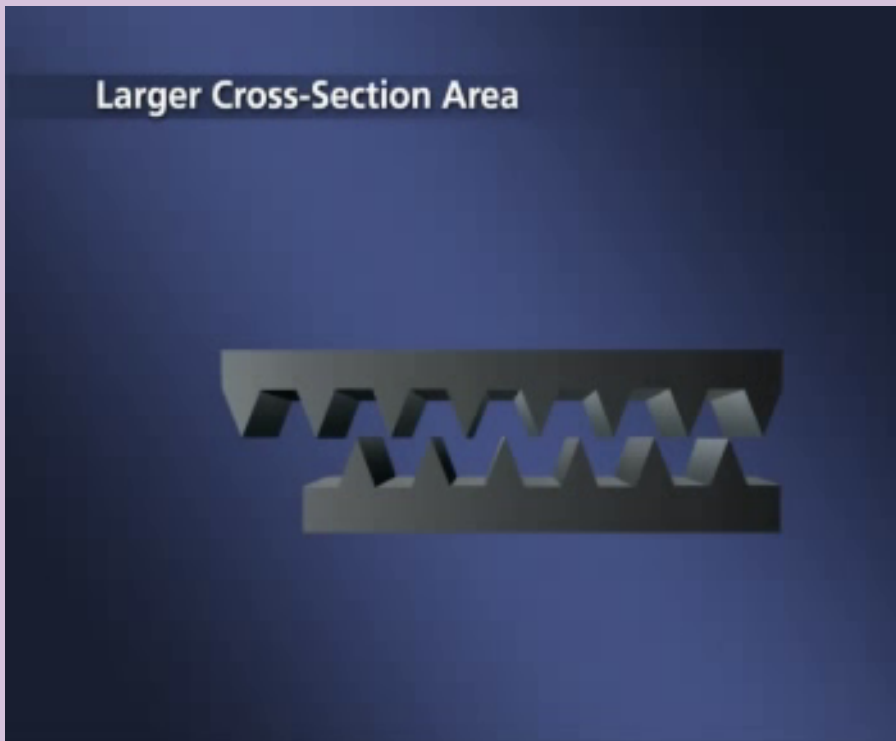
- Maintains a uniform flow rate along lateral at different inlet pressures*.



* Subject to dripper & drip line type.

Self Cleaning

- Integral self flushing system within dripper offering wide filtration area.



Drip Line Specs

- Continuous strip of irrigated soil achieved using 1.6 litre per hour drippers at 60cm intervals
- Dripline – 1mm wall thickness. Long life expectancy when used correctly.
- Length of runs:
 - 16mm pipe = 250 metres
 - 20mm pipe = 400 metres
- Maintenance – inject acid every winter
- Tip – plant rows in line with soil type if possible.

Summary

UK growers already produce some of the best quality top fruit in the world, but how do we increase yield and improve quality (particularly fruit size)?

Higher planting density

Irrigation

Fertigation

Grower's husbandry and orchard management skills

The combined effect of all the above is to drive yield and quality.

Yield is the key to increased profitability and thus sustainability for the grower.

Profitability will fuel new orchard plantings.

New plantings will reduce imports.

Irrigation is one of the tools to drive yield and the profitable expansion of UK apple and pear production.

As Paul said to us "NEVER plant an orchard without irrigation. NEVER! It has to happen and isn't expensive.

Acknowledgements

- Peter Bukowski
 - Paul Hamlyn
 - John Clarke
 - Tim Hall
 - Mark Holden
 - Peter Kedge
 - David Riccini
- A.C. Goatham & Son
Bardsley Farms
Fenland Top Fruits Ltd
Newmafruit Ltd
Adrian Scripps Ltd
Boormans & Victoria Farms
W. & D. Riccini