Design Pitfalls in New Irrigation Systems

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We are frequently called upon to address irrigation challenges with systems that are less than one year old. The challenges range from determining the proper pressure settings on the field valves to determining why water does not make it all the way to the top of the field. In this article we identify some of the common pitfalls associated with new irrigation systems.

Cheaper is not necessarily better. Historically, the competition between irrigation dealers for a grower's new business has been rendered into a pricing battle. The growers have generally supported this battle by accepting the lowest bid, regardless of design criteria. One potential when purchasing the less expensive system is getting inferior components. Not all drip emitters or micro sprinklers are created equally, although when brand-new their design flow-rate is similar. Some are more prone to plugging over time and require a higher level of management from the grower. A less expensive system may utilize brass gate valves and spring-loaded pressure-regulators, which have a tendency to leak and loose their tolerance in a few seasons, instead of a high-quality valve with an adjustable pressure pilot. A common way to cut costs is to run smaller diameter hoses. Even though the hose may deliver sufficient pressure for irrigation, it may be impossible to adequately flush the laterals, leading to chronic plugging problems. *Whenever possible, the grower should specify his own preference of emission device and valve style and inquire about flushing velocities prior to the execution of the design.*

Be cautious of "Low Energy" and/or "Economic" designs. Although the intention is admirable, quite frequently it is one of these two types of designs that can't quite get water to the top of the field. This is a more common occurrence than one might expect, given all of the computer-aided designs that abound. Even though the two design approaches emanate from opposite sides of the design spectrum, the reason for their potential shortcomings is usually the same: the underestimation of pressure losses in the field. The Low-Energy Design attempts to reduce the horsepower input by sizing the mainlines large enough to keep friction losses at a minimum. The additional cost of the larger pipelines will be paid for through savings over time in energy bills. The Economic Design selects a smaller pipeline size and accepts the higher friction losses, because the economic payback is longer than the predicted life of the system. In either case, the design engineer is attempting to shave the current or future price of the system by narrowing the buffer of excess pressure in the system. It may work out perfectly on paper or in the CAD program, but the grower's field is far from that perfect place. Many times the grower is able to "find" an extra acre plantable here and there and the design buffer is taxed beyond the limit. It has also happened that the designer failed to allow for "hidden losses" such as hose risers, valve manifolds and dirty filters. A couple of psi here and there can mean the difference of water

making it to the last tree or vine, if the margin of error has been minimized in the name of Energy or Economics. *The grower should make a point to the design engineer that he expects a stated minimum pressure at the far end (or top) of the system, which he will check with a gauge prior to final payment.*

Air vents do more than increase the cost of the irrigation system. We are not sure of the origin, but there is a pervasive opinion in agriculture that air vents are similar to chrome trim and fins…you find them on the Cadillacs, but are they really necessary? We have situations where water is prevented from entering a field because of entrapped air. It is also possible to completely collapse a pipeline because of poor vacuum relief. It is more common and more insidious to have moderate effects from improper sizing of air vents and vacuum relief. A pipeline partially occluded with an air pocket may act as a pressure-reducing valve where it is not wanted. Too small a vacuum relief valve will cause the pipeline to flex every time the system is turned off, causing a predictable failure five years down the road. A good indication that the vents may be too small is placing a 2" vent on a pipeline of 8" or greater, especially if there is any elevation differences. *If there is a high spot in the pipeline, a vent is needed. If any vent seems too small for the size of line, it probably is.*

Who picked this filter, anyway? Filter selection should be based on the system's flow rates, emission devices and the quality of the irrigation source water. Most of the filtration challenges we encounter are related to an inadequate understanding of the water quality prior to the filter's selection. In many cases there is a need for pre-treating the water prior to final filtration. This can result in additional pressure requirements and increased horsepower demands. In some cases the water may require aeration for iron removal. All of these post-installation challenges are more costly than if the right questions were asked up front. *If you do not know the quality of your source water then your filter selection is only a guess.*

Who's in charge? As amazing as it may seem, we often come across irrigation systems that were engineered without the knowledge of how much water is available. This is perhaps the most glaring symptom of a lack of oversight on the project. Other less obvious symptoms are irrigation blocks that do not match the grower's farming methods and no consideration of future system expansions. There is so much talk about Y2K compatibility yet many irrigation systems are incompatible for the planned expansion the following season. In almost every case there was a lack of a Project Manager. The grower was busy planting his crop, organizing labor, etc., and the irrigation installer was doing what he was being paid to do…install the system. If the grower is not paying the design engineer to ask all of the pertinent questions up front then it becomes the duty of the grower to ask the right questions himself. If the grower has not educated himself as to which questions need to be asked there arises a potential for future operational "challenges". *It is the grower who will have to live with the irrigation system and it is ultimately his responsibility to insure that all the pieces fit together.*

Nice system! How do I turn it on? How is it that a grower can purchase a six-figure irrigation system to protect a seven-figure agri-investment and not know how to operate and maintain it? The litany of the irrigation dealers is "Well, you don't ask your automobile dealer to teach you to drive, do

ya'?" Even if the grower learns how to run the system, what is the success rate on his teaching his employee in a foreign language? Even an irrigation system that was flawlessly designed and installed is scheduled to fail without proper operation and maintenance. *It is up to the grower to provide an adequate level of training to his irrigation team to insure continued irrigation success.*

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