What is the real bottom line? A new approach to sprinkler irrigation

By Senninger Irrigation

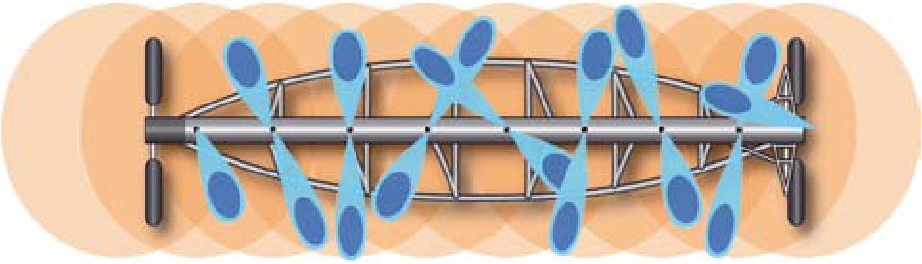
When you think about the bottom line in terms of an irrigation system, many questions come to mind. What is the cost to install the system? Where can I save money? When will I see a return on my investment? This line of thinking often considers just the initial costs of the system and its components. However, it is important to look at the bigger picture and consider the ultimate costs. So instead, ask yourself how those initial savings might impact your yield, energy costs, loss of water, and soil damage.

Over the past several years, technology has dramatically changed in irrigation. Regardless of your type of system (mechanical move, solid set, micro, or drip) new technologies have been developed to conserve water and energy, while increasing your yield and lowering input costs.

Uniformity

When designing an irrigation system, one objective is to take a predetermined amount of water and apply it uniformly over a given area. The uniformity of the sprinkler water pattern applied is known as Distribution Uniformity. There are two ways to measure water application: The average application rate and the instantaneous application rate. Average Application Rate (AAR) is the rate of water application over the entire wetted area. It is an average value assuming uniformity within the wetted area is constant. AAR is calculated by multiplying the system's GPM by 96.3 and dividing that by the area irrigated (sprinkler spacing x lateral spacing). On the other hand, Instantaneous Application Rate (IAR) is the rate of water application at an instant of time (see figure 1a-b). IAR is not the designed total application. Sprinkler packages must be carefully designed to keep IAR below average soil intake rate.

Figure 1a *Instantaneous application area of stream driven applicators. Flow is delivered to a relatively small area*



Application intensity

An irrigation system should be designed to deliver low application intensity, spreading flow over a large area. Low application intensity helps preserve soil structure and reduce runoff.

As water reaches the soil, its composition is maintained. Smaller soil particles remain dispersed with larger particles, so the soil infiltration capability is maximized. High application intensity disrupts the balance of particles, damaging soil structure.

Larger particles are dissolved and smaller particles are suspended in standing water. As the water subsides, the smaller particles create a sealing layer, damaging the soil infiltration capability. This leads to runoff, erosion, and inefficient irrigation that cost you money.

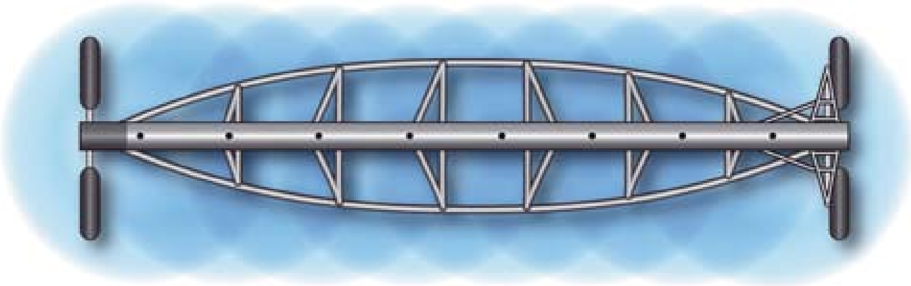


Figure 1b *Instantaneous application area of a wobbling device. Flow is spread out over a large area*

Pattern integrity

Pattern integrity refers to the consistency of the distribution footprint from an applicator. This consistency requires maintaining the size of the irrigated area as well as the uniformity within that area. To achieve this, applicators must deliver the "right sized" droplets. Large droplets resist wind and travel farther, providing a larger diameter of coverage. Smaller droplets are gentle on the soil and crop, but must not be so small that they are prone to wind drift or evaporation. The optimum droplet size is the largest droplet possible that does not have adverse effects on soil or crop.

Pressure regulation

The sprinkler's operating pressure influences water droplet size and the wetted diameter. The use of in-line pressure regulators helps maintain consistent outlet pressure regardless of variations. This saves energy and money. Many irrigation systems have the potential to experience changes in elevation and pressure, causing flow fluctuations in unregulated systems. A system without pressure regulators can cause under-watering and over-watering in areas of varying elevations. When a system uses pressure

regulators, application remains uniform even as the elevation changes.
Many applicators have been designed to operate specifically at low pressures to help save energy costs. Systems using these low pressure applicators can experience a huge impact on flow and application uniformity. For instance, with a 10psi applicator, a variation of 1psi can mean a 5% difference in flow. This difference is what causes the over- and under-watering of unregulated systems.

High pressure systems cost more in regards to energy consumption and often produce small droplets that are susceptible to wind drift.

System design
Sprinkler profile, application rate, distribution uniformity, diameter of coverage, and pressure recommendations are all considerations that can be evaluated when designing an irrigation system.

Numerous applicators are available with various performance criteria, and some offer other advantages in versatility. Technology is now available to measure and illustrate applicator uniformity and performance to help assure optimum system design. It is not necessary to purchase system design software because dealers and manufacturers have the ability to analyze and provide a design that meets the requirements for virtually any installation. When done correctly, system design produces success at harvest, increasing your crop yield.

The bottom line
With the development of these new technologies comes the responsibility to use these resources in an effort to save money while increasing yield. Science is proving many previous efficiency claims to be less than accurate. Now that the tools are available, it is time to consider that water and energy savings are not only desirable, but mandatory.

The focus on initial cost of installation is no longer the "bottom line". The real "bottom line" is in what can be saved (water, energy, soil quality) added to increased crop yields from proper system design. ■

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يتناول هذا المقال من شركة Senninger الأميركية مُقاربة جديدة لتقنيات الري بواسطة المرشّات.
تُؤخذ بعين الإعتبار عدّة عوامل قبل تركيب نظام ري شامل، كلفة النظام الشاملة وكيفيّة توفير المال في عدّة نقاط، ولكن الأهم هو النظرة الشاملة وكيف أن التوفير في بداية المشروع قد يؤثّر سلباً على المحصول وعلى كلفة الطاقة وخسارة المياه والضرر بالتربة.
برزت تقنيّات جديدة في مجال الري في السنوات القليلة الماضية تساعد بتوفير المياه والطاقة وذلك مع زيادة نسبة المحاصيل وتخفيض الكلفة الشاملة.
من أهم الأهداف لدى تصميم نظام ري بالمرشّات هو تحديد كمية مياه مُسبقة يتم توزيعها بشكل مُتماثل على مساحة معيّنة. كما يجب تأمين نسبة تدفّق مُنخفضة لمياه الري توزّعها فوق مساحة كبيرة وذلك بطريقة متناسقة ومتواصلة بنفس النسبة. كما يُنصح بإستعمال أجهزة ضبط للضغط مُدمجة بنظام الري وذلك يُساعد بإبقاء كمية المياه المُتدفّقة ثابتة، خاصةً في المساحات ذات الإرتفاع المُتقلّب.

REFER TO **RIN 04** ON PAGE 96

REFER TO **RIN 05** ON PAGE 96