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PIPELINE

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Volume 7, Issue 1: Winter 2010

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I was told a story about a young golf course superintendent. After a few months on the job, he went into a board meeting. He told the greens committee that he had a plan. He said his idea was to rebuild three greens on the golf course every season. In that way, they would have all 18 greens rebuilt in six seasons. Hearing this, an older board member stood up and said, "Son, how many seasons do you think I have left?"



Well how many seasons do we have left? There are more regulatory agencies writing and enforcing water policy than ever before. So much so that power struggles among the policy makers are beginning to grow. So much so that managing the information coming forth is growing more difficult to manage. We then still have to distill that information down to its relevancy and make sure we disseminate it to our members, all in a timely manor so that it can be acted upon.

The only way we will be able manage the information and achieve our initiatives is as a collective, a collective who produces a currency, political currency at least. Real currency trumps all other of course, but we must generate both of these, political and actual, through membership recruitment, political contributions, and insertion into the regulatory groups that are writing policy. Our political future is at hand. Our members must begin a lobbying effort in earnest.

Please find your district legislator and pay them a visit in their home office. Let them know you are a constituent and are eager to help and get involved in the district. I give you the commission to represent the Society. Please be respectful to the lawmaker and staff, just like you were speaking to your best customer. You will need to communicate the same effective, consistent message:

- The green industry is a \$15.2 Billion industry annually (yes, that is billion with a "B") in the state of Florida*
- The green industry employs 293 thousand people in the state.*
- Total wages paid in 2005 were \$4.48 Billion*
- We are on the forefront of water conservation efforts.
- We need their support!

**The Nursery and Landscape Industry's Impact on FL's Economy.*

Even our small group can be politically powerful. All we have to do is make our collective voice heard.

Matthew Shreves

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Rain Bird Sensors Save Time, Money & Water

Using smart, weather-based irrigation technology is a very efficient way to maintain a healthy, beautiful landscape. As smart technology continues to emerge as a must-have for irrigation systems, more customers are asking contractors for options that are user-friendly, reliable and affordable. Now, Rain Bird has answered the needs of both customers and contractors with its new WR2 Wireless Rain and Rain/Freeze Sensors.

After installation and programming, the WR2 automatically senses and measures both rain and cold temperatures to prevent unnecessary irrigation, saving water and reducing wear on irrigation system components. The WR2 consists of three durable components: a

controller interface with an easy-to-read LCD screen, a sensor unit and a self-leveling sensor mounting bracket.

The WR2's sensor transmits weather data back to the controller interface every 45 seconds allowing the device to be highly responsive to changing environmental conditions. After programming the WR2 with the appropriate irrigation mode, rainfall and temperature set points, contractors can save their settings using the special "contractor default" feature, making it an easy, one-step process to restore the settings if they are modified.

For more information about the WR2 or any of Rain Bird's other quality irrigation accessories, visit www.rainbird.com or call 1-800-RAINBIRD.

Irrigation System Tested in Naples

A satellite-controlled irrigation system at a community in Naples, FL is showing promising results, using up to 80 percent less water than conventional irrigation and saving money on household water bills. The project, launched late last spring, is comparing water usage of Toro Irrigation's IntelliSense weather-based system to traditional timers-controlled irrigation in the Lucarno Villa neighborhood at Mediterra.

Just seven months into the 18-month pilot study, the Toro system has saved 1.23 million gallons of water on the seven test properties compared to seven similarly sized and landscaped control sites, according to Dennis Cafaro, general manager of Resource Conservation Systems, a Bonita Bay Group company that provides non-potable water to master-planned communities.

"This has incredible implications for Southwest Florida and Florida, especially this time of year when we're hearing about water restrictions, drought condi-

tions and conserving water," said Cafaro. "This could very well be the best way to reduce water usage for irrigation."

The Toro system uses daily satellite weather data to calculate precise irrigation needs for the specific installed location. Four system controllers are shared among the seven properties, and Toro officials have said Mediterra is the first site in Southwest Florida to install the systems.

Toro has also built in a special "surge protection circuit" into the controller which helps prevent damage to the unit due to any introduction of high voltage spikes or lightning strikes. This unique feature amongst many more provided in the Toro controller make this a true state-of-the-future product have proved more than capable of surviving Florida's stormy season. It's like bring science & common sense together!

For additional information call toll free 800-775-3560, or visit the Web site at www.mediterranaples.com.

2009 FIS Winter Meeting a Success



The Florida Irrigation Society held their Winter General Membership Meeting at the Historic Dubsread Golf Course on November 20, 2009. At this meeting, the Board of Directors brought the General Membership up-to-date on the endeavors the Board of Director's have worked on this year and discussed future projects for 2010.

David Wickham, Rick Williamson and Kirk Wurster were presented with plaques for their service to the Society and the Board of Directors as they all

have retired from the Board of Directors. Past Treasurer Dale Nimmo was presented with a plaque for his service to the Society and the Board of Directors as Treasurer from 2006–2009.

Nominations for new directors for the term of 2010–2011 were nominated and elected as: Judy Benson, Clear Water Products & Services; Dale Nimmo, Central Pump & Supply; Mark Payton, FIS Outdoor; Rob Stalvey, Coastal Irrigation Irrigation of SWF; and Andy Voelz from Toro.

Chapter Raises Money For Children

The Southwest Florida Irrigation Society Chapter held its Christmas party on December with 25 people in attendance. In addition to great fellowship and awesome Italian food, the chapter raised \$250 for Toys for Tots charity. A special presentation was also a part of the night's festivities. Chapter President Rene St. Pierre presented a check to member Steve Hall from proceeds from the recent charity fishing tournament benefitting Emma Hall. The first annual "Emma's Tournament" raised over \$4,000 to help offset medical expenses for Emma's care and therapy. The Hall family was blessed with some fantastic news about the same time; Emma will be returning home. Emma will still need expensive therapy and round the clock care, but still the news is a blessing!

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Vista Offers New LED Lighting Line

Vista Professional Outdoor Lighting released its new family of LED-based up and accent fixtures for low-voltage landscape lighting applications. Fueled by rapidly increasing electrical costs and consumer demand for eco-friendly products, LED technology is poised to revolutionize the landscape lighting market. Vista introduces best-in-class designs that match the light quality and output of halogen sources while using up to 80% less energy.

The new 3000 series LED fixtures offer a fully integrated design that protects internal components from moisture intrusion and excessive heat, assuring long life in all installations. A rugged die cast aluminum housing resists damage from maintenance equipment and is paired with a proven,

commercial-grade adjustable knuckle for precise aiming.

These new LED fixtures are designed to meet or exceed the performance of industry-standard halogen MR-16 lamps, with precision-engineered optics and a pleasing warm white light. Each fixture is rated for 50,000 hours or approximately 17+ years of normal use and is designed to allow field replacement of internal components. Changing the LED driver assembly takes seconds, thanks to handy plug connectors.

Each fixture can be ordered in any of Vista's 15 standard powder-coated finishes as well as custom colors. Fixtures can be ordered with choice of mounting: ground stake, wall canopy or tree mount. For more information, please visit www.vistapro.com.

Fishing For A Cause

Sponsored by the Southwest Florida Irrigation Society Chapter, more than 45 fishermen participated in a tournament in Ft. Myers to benefit Emma Hall's medical trust fund. The event was a huge success raising about \$4,000.

There were plenty of raffle items such as gift certificates to Bass Pro, Outback, Chili's, and many others. The grand prize was a 42" HDTV, donated by the SWFL FIS chapter, and Mike St. Pierre was the lucky winner. The "largest snook" prize went to Rob Stalvey and



Rob Stalvey Jr. and the "largest redfish" capture went to Renee and Mike St.

Pierre. Both winners graciously donated their \$200 prize money back to Emma!

The chapter would like to thank their sponsors: Southwest Florida Irrigation Society Chapter, Massie and Reilly CPA, Alliance Lighting, AC Electric, Allstate, Rick Fox

Plumbing, R & R Sprinkler, Coastal Irrigation, Doria's Landscaping, Steele Trucking, Hunter Industries, and Nature's Blueprint Inc.

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Tampa Bay Chapter Meeting
Location TBA

February 9

Northwest Florida Chapter Meeting
Perry's of Niceville Legendary
Seafood & Steaks, Niceville

Volusia Chapter Meeting
Clubhouse Restaurant,
Daytona Beach

February 10

Central Florida Chapter Meeting
Waffle House on Fairbanks

February 16

Northeast Florida Chapter Meeting
Location TBA

February 17

Southwest Florida Chapter Meeting
Golden Corral Buffet & Grill,
Fort Myers

MARCH 2010

March 2

Tampa Bay Chapter Meeting
Location TBA

March 9

Northwest Florida Chapter Meeting
Perry's of Niceville Legendary
Seafood & Steaks, Niceville

Palm Beach Martin County
Chapter Meeting
Duffy's Sports Grill,
North Palm Beach

Volusia Chapter Meeting
Clubhouse Restaurant,
Daytona Beach

March 10

Central Florida Chapter Meeting
Location TBA

March 16

Northeast Florida Chapter Meeting
Location TBA

March 17

Southwest Florida Chapter Meeting
Golden Corral Buffet & Grill,
Fort Myers

APRIL 2010

April 6

Tampa Bay Chapter Meeting
Location TBA

April 13

Northwest Florida Chapter Meeting
Perry's of Niceville Legendary
Seafood & Steaks, Niceville

Volusia Chapter Meeting
Clubhouse Restaurant,
Daytona Beach

April 14

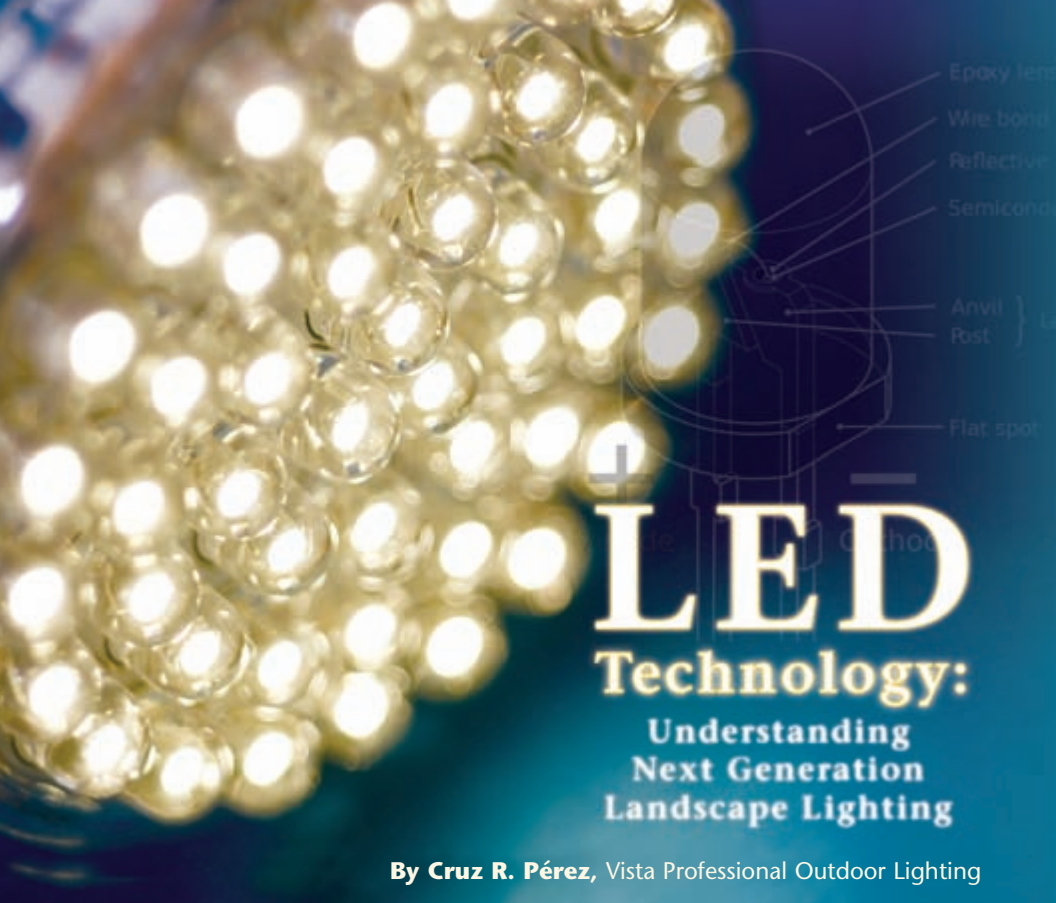
Central Florida Chapter Meeting
Location TBA

April 20

Northeast Florida Chapter Meeting
Location TBA

April 21

Southwest Florida Chapter Meeting
Golden Corral Buffet & Grill,
Fort Myers



LED Technology: Understanding Next Generation Landscape Lighting

By **Cruz R. Pérez**, Vista Professional Outdoor Lighting

Driven by rapidly rising electrical costs and a growing interest in smart eco-friendly solutions, the entire lighting industry has turned its attention to high-efficiency products. Since 2002, average electricity rates in the United States have risen by over 25 percent, so there is real demand for solutions that control energy use and that match trends toward green lifestyles.

Experts predict that LED will rapidly replace traditional incandescent sources, providing equal light output while using 80-90% less energy. LED is appearing in thousands of applications and is evolving rapidly through continuous improvement and new innovation.

Once used solely as indicator lights for electronics, LEDs have evolved into a

major lighting technology that will change the future of how professionals light a landscape. Let's examine the improving performance characteristics and energy savings potential of LEDs.

How Does LED Work?

A Light Emitting Diode (LED) is a semiconductor that converts electricity into light. It is a solid state device that does not contain a breakable filament. LEDs were first commercially introduced in the 1960s and were initially used as indicators in electronic displays. In more recent times, the LEDs have been increasingly used in general illumination applications. One area where they provide an ideal mix of efficiency and output is landscape lighting.

Each LED diode is small, typically quarter-inch or less in diameter. Multiple

LEDs are arrayed in patterns to create the desired amount of light output. LEDs are naturally best at providing light in a focused direction, so advanced optics are often combined with the LED arrays to create carefully controlled, glare-free lighting patterns.

By their nature, LEDs are typically blue, red or green, so many early LED lighting systems relied on mixing these colors in an elaborate fashion to create “white” light. A breakthrough came in the early 1990s when a special phosphorus coating was developed that would allow white light to be created from a single LED. Manufacturers now test and sort each LED produced into specific bin lots according to the color of the light output.

LED manufacturers use a measure called “color temperature” to numerically indicate the appearance of the color of light sources. These numerical ratings are an easy way to reference how “warm” or “cool” the light is perceived. Light sources from the blue end of the spectrum are referred to as cool, and those toward the red/orange/yellow side of the spectrum are described as warm.

Light sources with a color temperature of 2900K have a warm, orange-white appearance. This would include most incandescent and halogen light sources.

LEDs are now available from some manufacturers that are indistinguishable from their halogen equivalents in color and lumen output. The availability of these next-generation warm white LEDs has dramatically increased acceptance of LED technology in residential applications.

Light sources with a higher color temperature (4000K or higher) have a

cool or bluish-white appearance. The light is saturated in green and blue wavelengths, bringing out cooler object colors such as green and blue more richly. The “cool blue” LEDs are typically only applied for moon-lighting effects and in commercial applications

LEDs require a driver to operate. The driver converts incoming AC power to DC current to operate the LEDs and regulates the voltage for optimum operation. The quality and efficiency of the driver is essential in determining the longevity and performance of the fixture. Low quality circuits will lead to premature fixture failure.

Effectively integrating the driver into a fixture is a complex engineering task. The driver is essentially a circuit board, so it must be hermetically sealed to protect its components from moisture. In addition, excess heat created by the driver board can dramatically reduce the light output and the fixture longevity, therefore,



“Experts predict that LED will rapidly replace traditional incandescent sources, providing equal light output while using 80-90% less energy.”

the fixture must be designed to dissipate heat effectively.

Unlike a halogen lamp that generates significant heat together with light output, LEDs themselves do not generate any infrared heat. This allows the fixture lens to remain entirely cool to the touch, a significant advantage for in-ground and accent fixtures.

Are LEDs Reliable?

Unlike an incandescent lamp, LEDs include no filament so they do not “burn out”, but rather they gradually decrease in their light output beginning many years after initial installation. LEDs have a rated life based upon the time it takes for the light output to decrease to 70% of the original output, which is typically about 50,000 hours or 17 years of normal residential use. This extreme longevity makes LED lighting a true fit-and-forget solution for tree-mounted fixtures and other locations where re-lamping is diffi-

cult. A typical incandescent fixture will need to be re-lamped 10 or more times during the life of a typical LED fixture.

Like any new technology, LEDs emergence within the marketplace has experienced some setbacks as early products have not always met the needs of the general public. If we consider the development of compact fluorescent light bulbs, they were initially rejected as flickering, slow to start, bluish-tone, and often expensive. As manufacturers improved technology, performance and price, sales have taken off to the point where they are widely accepted as an alternative to traditional light sources.

Early LED landscape lighting solutions have been criticized as too bluish in color, too dim and not optically accurate. Even today, it is possible to go to a do-it-yourself center and purchase a solar-driven LED light that offers dim, bluish light that is entirely displeasing to the eye. Do not confuse these inferior products with pro-

Advantages of LED Landscape Lighting At-A-Glance

- ▶ **Dramatically lower energy consumption:** Up to 80% less energy use than halogen lamps, thus more cost-effective to operate.
- ▶ **Simplified installation and wire sizing:** Lower wattage draw per fixture allows for dozens of fixtures per cable. Virtually eliminates cumbersome design calculations.
- ▶ **Reduced transformer and cable costs:** Reduced number of wire runs with smaller cable sizes. Even the largest lighting projects can be accommodated on a single transformer.
- ▶ **Light output less sensitive to voltage at the fixture:** The on-board LED driver compensates for a greater range of input voltages, maintaining uniform light output for each fixture on long wire runs.
- ▶ **Long service life:** Typical rated life measured in years, not hours, eliminating the need for re-lamping fixtures on an annual basis.
- ▶ **Durability:** Because they are filament-free, LEDs are shock resistant and operate effectively across a wide range of temperatures.
- ▶ **Glare-free directional light:** easier to control and aim light output with high performance optics.
- ▶ **Safety:** Fixture lens remains cool to the touch
- ▶ **Instant on:** Unlike HID or fluorescent fixtures, LEDs start instantly. Lifetime not effected by rapid switching.



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Important Lighting Terms to Understand

Color temperature – the color of light, measured in Kelvin (K). A 100 watt incandescent light bulb in a table lamp produces a warm color-temperature of 2950K. Sunlight at sunrise is 1800K. Overcast sky has a color-temperature of 6500K. In the past, LED lights would have a cool, bluish cast. Newer warm-white versions produce light output that is closer to an incandescent lamp (2800K), allowing LED to be accepted in a much wider range of applications.

Watts – the amount of electricity consumed by the fixture. Efficiency of a fixture is often measured by the amount of light produced (lumens) per watt of electricity consumed.

Lumens – the brightness or intensity of light produced. The higher the lumens, the brighter the light. For example, a dinner candle provides about 12 lumens. A 60-Watt Soft White incandescent lamp provides 840 lumens. With LED, a 4.5 watt emitter array will produce equal lumens to a 20 watt halogen bulb.

Thermal Management - Incandescent lighting sources produce infra-red heat, so they are hot to the touch. LED arrays do not create infra-red heat, keeping the fixture lens cool. However, the LED driver generates significant heat. Excess heat lowers fixture performance and longevity. LED fixtures that are “overdriven” or run too hot have dramatically shorter lifespans. Thermally-efficient LED designs include a high performance heat sink designed into the fixture body to effectively dissipate heat.

fessional-grade solutions being applied by top landscape lighting designers. Seeing truly is believing, so be sure to ask for a full demonstration of any LED fixture you are contemplating using.

How efficient are LED fixtures versus standard incandescent fixtures? The simple answer is the typical LED fixture will produce the equivalent light output using about 80% less energy. A good comparison is a 20-watt MR-16 lamp and carefully tuned 3-emitter LED array with high-performance optics, using about 4.5 watts. These two provide light output that is virtually equivalent in lumen output, color temperature and beam control.

Does LED Make Installation Easier?

Dramatically lower wattage consumption by each LED fixture allows you to significantly increase the number of fixtures on each cable run and correspondingly decrease the size of the system’s transformer. For many residential installations, a single continuous cable run can be all that is required to supply power to over two dozen fixtures. Because each fixture contains a driver which helps regulate and balance the flow of current, all fixtures will have uniform light output regardless of minor variations in incoming voltage.

The combination of these two factors: lower power use and self-balancing fixtures can virtually eliminate the need for laborious voltage drop calculations in many systems. It also can allow for the addition of more fixtures into many installations without affecting the performance of the balance of the system.

How much energy would a typical residential client save in one year with an all LED installation versus an equivalent one with halogen lamps? Considering an installation using 900 watts of halogen lighting, operated nightly for 10 hours, the annual energy cost at the local rate of \$0.145 per kwh is approximately \$476. The same system with an equivalent number of LED fixtures with equivalent lumen output would cost approximately \$95 annually to operate.



In addition, the halogen system would require re-lamping of the fixtures after approximately one year of operation (assuming an typical halogen lamp life of 4,000 hours). The LED system offers an average life of 50,000 hours or 17 years of use in this application.

The Bottom Line

According to the U.S. Department of Energy, no other lighting technology

offers the same potential as LEDs to save energy and to enhance lighting quality and reliability. Investigate the LED options available from proven manufacturers and see how this new technology will change your business for the better.

Cruz R. Pérez is the Vice President at Vista Professional Outdoor Lighting and can be reached at 805-527-0987



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PVC

FITTINGS:

Features & Drawbacks

Tens of thousands of irrigation systems that have been designed, and built with PVC pipe and fittings, perform satisfactorily, and a very small percentage run into problems. Most of these problems arise from three basic causes, all of which can be avoided by the realization that PVC is different from other, more traditional, piping materials. Therefore, PVC must be handled differently in designing, installing and repairing systems.

This is not new in the history of civilization. For many, many centuries,

bridges were built of wood. Then steel came along. Bridge spans could be built longer than before. They were much stronger. However, they had a drawback, according to some people who had grown up in the wooden bridge building trade; they could not be built with hammers and nails!

Many times, we face similar problems in plastic irrigation systems. Before I touch on the several causes that account for most of the problems in PVC irrigation systems, it might be helpful to compare some of the key properties of PVC



By Larry Workman, Lasco Fittings

DIFFERENCE BETWEEN MATERIALS

	PVC	STEEL	UNITS
Solvent Join	Yes	No	
Weight	.81	.455.5	...pounds/cubic foot
Chemical Resistance	Excellent	Poor	
Flow Coefficient	.150	.65-110	...Hazen-Williams
Modulus of Elasticity	.400,000	.29,000,000	...psi
Max. Service Temp.	.140	.1,000	...°F
Tensile Strength	.7,000	.60,000	...psi
Max. Design Stress	.2,000	.20,000	...psi
Relative Impact Resistance	.1	.6	
Coefficient of Expansion	.3x10 ⁻⁶	.0.6x10 ⁻⁶	...in/in/°F

when compared to steel. PVC has major advantages in installation; it can be solvent cemented, it has increased chemical resistance, lower weight and friction loss. Steel on the other hand, obviously scores higher in other properties. The point is not that one material is better than the other, but that they are different – and that the different properties require different handling, installation, design, or maintenance when used in irrigation systems.

The first and most frequent cause of PVC system problems is failure in designing the system to withstand the surges, shocks and other abnormalities that will and do occur in all piping systems. The easy answer is to make sure that the system is designed so that its normal operating pressure is two-thirds of the working pressure for the “weakest component” in the system. This will reduce the chance of failure due to hydraulic shock or pressure surges.

There are many reasons behind that “easy answer” and it is important to understand those reasons. The PVC piping industry, through the American Society for Testing and Materials (ASTM) and the Plastic Piping Institute (PPI) have developed two pressure-rating systems for PVC pipe. One is the Standard Dimension Ratio (SDR) or Class system. The other is the Schedule system (i.e. Schedule 40 and Schedule 80).

The SDR is a ratio of the minimum wall thickness to the outside diameter of the pipe, and is based on an established stress or pressure level. These piping components are commonly referred to as “Class” pipe. In this way a system made of “Class 200”, “Class 315”, “Class 160” has a pressure rating of 200 psi, 315, psi or 160 psi respectively.

SDR RATIO	PRESSURE RATING (psi)
32.5 (Class 125)	.125
26 (Class 160)	.160
21 (Class 200)	.200
17 (Class 250)	.250
13.5 (Class 315)	.315

Schedule 40 and Schedule 80 pipe have specific pressure ratings for each pipe size. These ratings vary from 850 psi for a one-half inch Schedule 80 pipe and drop to 130 psi for 8-inch Schedule 40. In these systems, the operating pressure is most commonly limited by the largest diameter pipe.

SCHEDULE 40 & SCHEDULE 80 PRESSURE RATINGS

Pressure Rating	Schedule 40 (psi)	Schedule 80 (psi)
0.5	.600	.850
0.75	.480	.690
1.0	.450	.630
1.25	.370	.520
1.5	.330	.470
2.0	.280	.400
2.5	.300	.420
3.0	.260	.370
4.0	.220	.320
6.0	.180	.280
8.0	.160	.250
10.0	.140	.230
12.0	.130	.230

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*Seth Pfum,
Spartan Landscaping, LLC*



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Not everything is as simple as it seems! Schedule 40 and Schedule 80 fittings – unlike PVC pipe – do not have pressure ratings. Because of their various shape, thickness, irregularities, and configurations, standardized pressure ratings have been impossible to develop. The fitting must have a wall thickness at least 25% greater than its equivalent schedule and diameter pipe. Many years of field experience and billions of fittings later, this concept appears to validate the fitting will accommodate the pipe pressures. Further, manufacturers test a new design or configuration to the pipe test criteria as a matter of product qualification. This way the PVC fitting does not become the weak link in the piping system.

A unique component in the PVC piping system is the nipple. Nipples should only be made from Schedule 80 pipe stock or molded with equivalent wall thickness. Nipples and all threaded fittings must have a wall thickness in the threaded portion equal to the minimum wall thickness of a Schedule 80 threaded pipe. In addition, the Plastic Pipe Institute Technical Report (PPI-TR16-August 1973) states in paragraph 3.7, “threaded pipe has a pressure rating which is exactly one-half that of Schedule 80 pipe.” This is due to the cut or notch that the threads make in the wall thickness. Studies have shown that molded threads (nipples and fittings) are substantially stronger in the threaded portion than those with machined or cut threads. This is due to the natural flow of molten material around the thread profile during the molding process. This is similar to metallic fasteners, which are stronger if they have rolled threads rather than machined threads.

CYCLIC FATIGUE

Let me turn to the two other aspects of PVC piping systems that are frequent causes of failures and result in problems about which you need to be aware. One arises from the nature of PVC and the other arises from the



Generally, a magnified examination of the fatigue failure will show material that has “stretch marks”: a necked-down cross section, “tapered off-shoots” or whitened surface past the end of the crack.

nature of irrigation piping systems. Again, there is no “easy answers”.

Replacement of a fatigue-failed fitting will “solve” the leaking problem for the moment. However, this does not solve the underlying problem that can lead to additional failures a few days, weeks or months later. Chances are more basic steps are required.

Generally, a magnified examination of the fatigue failure will show material that has “stretch marks”: a necked-down cross section, “tapered off-shoots” or whitened surface past the end of the crack.

These long-term failures will most usually be found in the most highly stressed areas of a fitting. In typical PVC tees and elbows, this area is the crotch or the intersection of the connection ports.

Sometimes the failure of a female threaded part seems to contradict this scenario. Here, failure is usually found to originate and follow along the “knitline”, “bondline”, or sometimes called the “weldline”. Simply stated the “knitline” can be the weakest link in the chain and with the high wedging loads induced by over tightening tapered pipe threads, the “knitline” may fail. In these cases, the crack starts on the inside diameter or threads and propagates through the fitting wall quickly, usually without the stretch marks.

PRESSURE SURGES AND WATER HAMMER

PVC piping systems have both benefits and drawbacks relative to the water hammer phenomenon. Because of the elastic or non-rigid nature of PVC, the pressure wave or surge travels through a plastic pipe much slower than in metal, and the peak surge is greatly

reduced. This is partly because some of the energy is dissipated by causing the PVC pipe and fittings to swell or grow slightly as the pressure wave is traveling through the system.

A very common cause of water hammer, often overlooked, is the air slug, which is nothing more than bubble or air pocket within the system. When this bubble is traveling through the piping at the velocity of the water, there is no real problem. Nevertheless, when that air slug gets to the sprinkler, the air escapes through the sprinkler nozzle roughly five times faster than water, so the upstream water velocity suddenly increases. When the air slug is gone, the system velocity is suddenly reduced to the original value. For example if the normal velocity is only three feet per second, the system can increase to fifteen feet per second during the air escape, and can be instantly reduced by twelve feet per second to the original speed. The twelve foot per second change in velocity will create an additional pressure spike of over 200-psi in a two-inch system. The surge of 200 psi in addition to a working pressure of 100-psi exceeds the 280-psi rating of a Schedule 40 pipe.

The 200-psi surge will only last about one-third of a second, a short time, only enough to cause the gauge to flicker. Most gauges and pressure recorders will only reflect or show about one-half of the maximum pressure because their mechanisms cannot react quickly enough. Many times an oil-filled gauge will be installed to provide a steady needle for easy reading; however, the dampening of the needle movement will hide the surges and damage that is being done to the system. Since PVC is a visco-elastic material and sud-

den changes cannot be tolerated effectively, the surges may result in broken piping and components.

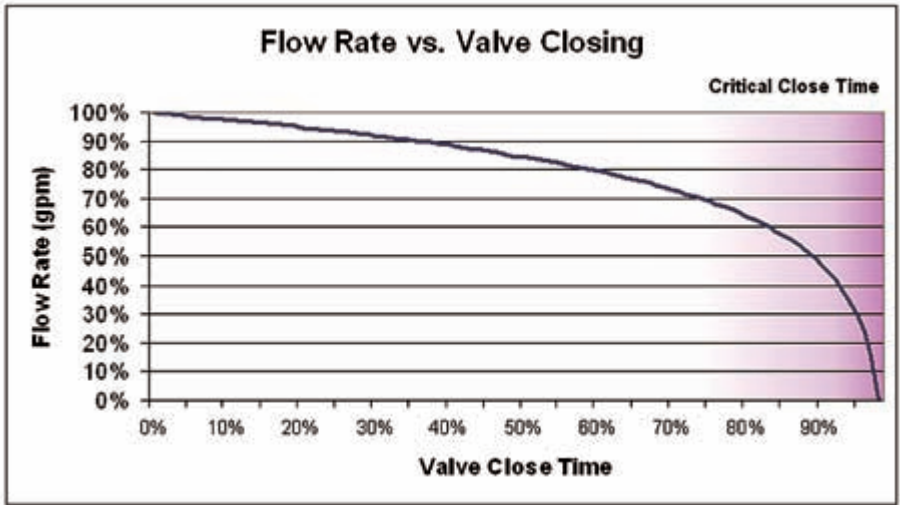
You can see that the maximum surge pressure generated in a Two-inch Schedule 40 system flowing five feet per second is about one-third of the surge spike generated in a steel or copper system. The axiom that says; "Nothing is free" holds true with PVC. Although the peak surge in PVC is small compared to steel, the wave velocity is also very slow, by the same 3:1 ratio. This means that the same valve, which does not cause water hammer in a metal system; can cause a pressure spike in a PVC system. Therefore, in order to prevent damaging pressure spikes, the valve closing times in a plastic system must be much longer than the closing times in a metal system.

Most solenoid-controlled diaphragm valves will close or open more rapidly the greater the difference between the upstream and the downstream pressure. This means that most of the flow (gallons per minute) is closed off in the last 25% of the valve operation. Conversely, the bulk of the flow comes on during the first 25% of opening. These sudden, quick and repeated changes in flow during system operation generate repeated cyclic pressure fluctuations. These are the fatigue-causing culprits that can weaken and ultimately destroy any irrigation system.

Pressure fluctuations within a system should never exceed 1.5 times the lowest rated component in the system. In addition, if there is a pressure increase or decrease of 50% (i.e. 80 psi to 40 psi, or 50 psi to 100 psi) in a short period and it is often repeated the fitting will fail. Although all systems have some degree of pressure fluctuation and not all pres-

TWO-INCH SCHEDULE 40 SYSTEM

	Wave Velocity (fps)	Surge Pressure (psi)	Critical Close Time (sec)
PVC	1402	.600	.850
Steel	4367	.480	.690
Copper	4191	.450	.630



sure variations can be removed, an effort must be made to stabilize the pressures.

There are many methods of reducing severe pressure fluctuations. The first and most essential step is to find out what is happening within your system. That may call for a pressure recorder. Depending on the complexity of the system and its size, recorders may be installed either for a short-term check or for permanent monitoring; they can vary, too, from a unit with a hand wound clock motor up to solid-state computerized models. Pressure recorders may be available for short-term rental in some areas, and we have heard of municipal water purveyors lending them to their customers.

By recording the system pressure and comparing it to the irrigation schedule, a good analysis can be made as to what must be done to reduce the quantity or magnitude of the surges. Many times, surges or pressure variations are worse during the night hours when no one is available to observe what the recorder can capture.

Once the source of surges is located, the solution may be as simple as adjusting the high/low pressure limits of the pump station, revising some valve grouping, or lowering the overall system pressure.

Although these steps may remedy the cause of failures, they will not neces-

sarily eliminate future breaks. Once a component has been "bruised", it may only be a matter of time until a fracture happens. However, making pressure corrections may significantly extend the system's operating life.

To sum up, the best method to prevent a catastrophe is to be aware of what is actually happening in the system, not simply what was designed. Installing pressure recorders at various locations in a system, including the extremities, can be of beneficial in preventing failures. This in turn, will result in an irrigation system, which will last and perform as expected and specified. Remember: smooth out the pressure fluctuations to have a smooth running system!

Although PVC piping systems appear to be the ideal material to use, nothing—including steel—is perfect for all applications. Each material has its own set of characteristics and drawbacks. It is these attributes that must be constantly reviewed by the user, or designer before proceeding with designing, installing or repairing a piping system. Along with these considerations the proper tools, education, and techniques must be used to create a project that will fit its materials and purpose.



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CLIMATE CHANGE:

Facts or Fiction?

By Paul "Skeetz" Mez, Panhandle Sprinkler Repair

With the recent climate-gate scandal, we are left to conclude for ourselves what really is the truth and what is fiction. Why is this important to us? Our very livelihoods are at stake here. As water management specialists, we need to be knowledgeable of the facts and wise to the tricks and false information put forth by individuals and organizations to further their agendas.

Back in the 1970s, the mantra taught on our college campuses was global cooling. In my college environmental science courses, I was taught that we were going to enter into a global ice age due to the pollution. The reasoning behind this was that because of pollution in the atmosphere, the sun's rays were being reflected back into space and this was causing the earth to cool. There was no mention of CO₂. And now, 40 years later, we are hearing the opposite using the same data.

The battle lines have been drawn on a global level, and now we have the Copenhagen Conference to try to reach some kind of agreement as to what

way to proceed to "protect" the earth. We will be confronted and we will need to confront misinformation and outright lies as we work to save our industry from harm by those who wish us ill will. The best way for us to be able to confront these issues is to arm ourselves with information and unquestionable facts we can use to refute false claims and distortions.

Did you know that between 1950 and 1980, there was a steady increase in water use in the United States? During this time, the expectation was that, as population increased, so would water use. Contrary to expectation, reported water withdrawals declined in 1985 and have remained relatively stable since then in spite of a steady increase in United States population. Changes in technology, in state and federal laws, and in economic factors, along with increased awareness of the need for water conservation, have resulted in more efficient use of the water from the nation's rivers, lakes, reservoirs and aquifers.

Estimates of water use for 2000 indicate that about 408 billion gallons per day were withdrawn for all uses during

nk Science?

When we look at news stories about climate change and all the other existing environmental problems, we have to ask ourselves what is the truth and what is junk science.



the year. This total has varied less than three percent since 1985 as withdrawals have stabilized for the two largest uses: thermoelectric power and irrigation. Freshwater withdrawals were about 80 percent of the total, and the remaining 20 percent was saline water. Saline water is defined as water with 1000 mg/L or more of dissolved solids; it is usually undesirable for drinking and for many industrial uses". See Nationalatlas.gov/articles/ for more information.


Another bit of information of interest to those of us here in Florida. A Columbia University study published in October 2009 shows that the severe water shortage that effected the Southeast and especially Georgia in 2005-2008 was not caused by "climate change" but was a minor event when compared to the severe droughts in the previous 1000 years.

The root of the problem associated with this drought was according to this study was "a growing population, driven in large part by in-migration, over the last few decades." For example, Georgia's population grew from 6,478,216 in 1990

to 8,186,453 in 2000 and an estimated 9,544,750 in 2007, according to U.S. Census figures. That is an almost 50 percent increase in just 17 years. This study went on to show that the recent drought is unlikely to have been influenced by anthropogenic climate change.

We have entered the age of "political" science and we need to be constantly on guard for such use for the sake of a certain agenda. We all have a wealth of information at our fingertips through the Internet to help counteract the misinformation being constantly spread by those who espouse a certain agenda.

We must look beyond the perceived biases of the ones stating the facts to see whether the information is accurate or misapplied for the sake of a cause of perceived problem. When we do these things, we will be much better able to withstand the onslaught of those who wish to change our livelihoods through their regulation of our industry and our lives.



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Take a minute to explore the new features and information that is now available. One specific feature introduced is the ability to blog with other members of FIS. This tool will allow you to discuss important code changes and irrigation practices, read or make important announcements and get the very latest on what is happening with your chapter!

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- ▶ To register, go to www.fisstate.org and navigate to your chapter's page (listed on the left) and then click on the link on the chapter page to go to the blog.
- ▶ At the right bottom of the blog page, you will see a link named New User Registration. Click that link, it will take you to a login page. You will type in your desired User ID and email address, and then click register.
- ▶ You will receive a confirmation email that contains your password. (If you do not receive this email, please check your spam folder. If you have still not received it, contact the FIS webmaster.)
- ▶ Once logged in, visit your dashboard, where you can edit your account and write posts. From there, you can update your profile, change your password and participate in the blog.
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- ▶ In order to comment on someone else's post, visit the main blog page and click on the Comments button below the post. Your comment will not appear on the main page. Other users will only be able to read it by clicking on Comments.

HOW ARE YOUR COMPANY'S ON-LINE REVIEWS?

By Jeff Carowitz, Strategic Force Marketing

“What others say about you is more important than what you say about yourself” is a respected public relations maxim that is even more relevant in today’s world of on-line recommendations.

Many small businesses are discovering the power of web reviews in convincing potential clients to select their firm. Contractors are telling me that “more customers are finding me on Angie’s List” or “we’re seeing more unsolicited reviews of our company on Google local”.

Web reviewers rave enthusiastically about their favorite firms and are quick to bash those that deliver poor service. Readers love that they can get a variety of real-life opinions from those that have actually experienced the service. For homeowners selecting a contractor, this credible feedback gets much more weight in the decision than the contractor’s own marketing hype.

Improve your chances of capturing business by checking out your company’s current on-line reviews. Have you been reviewed on the important sites? (For contractors, these include Angie’s List, Google Local, Yahoo Local and Yelp.) And more importantly, do the reviews appear to fairly reflect the quality of your products and services?

Start by checking your rating on Angie’s List, a popular site that sells memberships to homeowners that allows them to read and to post reviews of contractors. They’ve become the fastest growing and most credible site for contractor reviews because of their vigorous process for member-only reviews and their national marketing efforts. It’s no secret that the top-rated contractors on the site receive the most phone calls.

Many contractors are now surveying their customers to find which ones are

using Angie’s List and gently encouraging those customers to say nice things in a review. You find that your satisfied clients that use the site regularly are typically willing to post a brief review. Getting them to do so is critical, as the only way to influence your reputation and overall rating on the site.

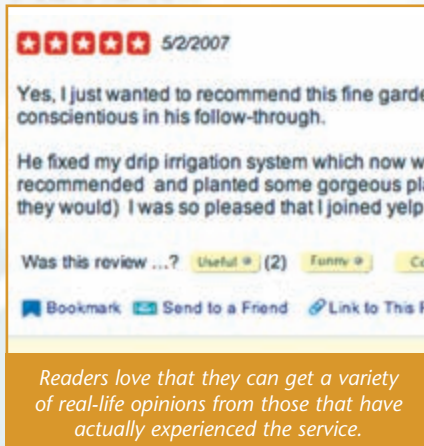
Both Google and Yahoo offer local search features that include the ability to post and to read reviews of companies that are searched. A Google search for “Orlando landscape contractor” for example yields a city map and a list of contractors with addresses together with star ratings. The star ratings are linked to the review section of each contractor’s Google local listing.

The prominent placement of these local search results means you need to take action if your rating is poor. For example, a single bad review could show you as a “one star” company. Google offers a great feature that allows you to send an invitation to potential clients allowing them to go directly add a review about you.

Good reviews have the added benefit of improving your site’s standing in the search engines.

If you’re asking clients to write reviews for you, make sure they’re honest and very specific. Readers tend to disregard fluff and look for real-life experiences. A detailed, substantive opinion from a satisfied customer is always best.

Jeff Carowitz is a leading consultant to the irrigation industry. He can be reached at Jeff@StrategicForceMarketing.com or 760-532-7034





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