TECHLINE IN TURFGRASS

Techline has been used successfully in turf grass for over 9 years.

It is in the 6th year of extensive tests at the Center for Irrigation Technology (CIT) in Fresno, California with the intiation of subsurface irrigation feasibility beginning in 1989.

It is a popular choice in high traffic areas, such as parks, and has even been used
successfully in composition tennis courts.

The CIT tests were designed to test the ability of subsurface irrigation to grow turf, as well as recommending emitter rates as well as spacings. The results have shown that irrigating with dripperlines below the surface can be an effective method for growing turf, regardless of the climate.

Why use Techline in Turf? The following are several places where using Techline makes good sense:

1. Turf areas in medians. The issue here includes getting roadways wet, and possibly creating
   a slipping hazard, or other hazards to vehicle traffic.
2. Turf close to ground level windows. Wet windows, even if not called out as an issue, are.
3. Turf in narrow strips. The ability to irrigate areas with less water is important in long narrow areas where either getting the water is hard, or zoning the area is difficult.
4. Turf areas in locations like auto dealers, where wetting cars or other outdoor displays is not desirable.
5. High wind, or constant wind.
6. Areas where sprinkler heads sticking up is a liability. Even the best sprinklers on the market can stick up.
7. Turf areas where vandalism is a potential.
8. Odd shaped areas close to a building. Many building designs have shapes that make it hard to irrigate with overhead sprinklers. Installing Techline and moving away from the building before installing rotors can help make the design easier.
9. Areas where staining of buildings or hardscapes can occur. Iron in the water for instance can stain concrete or brick.
10. Bleaching of hardscapes such as wooden fences.
11. Steep slopes, where overhead watering could cause wash outs.
12. Odd shaped areas where standard irrigation cannot be easily employed.
13. Locales where cost of water is too expensive for standard overhead irrigation. (SSDI is typically 90 % + efficient vs. 50 % -60 % with overhead irrigation).
14. Graywater application or fertigation applications where throwing watering is illegal.

TECHLINE IN TURFGRASS

Tips for using Techline in a sodded lawn:

1. Follow catalog recommendations for turf
2. Bury the Techline 4" below final grade. In areas where mechanical aeration will be used, bury the Techline 6" below final grade.
3. When installing the sod, it is imperative that the final grade is smooth, ensuring that the sod makes solid contact with the soil.
4. Thoroughly wet the sod with overhead irrigation, and roll the sod with a hand roller to ensure good contact.
5. Set the zone to run as required, and keep those wetted from above until the roots establish. Once you cannot pull the edges of the sod up, you can discontinue overhead watering.
6. Irrigate daily.

Tips for using Techline in a seeded lawn:

1. Follow above recommendations.
2. Discontinue overhead watering when entire area shows sprouting.

ACID TREATMENT OF DRIP IRRIGATION

By NETAFIM Research and Development Department

GENERAL

Treatment with acid is mainly needed to dissolve precipitates of lime (calcium carbonate) formed in the irrigation system. It might be used to clean the drippers' water passages from other mineral deposits like ferric oxides. This does not treat algae and other organic matter problems.

TYPE OF ACID:

To save money, concentrated and inexpensive technical acids should be used, such as concentrated technical hydrochloric, nitric of sulfuric acid. Phosphoric acid, applied as fertilizer through the drip system, might, under certain conditions, act also as a preventive measure against the formation of precipitates.

SAFETY PRECAUTIONS:

Contact of the acid with the skin can cause burns. Contact with eyes could be extremely dangerous. During treatment, and especially when filling containers with acid, wear protective goggles, clothes and boots. Follow the instructions on the Material Safety Data Sheet (M.S.D.S.) attached to the delivered acid.

PROBLEMS OF CORROSION:

Polyethylene and PVC tubes are resistant to acid.

Aluminum, steel (with or without inner concrete coating) and asbestos-cement pipes are damaged by corrosion. In every case, resume normal water flow through the system after completion of treatment for at least one hour in order to flush any remaining acid. The importance of flushing cannot be over emphasized when the pipes used are particularly sensitive to corrosion.

METHOD OF OPERATION:

Acid can be applied through the drip-irrigation system by a fertilizer pump resistant to acids or by conventional control head with a fertilizer tank.

APPLICATION OF ACID BY FERTILIZER PUMP:

The goal of acid treatment is to lower the pH level of the water in the irrigation system to values between two to three for a short time (twelve - fifteen minutes). This is achieved by injection of a suitable quantity of acid into the system.

ACID TREATMENT OF DRIP IRRIGATION

INSTRUCTIONS:

1. Clean the filters.
2. Flush the system with clean water as follows: flush the main pipes, then the distribution pipes and finally the drip laterals. Use the highest pressure possible for flushing. Deactivate the pressure regulators and flush the laterals, a few at a time. (Netafim pressure regulators can be deactivated by Pressure Regulator Annulers.) REMEMBER! Effective flushing with clean water will prevent blockages during treatment.
3. Ascertain the discharge of the water from the system through which the acid will be injected, and the discharge of the fertilizer pump.
4. Calculate the required amount of acid that should be injected into the system in order to get 0.6% of acid concentration in the irrigation water.
5. Inject the acid into the system within fifteen minutes only after the system has reached maximum operation pressure.

NOTE: Acids suitable to be injected in 0.6% concentrations are:

Nitric acid	60%
Phosphoric acid	75%-85%
Sulfuric acid	90%-96%
Hydrochloric acid	30%-35%

It seems as if the most economical acids are sulfuric acid (battery acid) and hydrochloric acid (swimming pool acid).

CALCULATION METHOD:

The injection rate of the acid to the treated zone can be figured in the following way:
{FLOW IN G.P.M.} X {0.36} = {INJECTION RATE IN G.P.H.}
For example:
Flow = 100 g.p.m.
100 x 0.63 36 g.p.h.

1. Question: What amount of acid (in gallons) is required?

Answer: Since the acid should be injected for only fifteen minutes, the total gallons of acid to be used will always be a fourth of the injection rate.
For example: 36:4 = 9 gallons.

NOTE: Under certain conditions, i.e., hard water with a very high pH, there might be a need to raise the acid concentrate in the system to 1%. Please consult a Netafim Representative prior to such a treatment.

IRRIGATION SCHEDGULING

California Department of Water Resource, Division of Local Assistance

CIMIS IRRIGATION SCHEDULING

Good irrigation management is required for efficient and profitable use of water for irrigating agricultural crops and turfgrass. A major part of any irrigation management program is the decision-making process for determining irrigation dates and/or how much water should be applied to the field for each irrigation. This decision-making process is referred to as irrigation scheduling.

The following is a short description of the water budget method of irrigation scheduling, and how to use CIMIS ETo to help determine irrigation schedules.

Water Budget Method

The water budget method is simply an accounting procedure similar to the bookkeeping required to balance a checking account. If the balance on a given date and the amounts of transactions are known, the balance can be calculated at any time. In addition, the time when all funds would be withdrawn can be determined so that an overdraft is avoided.

For irrigation scheduling, soil water content is balanced. The amount of water that is lost as crop evapotranspiration (ETc) is analogous to writing checks. The water that enters the soil reservoir (as rain or irrigation) is analogous to depositing funds in a checking account. By keeping records of these transactions, it is possible to know how much water is in the soil reservoir at anytime.

The initial balance can be determined by direct observation or assessed after a thorough wetting of the soil by irrigation or winter rains. Daily quantities of ET are depleted until the soil water has been reduced to a desired level. At that point an irrigation should be applied with a net amount equivalent to the accumulated ET losses since the last irrigation. The soil profile is thus recharged to full capacity, and the cycle begins again. If full recharge is not desired or not possible, the new balance can be determined from the net irrigation amount or by field observations. This method, however, may not work well at locations where contributions to crop ET from a water table or other source cannot be quantified.

Field capacity is the quantity of water stored in a soil volume after drainage of gravitational water. Only a portion of the water content can be potentially removed from a volume of soil by a crop and this quantity is called "available water". The amount of available water within the crop root zone at any given time is often called "soil moisture reservoir". Unfortunately, only a fraction of the reservoir is readily available to the crop without water stress.

A major goal in good irrigation management is to prevent yield reducing crop water stress by maintaining the soil water content above a certain level. This is

IRRIGATION SCHEDGULING

done by keeping track of soil water content and knowing how dry the soil can get before yield reducing crop stress will occur (referred to as the yield threshold depletion or YTD). The value of the YTD is mainly dependent upon the crop sensitivity to stress and root density. The ultimate choice of how much water to deplete before an irrigation is made by the irrigation manager and may depend on cultural practices, labor, water deliveries or other considerations. YTD is simply a limit for soil moisture depletion.

Crop water use can be calculated with reference evapotranspiration (ETo) from CIMIS and a crop coefficient (Kc) as ETc = ETo x Kc. These ETc estimates can be used to determine day by day soil water depletions from field capacity and thus can be used to schedule irrigations. Table 1 is a sample of how a water budget would be calculated for a seed alfalfa field with a YTD of 2.6 inches.

TABLE 1. Water budget scheduling example for seed alfalfa with a yield threshold depletion (YTD) of 2.6 inches.

Date	Effective Rainfall (inches)	Irrigation (inches)	Crop ET (inches)	Available Water (inches)
July 1			2.50	
2	0	0	.30	2.20
3	0	0	.19	2.01
4	0	0	.22	1.79
5	0	0	.28	1.51
6	0	0	.25	1.26
7	0	0	.26	1.00
8	0	0	.28	0.72
9	0	0	32	0.40
10	0	0	.36	0.04
11	0	2.50	.40	2.14
12	0	0	.22	1.92
13	.42	0	.11	2.23
14	.25	0	.15	2.33
15	0	0	.25	2.08

The budget record begins on July 1 with the total water content at field capacity. On each day, ETc is added to the depletion on the previous day to obtain a new depletion value. A net of 2.50 inches was applied on July 11 because the depletion from field capacity was going to exceed 2.6 inches on July 12. Effective rainfall, or amount of rainfall that contributes to the the soil reservoir on July 13 and 14 was recorded and the depletion was adjust accordingly.

IRRIGATION SCHEDGULING

Irrigation System Efficiency

The water budget method of irrigation scheduling can be used to determine when an irrigation should occur and how much water to replenish. It does not by itself determine how much water should be applied through the irrigation system or how long the irrigation system should be operated to apply the water. Determining the amount of water to actually apply through the irrigation system is done by dividing the amount of water required to replenish the soil reservoir by the efficiency of the irrigation system. Water that runs off the field or percolates below the root zone due to no uniformity of the irrigation system does not contribute to the soil reservoir. For example, if 30 percent of the water applied runs off the field or percolate below the root zone, the irrigation efficiency is 70 percent and the required applied water for the July 11 irrigation would be:

2.50 inches / 0.70 = 3.57 inches

Therefore, the grower should apply a depth of approximately 3.6 inches to replenish the soil reservoir over the entire field. Any application of water over 3.6 inches would result in either excess runoff or percolation below the root zone.

Determining the efficiency of an irrigation can only be done accurately by a system evaluation during an irrigation. Depending on the design, maintenance and management of an irrigation system, the efficiency can vary substantially. There are several government agencies and private consultants who can perform these evaluation

Normal Year Irrigation Schedules

A good planning tool for an irrigation manager is a normal year irrigation schedule. This is an irrigation schedule for a specific field and crop that is based on historial weather data. This schedule can be developed before the irrigation season and can be used to estimate when irrigations will most likely be needed during the season.

A normal year schedule can be updated during the irrigation season using current ETo information. This will result in changes in irrigation dates or amounts that reflect current conditions. For example, lower than normal ETo values would result in either more time before the next irrigation or a smaller amount of required water for the same irrigation date. This updating can be done on paper or by using a computer system.

Determining How Many Point Source Drippers to Use

While dripperline technology is now a more frequently used method of irrigating, there are still instances where point source drippers are designed or specified for large plants and trees.

Determining the number of drippers to use is frequently a function of using hard-to-find formulas, which few people want to do.

While soil, climate, and location factors should always be considered in determining the actual number and location of drippers, this chart will give you a close estimate of how many 1 GPH drippers to use.

Feel free to contact us any time you have questions. Call 1-888-NETAFIM,
or visit us on the web at www.netafim-usa.com.

QUICK ANSWER GUIDE

Welcome to the Netafim-USA Landscape Division Quick Reference Guide. This guide is designed to answer some of the most frequently asked questions.

We recommend that all sales and counter team members review this and that a copy be kept with all sales people and on the counter.

Why Sell Netafim Landscape Products?

- Netafim is the number 1 drip and low volume irrigation products manufacturer in the world
- Netafim is the 2nd largest irrigation company in the world
- Netafim opened the first commercial drip products factory, and created commercial viability for drip technology
- Netafim is the only company with a complete line of continuous, self-flushing products
- Netafim products are very high quality, coming to Landscape from Agriculture, where the applications are more severe, and where the products have been used for a number of years.

What Will I Be Selling?

Most of your sales will be Netafim dripperline products, among them Techline and Techlite, as well as the products that support them.

You will also be selling point source drippers, Netafim's Aquanet DC valves, Motorola AC and DC controllers, moisture sensing and control equipment, as well as a full line of filtration equipment.

What is Techline?

Techline is polyethylene pipe with drippers attached to the inside wall of the pipe. It is used in:

- Planting beds,
- Shrubs and groundcover,
- Turfgrass,
- Plants that shouldn't have water on the leaf or flower, such as roses,
- Retrofits of fixed spray and bubbler zones,
- Irregular shaped areas,
- Slopes,
- Vandal prone areas,
- Water window issue areas,
- Areas where water can cause staining or bleaching,
- At-grade windows,
- Low pressure or low volume areas,
- Car dealerships or parking lots where overspray is not allowed, and
- Areas where the soil is too hard to dig in

QUICK ANSWER GUIDE

In short, anywhere you can use fixed sprays and rotors and many places where you can't.

What is Techlite?

Techlite is non-pressure compensating dripperline and is used for on-surface applications.

It is available in 17mm, 12mm, and 8mm. These sizes allow the user to choose the correct size for the area being irrigated, allowing for a cost-effective and easy-to-install on-surface system.

Because Techlite is non-pressure compensating, it is only used on-surface. Its purpose is to help you compete effectively with the broad variety of low cost dripperline products available. Techlite's competitive price ensures that a sale isn't lost to price.

Are Techline and Techlite Easy to Install?

Yes. The Netafim Landscape catalog has 3 charts on page 5 for choosing and applying Techline. They show which model of Techline to use, how far apart rows should be, what the application rate is, and how long to irrigate to apply ¼" of water. Charts also show you how long a length of Techline can be as well as what the flow rates per 100' in both GPH and GPM are.

A frequently used type of Techline is TLDL6-18025. This is Techline dripperline (TLDL) using the .6 GPH emitter with the drippers spaced 18" apart. The "025" means the roll of dripperline is 250' long. On page 5 you will see that this model will be most often used in loam soil for shrubs and groundcover.

Over 60% of the time contractors will lay the Techline (or Techlite) on-surface, put soil staples in the ground to hold it down (one for every 5' in clay, 4' in loam, and 3' in sand and 2 staples on each tee, elbow or cross) and cover it with mulch. You can also bury Techline evenly down to about 6".

Whether the contractor uses Techline or Techlite, he/she will have installed a better way to irrigate. And without having to trench or dig in the area, contractors save valuable time and money, which translates to greater profits and increased jobs won.

How Far Can I Run Lengths of Techline?

A long way! The chart on page 5 called "Techline Maximum Length of Laterals" shows how far a length of Techline can be, (similar charts are available for Techlite on pages 8 – 10) as well as how much pressure it takes to make that length of Techline run properly. This chart also acts as a friction loss chart, and helps the contractor or designer easily determine what pressure the PRV should have.

QUICK ANSWER GUIDE

It is important to remember that the lengths shown are for *each row of Techline, **not** the combined length of all of the Techline in the grid.* If you have enough water, you can have any number of rows of Techline connected with supply and exhaust headers.

How Far Can I Run Lengths of Techlite?

Refer to the charts on pages 8 - 10 in the catalog to determine the maximum length of run. The maximum lengths of Techlite will be less in zones where Techlite runs uphill from the source. In zones where Techlite runs downhill from the source, run lengths increase.

We have determined the maximum length of the Techlite as a function of how much water the last dripper puts out vs. how much water the drippers closet to the source put out.

Our charts are based on the last dripper putting out 90% of the first dripper. Run lengths of Techlite may be longer than the guidelines chart, but there will be more than a 10% difference in dripper flows at the end of the line.

Does Techline Have To Be Buried?

No. Many contractors install it on-surface and cover it with mulch. Techline is UV resistant. However, because it is pressure compensating, it can be buried evenly up to 6" deep.

Can Techlite Be Buried?

No. It is an on-surface product designed to be laid on-surface, typically under a mulch cover.

How Long Will Techline and Techlite Last?

Techline and Techlite are made from linear polyethylene, like many other products in the irrigation industry. There is no reason why they won't last as long as, and probably longer than any other component in the system.

Warranty

The warranty for all Netafim Landscape Division products is inside the back cover of the catalog.

The warranty for Techline and Techlite is in two parts. The poly pipe is warranted against environmental stress cracking for 7 years. The drippers are warranted for 2 years.

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Do I Need A Special Controller to Apply Enough Water?

No!!!!!!!! Look on page 5 of the catalog at the General Guidelines Chart. It shows that .6/18" Techline on 18" rows will put down .42" per hour. To apply an inch of water means running the zone for less than 2½ hours a week, which is just over 20 minutes a day.

Frequency of Watering:

Daily, or every other day. Once a soil profile is properly wetted, it should stay wetted. This keeps the soil stable, eliminates soil shrinking, and develops the deepest roots possible.

Can I Put Techline on a Zone With Sprays or Rotors?

While it is physically possible, it isn't recommended. Techline, Techlite and drip products have "irrigation efficiencies" that range from 80% in arid parts of the country, to 95% in cooler climates of the U.S. and Canada. This percentage equates to the amount of water reaching the root zone of the plant.

In contrast, overhead irrigation ranges from about 30% to 60%. The reasons why overhead is less efficient include:

- water that evaporates in the air before it hits the ground,
- water that hits the ground but dries on the leaf,
- run off,
- overspray,
- wind loss, and
- water that gets into the soil, but not to the root zone.

Because of these efficiency differences, data for fixed sprays and rotors in irrigation catalogs are overstated. To actually achieve the stated application rate in the catalog, run times must be increased. For example, if catalog specs say a rotor is applying 0.40 inches per hour, and you are in an area where efficiencies are about 50%, you are actually only delivering ½ (0.20") the water stated.

In the case of Techline subsurface irrigation, you may be applying water at a 95% efficiency, meaning that the actual water being delivered is only 5% less than what is stated.

Therefore, it can be difficult to equate catalog data for sprays and rotors to catalog data for Techline, and hence, place overhead and dripperline products on the same zone.

QUICK ANSWER GUIDE

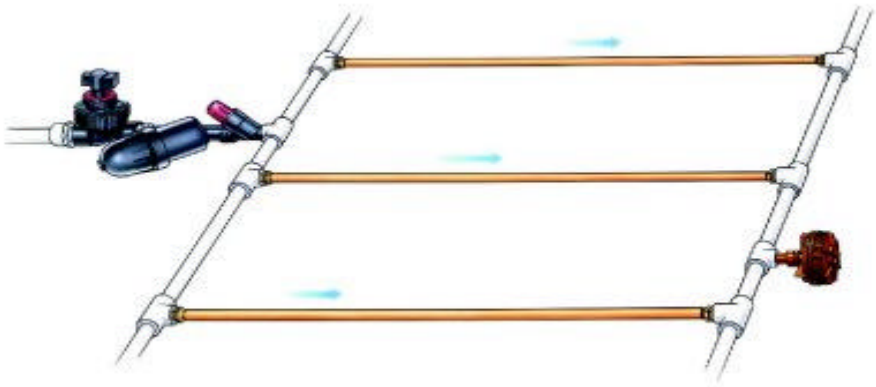
How Do I Calculate How Much Flow the Zone Has?

Page 5 of the catalog..."Flow Per 100 Feet".

Rules of thumb:

1. With .6/18" - About .68 GPM per 100' of Techline used
2. With .9/12" - About 1½ GPM per 100' of Techline used

What is a "Grid"?



Throughout our literature we show and discuss grids. Grids are simply a series of laterals of Techline tied together with Supply and Exhaust Headers.

We use grids, especially in subsurface applications to ensure that water flows through the zone from all directions (loops). (See "How Easy is it to Repair?")

Is it Necessary to Always Use A Grid?

No. However, using grids makes fixing breaks a snap. (See "How Easy is it to Repair?")

Also see The LITE Method

How is a Grid Put Together?

Most of our literature shows grids with Supply Headers and Exhaust Headers made from PVC. These headers are supply lines that feed rows of Techline in a zone. The Supply Header sends water down the Techline laterals, and the Exhaust Header completes the loop. These headers can just as easily be made from ¾" or 1" poly, Techline blank tubing (TLDL 001) or, they can be made from the regular Techline being used in the zone. *Using Techline or Techline Blank Tubing is especially advantageous in zones where the zone flow is under 5 GPM.*

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If Techline or Techline Blank Tubing is used for the grid's Supply and Exhaust Headers, it is possible to use Techline fittings without having to transition from Techline to PVC or poly. When the zone operates under 45 PSI, it also means that the contractor can use TL insert fittings without clamps.

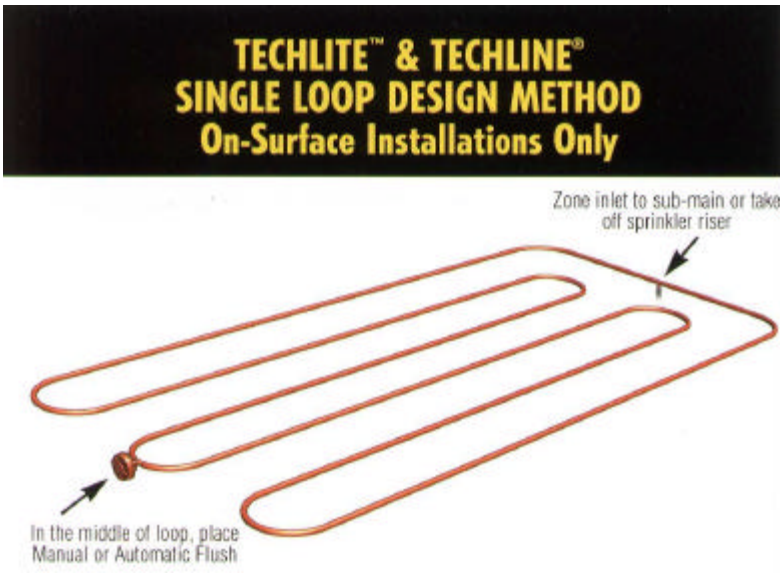
How Do I Choose the Correct Size Pipe for the Headers?

Our pipe sizing rules are the same as overhead irrigation. We believe that pipes should be sized so that velocities do not exceed about 5 feet per second.

Since Techline dripperline has an inside diameter of 0.57", it can move about 5 GPM at a velocity of not more than 5 FPS. That is why, if a zone of Techline does not require more than about 5 GPM, Techline or Techline Blank Tubing can be used for the headers.

Supply and Exhaust Headers are normally the same size and type of pipe.

The "LITE" Method:



In many on-surface applications we show Techlite or Techline snaking throughout a garden while only using 2 fittings. In other cases, a contractor may simply run Techline or Techlite along the front and back of a row of bushes. In these cases, the area does not require the use of headers. This type of on-surface layout is called the "LITE Method". Think of it as **"Labor Is Too Expensive"**, meaning that the installation time is greatly reduced, leading to greater installation efficiency and greater profits.

In other cases, a client may change plants in the garden frequently. In these instances Techline or Techlite can be snaked back and forth throughout the garden, allowing the client to move the dripperline as plantings change.

Do I Have to Use Techline or Techlite Fittings?

Techline fittings are designed to be used with Techline and 17mm Techlite dripperline without clamps under 45 PSI because of a special flared barb. Fittings for 12mm and 8mm Techlite are also available. With 12mm Techlite, no clamps are needed under 30 PSI; with 8mm Techlite, no clamps are needed under 25 PSI.

Though installation is quicker and less expensive with Techline or Techlite fittings, standard ½" poly insert fittings with clamps can be used, as well as Series 700 compression fittings with Techline and 17mm Techlite.

How Easy is Techline or Techlite to Repair?

Very easy!!!!! Fittings can be installed into tubing while the zone is running, making the repair of breaks quick, easy, and assured, since you can immediately see if it is repaired.

By using a grid layout, or the LITE Method, even if a break does occur, water can still flow to drippers downstream of the break. This helps keep the system operational, and minimizes the amount of debris that gets into the dripperline.

Once a repair is complete, most contractors simply disassemble the Line Flushing Valve, run the zone until the water comes out clean and free of debris, and reassemble the Line Flushing Valve.

Contractors should rely on grid layouts or the LITE Method to ensure the system runs optimally.

Techfilter:

Application: Techfilter is recommended for use with all new Techline subsurface installations.

Techfilter incorporates a chemical into the filter ring set of the disc filter. As water passes through the Techfilter, a very low dosage of the chemical trifluralin is transmitted throughout the Techline zone to all of the drippers. This technology provides very precise and even distribution of trifluralin throughout the piping network and effectively inhibits root growth into the dripper outlets. Proper application and use of Techfilter, including the required replacement of the filter ring set and registration of the warranty card with Netafim allows us to offer a 2-Year-to-Lifetime Warranty.

QUICK ANSWER GUIDE

Can Techfilter be Retrofitted Into an Existing Techline Subsurface System?

No. Netafim is required to sell Techfilter as a system. That is, the correct Techfilter and a required minimum number of feet of Techline must be purchased as a specific part number, at the same time.

How Do I Determine Which Techfilter to Use?

1. Determine which Techline you will be using from the General Guidelines Chart on page 5.
2. Go to the chart in the catalog at the top of page 7. This will show you which Techfilter to use based on the type of Techline and the number of feet of Techline in the zone.
3. Using the chart on the bottom of page 7, choose the correct model number to order.

What Other Components Are Used?

1. **Pressure Regulating Valves**

Application - Ensures the zone has constantly regulated outlet pressure.

PRV's are installed downstream of the remote control valve, or the remote control valve and filter, often in the same valve box.

Contractors will frequently install zones that use less than 5 GPM. (About 730 feet of .6/18", 500' of .9/18", or 1,000' of .6/24"). Therefore, many of the PRV's will be PRV075**LF**20 (Low Flow set at 20 PSI). See catalog page 15.

If zones are designed to flow between 3.5 GPM and 20 GPM, use the PRV075**HF**15, 25, or 45. The difference in which regulator to use refers to which Techlite dripperline is being used. If Techline is being used, it is usually easiest to use a 45 PSI regulator.

	LF15	LF20	HF15	HF25	HF35	HF45
Techline		x				x
17mm Techlite		x		x		
12mm Techlite			x		x	
8mm Techlite	x					

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Note: Always place the PRV downstream of the valve and filter. If you place a valve or filter downstream of the PRV, their friction loss(es) could cause the zone to lose needed pressure.

2. **A/VRV - Air/Vacuum Relief Valve**

Application – Subsurface Techline systems. Allows air to be expelled on zone turn-on, and allows clean air into the zone on shutdown. Protects drippers from drawing in contaminants or creating a vacuum.

Drippers release some water when the zone shuts off. This is normal, but it can lead to a vacuum. The A/VRV is installed at the zone's high point(s), and allows clean air into the zone.

On zone turn-on, the unit releases air so no air pockets exist.

3. **Line Flushing Valves**

Application - Automatic cleaning of the zone each time the zone is activated.

A Line Flushing Valve flushes about 1 gallon of water each time the zone comes on. It normally is buried in a 6" round valve box, with a bed of crushed stone under it to drain the water.

Because of potential sediment build-up inside the pipe, and because there could be particles in the pipe too large to exit through the drippers, the LFV flushes them each cycle.

Line Flushing Valves are normally installed at the far end of a zone because that is where the debris naturally moves to.

On zones with poly headers, or LITE Method installations on-surface, the TLFV-1 with the barbed insert is used most often. On jobs where the headers are made from PVC, the TL050MFV-1 unit with a ½" MPT thread is frequently used.

On very small zones, or where the flushing of about 1 gallon could cause flooding, a TLSOV (Techline Shut-off Valve) can be used. This is manually turned on and allowed to flush water several times a season. The TLFIG8 Line End can also be used.

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4. Filters

See the section on Filters

What About Pressure Requirements for Techline?

Get used to a new concept that will simplify your life. Techline pressure compensating dripperline emits water at the same rate whether the pressure is 7 PSI or 70 PSI. That is how we calculated the "Maximum Length of Laterals" chart on page 5.

The dripper housing contains a flexible diaphragm that regulates the pressure. It also helps release debris that gets into the dripper.

Using the guidelines on page 5, some drippers will have higher or lower pressures in the dripperline, but *THEY WILL ALL OPERATE THE SAME.*

What About Elevation Changes?

Elevation change, either up or down, is normally not a big concern.

Because pressure increases or decreases 0.433 PSI per foot of elevation change, a zone of Techline that has 20 feet of elevation change from the source will gain or lose 8.66 PSI, (20' x 0.433) not including the length of run friction losses. As long as the pressure stays between 7 - 70 PSI, the zone will operate properly.

Contractors should remember that long runs and elevation changes are cumulative, as with other methods of irrigation. Elevation changes that take pressure away will obviously shorten lengths of runs.

What About Low Pressure?

Remember the phrase " Techline - The Irrigation Problem Solver". Techline and Techlite are excellent products to use where pressures are too low to effectively run sprays or rotors.

Refer to the discussions above.

What About Well Systems, or Water From Ponds or Lakes?

Techline and Techlite can be used with various water supplies.

In some cases it may be necessary to have the water tested to ensure it does not have too much iron or other elements detrimental to the plants, trees, or turf.

QUICK ANSWER GUIDE

Techline and Techlite require a 120 mesh filter. 140 mesh filters are frequently used because they give an added measure of protection for the same price.

Unless other reasons exist, we recommend stocking either 120 mesh or 140 mesh, but not both. ¾" filters are a common size because they can support up to 13 GPM of zone flow.

Filter sizing and on-going maintenance is the key with well, lake or pond systems, but you should also be aware of any chemicals or compounds in the water.

What About Winterization?

The Netafim Preventive Maintenance handout offers specific information on winterizing procedures.

In general, we recommend blowing down the system with compressed air or simply use a gravity drain design. If compressed air is used, the pressure should be set no higher than the following:

Techline - 45 PSI
17mm Techlite - 45 PSI
12mm Techlite - 30 PSI
8mm Techlite - 25 PSI

Netafim Disc Filters:

Netafim filters are the finest filters in the world. The disc ring design ensures maximum straining area, and provides the longest time between cleanings of any filter on the market.

Most filters are a simple screen made from nylon or steel. The area of screening is only a few square inches, and when they are full of debris, they can restrict water flow, or collapse.

QUICK ANSWER GUIDE

Netafim filters have many times the straining area of simple screen-type filters because of the grooved disc design. They take much longer to load with debris, meaning the time between cleanings is dramatically increased. In fact, a Netafim ¾" filter has about 25 square inches of filtration area, and a 1" filter has 49 square inches! Even more important, the risk of the filter element collapsing is eliminated.

DF075-140 (below left) is a commonly sold unit. It has ¾" MPT threaded ends, and a 140 mesh ring set. Another ¾" filter frequently used is the DFV075-140 (below right). It has a shut-off valve for use as an emergency shut-off, as a means of cleaning the filter while the zone is under pressure, or simply to have a manual system.

How Do I Size a Filter for a Job?

Page 14 of the catalog has a chart showing how to size the filter based on flow of clean water. If you are working with lake water, well water, or other dirty sources, contact your Netafim Regional Sales Manager, or Netafim Customer Service toll free at 888.NETAFIM.

Where is The Filter Installed?

Filters are typically installed just downstream of the zone valve. Netafim filters have a max pressure rating of 120 PSI, and can be installed under constant pressure. If it is installed downstream of the valve, ensure it is upstream of the PRV.

What is the Correlation Between Mesh and Micron Size?

Technically there is no direct correlation. However, a certain mesh size does relate to the micron size of particles the filter catches.

The easy way to describe mesh - Think of a screen in a window or door. Mesh refers to how many vertical or horizontal strands of wire per square inch are used. The higher the mesh, the greater the number of strands that make up the screen and therefore the smaller the particles it can catch.

QUICK ANSWER GUIDE

Filter disk ring sets are color-coded to make it easy to determine mesh size.

Mesh	40	80	120	140	200
Micron	400	200	130	115	75
Filter Mesh Color	Blue	Yellow	Red	Black	Grey

How Often Should the Filter be Cleaned?

The easy answer is whenever it's dirty. The technical answer is whenever the pressure difference across it is 5 PSI or more. A contractor that is new to using Techline or Techlite may go back to a job every couple of months until he establishes how frequent disk cleaning needs to be. On many domestic systems, annual cleaning may suffice.

Backflushing a Netafim Filter:

When water is run backward through a Netafim disc filter, it can clean itself. This can be done manually or automatically, and eliminates the chance of not being cleaned often enough, especially in situations where odor or location may cause some reluctance to clean it.

When the water flow is reversed, the spring in the filter's cone is forced to compress. This allows the discs to separate slightly. With water flowing backward across the rings, debris is flushed free, and dumped to atmosphere.

How Large Do Netafim Filters Get?

Filters are available from ¾" through 12", and can filter up to 3,400 GPM. Call your Netafim RSM or Netafim Customer Service in Fresno if you need more information on the complete line of Netafim filters.

Point Source Products:

Netafim has an extensive selection of point source drippers in pressure compensating and non-pressure compensating models.

These drippers are typically used in:

- Wide spaced plantings,
- Containers
- Hanging baskets

The Tech Flow family of drippers are pressure compensating, have a built-in 5 PSI check valve and are available in a variety of styles.

The PC Jr family is a smaller version of the Tech Flow family with a 1.5 PSI check valve. Its small size makes it very inconspicuous.

The BD and WP families are non-pressure compensating drippers that are high quality, low cost solutions to point source applications.

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See catalog pages 20 and 21 for a complete review.

What Other Netafim Products Are Available to Us?

The entire line of Netafim products, including all Agricultural and Greenhouse products is available to Landscape distributors, *as long as the application is for landscape.* This includes Dorot valves from ¾" - 16" in all configurations, all filters and filter stations, media filters, spray stakes, and misting equipment.

It is always a good idea to check with us when you have a technical issue. Our Ag team, valve specialists and staff agronomists can help you through situations other companies are not equipped to solve.

Other Products Available:

1. Miracle Controller by Motorola:

Netafim offers 6, 9, and 12 station controllers in AC and DC. These controllers are designed, engineered and manufactured by Motorola, and offer customers the assurance of selling a high quality controller.

The DC controller requires no external power, and operates a sophisticated yet incredibly simple dirty water valve.

2. MSK:

The MSK is a standalone control system that operates a zone of sprinklers or dripperline without the need for a controller. It does this while measuring soil moisture on an on-going basis. If you have clients that are installing a system where no power exists, where there are no extra stations on a controller, or where extremely precise watering requirements exist, this product can solve the problem.

It operates for an entire season on one 9V alkaline battery.

3. PTW - Swing Pipe

Netafim sells 100' coils of PTW swing pipe. They are shrink-wrapped so a contractor can pull pipe from the center of the coil, and not have it unravel.

PTW swing pipe is dimensionally equal to other brands of pipe on the market, so all of the most popular fittings work with it.

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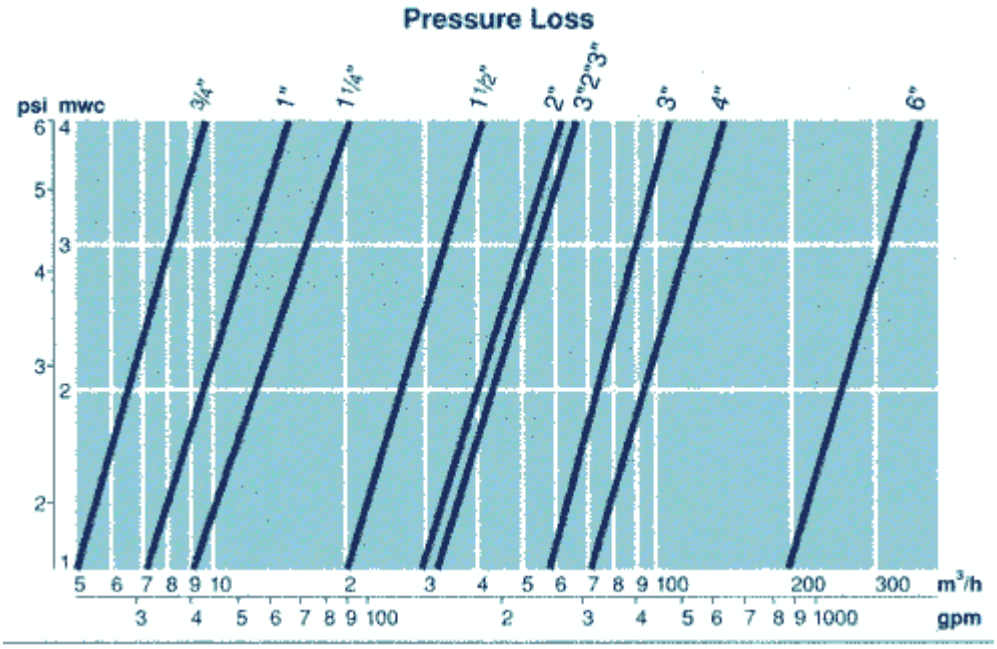
How Else Can Netafim Help Me?

1. Valves:

Netafim's valves are among the finest industrial valves in the world, with *friction losses lower than any valves currently in the landscape industry.*

They are available as:

- Manual
- 2-way
- 3-way
- Pressure reducing
- Pressure sustaining
- Quick reacting pressure relief
- Back flushing, and



- Surge anticipating

Valves range from ¾" - 16" in plastic, bronze, and epoxy-coated cast iron.

We can custom configure valves to your needs.

If you have a specific valve question, call us. We can help you through it.

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2. Marketing Support Materials:

A variety of materials, including:

- Catalog
- Price list
- Fact vs. Fiction Brochure
- Techline Design Manual
- Techfilter
- Sports Turf reprint showing Techline in turfgrass
- Store banners
- Product display headers
- Design details in .dwg and .dxf
- Sample Techline grid
- Seminar kits with samples of product for training needs
- PowerPoint disks
- Sample Bid and Performance Specs on disk
- Preventive maintenance instructions, troubleshooting and winterization instructions
- Project list
- Videos featuring:
  - Design, Maintenance and Installation
  - Techfilter, and
  - Fact vs. Fiction
- Web Page - An extensive web page on the Internet at **www.netafim-usa.com**. It has loads of information, including the complete catalog, order forms for more information, and an automatic calculator to quickly determine how much Techline to use.

Last But Not Least:

Your Netafim area manager can offer a significant amount of help as you develop and manage this side of your business.

Remember, this is the fastest growing segment of the Landscape irrigation industry. As such, you have a vested interest in becoming as proficient as possible in this type of irrigation, and Netafim products in particular.