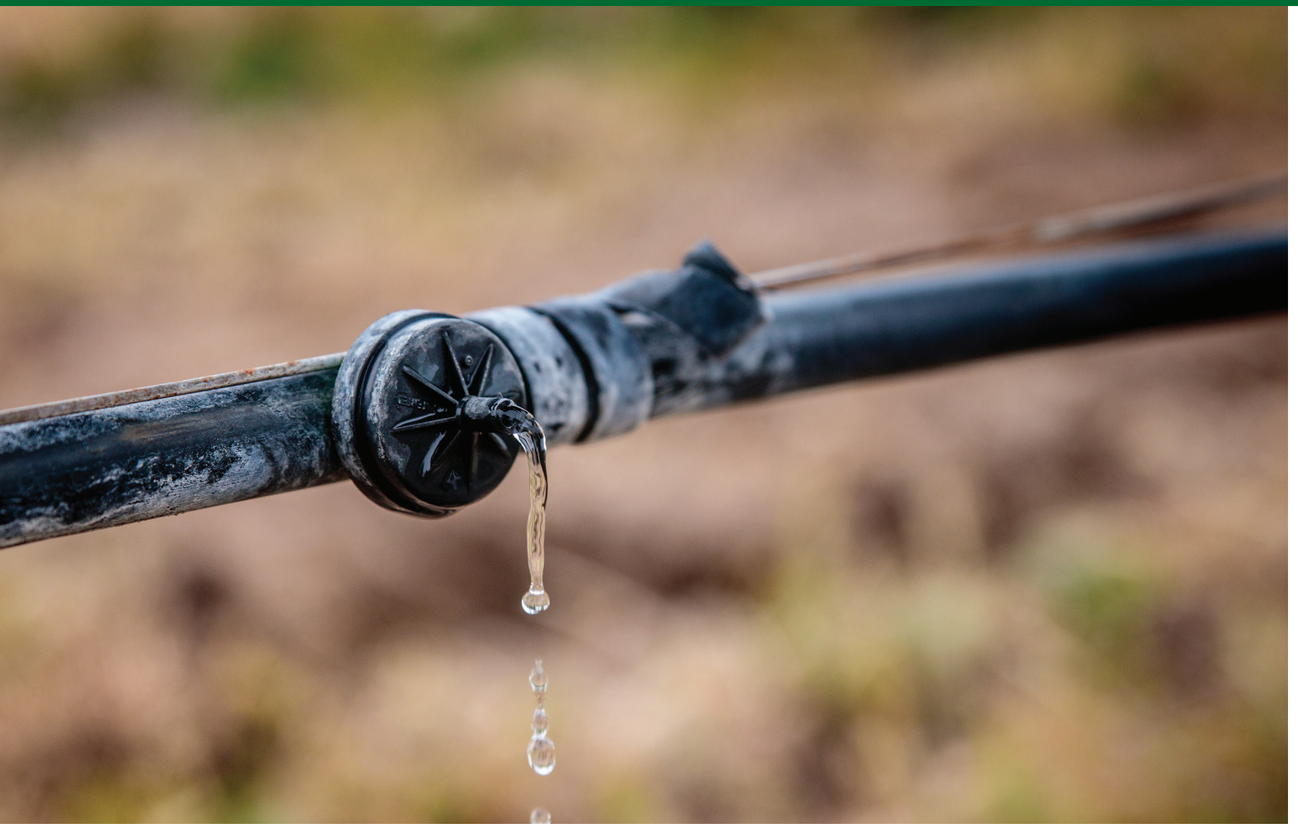


Irrigation Best Management Practices

By: Craig Macmillan, Macmillan Ag Consulting; Kris Beal, Vineyard Team;
Jacob Hernandez, JH Ag Consulting

The Project

Vineyard Team is a non-profit outreach and education organization based in Atascadero, California. The California Department of Water Resources (DWR) awarded a grant to Vineyard Team in 2017 to study grower adoption of irrigation best management practices in vineyards. Over three years 57 growers were recruited into the project. An irrigation interview was conducted with the growers creating an inventory of current irrigation-related behaviors. Irrigation system performance was measured using a Distribution Uniformity evaluation (DU). A DU evaluation measures pressures and flows at key points in an irrigation system to calculate a DU score between 0 and 1.0 that correlates to irrigation system efficiency.

Grower Irrigation Practices

Following growers for several years revealed best management practices for maintaining a high Distribution Uniformity score and a well-functioning irrigation system. These practices address three issues found with the irrigation systems in this project. System performance was affected by plugging from particulates, plugging due to water quality issues and problems with pressures.

Some practices one would expect to be associated with system performance did not stand out as being important. Frequency of drip hose flushing was one such practice. This suggest that the flushing events were not long enough to clear built up material from the hose. During DU evaluations substantial amounts of material were found at the end of hoses even in vineyards where flushing lines multiple times per year was reported. The implication is that flushing for longer periods of time or even more frequently is required before flushing will have a positive impact on maintaining DU scores.

Having a system for identifying problems is associated with a higher DU score. The most common system was visual inspection of lines when starting up the system and immediately repairing blowouts and plugged emitters. Replacing plugged emitters was also associated with higher DU scores. Although most growers reported inspecting lines and replacing plugged emitters, it was apparent from the DU evaluations that some growers were more aggressive in their replacement programs than others. Other recommended practices include using a nylon to capture debris for inspection when flushing hoses, cracking open emitters to look for particulates, slimes, or calcification and cleaning or replacing blinded over screen washers in riser tees.

Waiting until an emitter is completely plugged is too late from a DU point of view. A fully functioning emitter should drip constantly. It should look like a continuous flow. Irrigation systems with plugging problems will have few if any emitters that look like this indicating that lines and emitters need to be replaced and the filtration system is inadequate or failing due to damage or poor maintenance.

Filtration can prevent plugging from particulates pumped up from the well like sand or silt. Filters experience wear and tear like any other part of the

system and even a small failure leads to plugging downstream. If filters plug rapidly one solution is to install greater surface area of filtration to spread the load. Increasing the frequency of cleaning the filters is also important. When troubleshooting irrigation system performance problems, considering the adequacy of the filter station is important. It is common to install a filter that is too small for the particulate load to reduce cost of the system install, but this increases costs in the long run due to down time and emitter plugging downstream.

The higher the frequency of cleaning filters, the higher the DU score. Filters need to be cleaned regularly during the irrigation season. It is not enough to simply back flush filters regularly. Back flushing should be viewed as a secondary form of cleaning, not the primary type of filter maintenance. Screen filters must be physically cleaned and the sand in sand media filters must be monitored and replaced. Any pressure drop greater than five psi across the filter is a sign that there is material plugging the filter and it could be cleaner. One vineyard with a high scoring system removes the screens from their screen filters and pressure washes them several times during the irrigation season.

Although almost all drip emitters on the market today are pressure compensating emitters, pressure variability still effects system performance. In this study, many systems were found to have pressures in the field that varied from below the minimum to above the maximum specifications for the emitters installed. This leads to flows lower or higher than expected. In the case of low pressure, it can also be associated with inadequate flow rates. In the case of high pressures, it can be associated with blowouts. Installing or replacing pressure regulators can even out the pressures in the field and improve system performance. Consult the system design for reasonable target pressures in the drip line. Generally speaking, the pressure at the farthest point from the pump or the highest point in the system should be above 8 psi to ensure emitters are functioning properly.

The Benefits

The benefits of properly equipping and maintaining an irrigation system can be seen when one tracks water use over time. This is more than simply recording runtimes or water meter readings. These measurements need to be considered in the context of previous measurements. This allows a grower to see if they are using more water over time indicating that the system uniformity is declining, as more water is required to deliver what is needed to the weak areas of the vineyard. Obviously, every season is different in terms of weather, but this can be accounted for when multiple years are compared.

Scheduling of irrigation is the other component of irrigation efficiency. In this study, we found some growers applied twice as much water during a warm year than an "average" year. Other growers also delivered more water during that warm summer, but nowhere near twice as much indicating they were able to supply what the plants needed in an efficient manner. It may be the case that these growers were able to irrigate more efficiently by scheduling irrigations more accurately to the needs of the plants using plant-base, soil-based, or weather-based technologies to estimate vine water use rather than relying on visual assessment or other less grounded methods. In a few cases, water use went down as a result of system improvements from the previous year demonstrating how important implementing best practices like replacing plugged emitters and addressing pressure issues were to efficient system performance.

A Success Story

Project staff evaluated two blocks at Zabala Vineyards, in Greenfield, California. The initial DU score in the spring of 2018 for the 20-year old vineyard was 0.88. Significant pressure variation was observed during the evaluation due to dirty and plugged hose screen washers installed in riser tees. Plugging accounted for about one-half of the problems with DU, and chemical remediation was recommended. After the initial evaluation, the grower improved his maintenance program by implementing a more rigorous flushing routine, removing or replacing dirty screen washers, and remediating drip hoses and emitters with a strong acid treatment and flush.

The DU score improved from 0.88 to 0.91 between the two evaluations. Problems due to pressure were reduced by about 20% in the retest evaluation. High pressure losses at the pump station were not present in the retest, and the difference between riser pressures decreased by 5 psi, from 7 to 2 psi even though average set pressure between the two tests was unchanged. On average, emission devices performed about 8% better after chemical remediation and flushing.

This is an excellent example of how small changes and a more aggressive maintenance regime improved system efficiency without major changes to the system itself at an affordable cost. Costs were $35/acre to treat with strong acid, plus his labor to flush. Water treatment was done based on water quality analysis and with the help of a professional water treatment company.

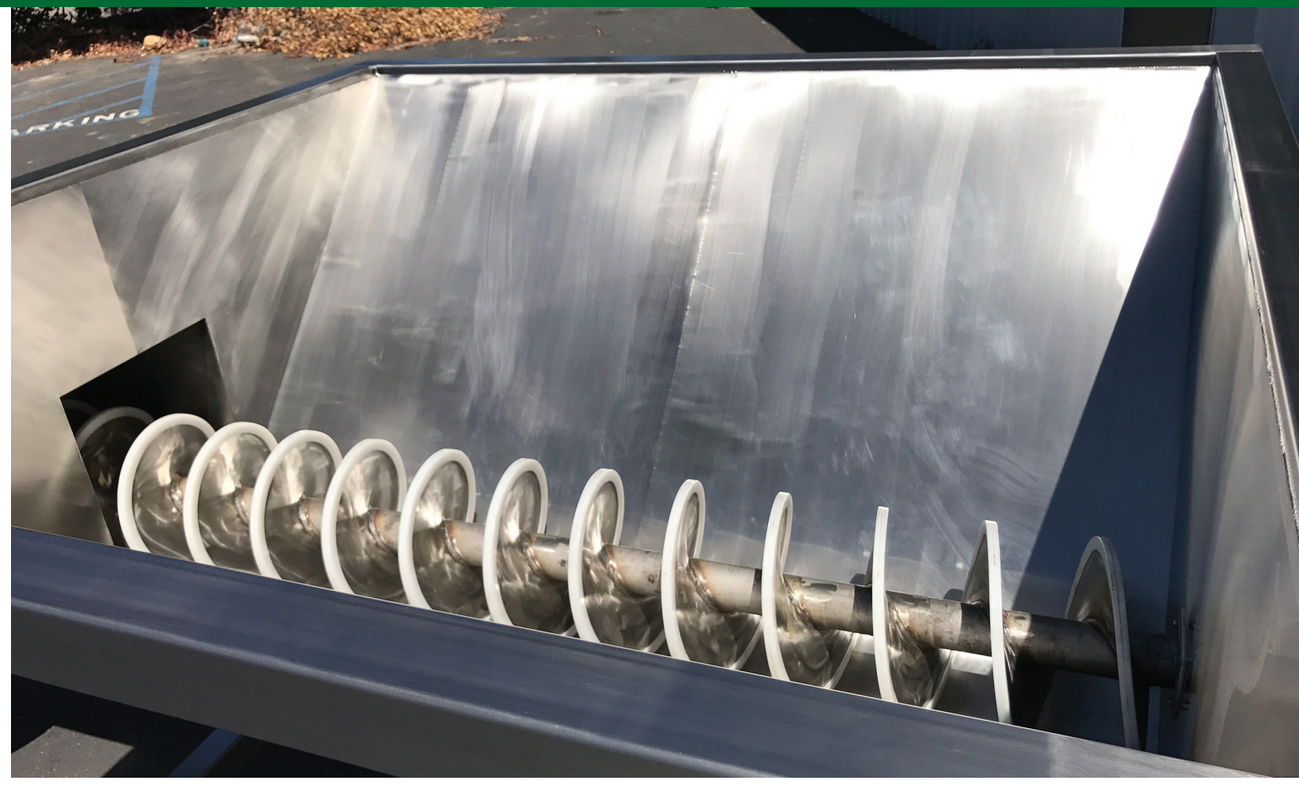
Recommendations

When troubleshooting irrigation system performance issues, start at the pump. Determine if the pump is operating properly. Confirm that the pressure supplied by the well pump is sufficient to deliver water to the highest point in the system or the farthest point from the well pump. If not, install a booster pump.

Then, investigate whether the quality of the water coming out of the well is the source of irrigation system problems. This can be in the form of plugging due to precipitates from bicarbonates, bacteria, algae, or other biological slimes. Correct these issues before sending water into the system. Precipitates can be managed by adjusting the pH of irrigation water. Biological issues are often managed with chlorine. It is easy to overlook the importance of water treatment for the functioning of the system. If there is a water quality issue, however, it is the most effective way to reduce plugging of emitters and maintain a high DU score.

Distribution Uniformity evaluations are offered by many Resource Conservation Districts, County ag departments, State ag agencies, and USDA offices as mobile irrigation lab services. Simplified versions can also be performed by growers themselves.

Other metrics like water use over time, changes in system pressures, and frequency of filter flushing over time can indicate changes in system efficiency. By monitoring the system's performance, it is possible to reduce the amount of water used over time and reduce pumping costs thereby saving money and resources.



Destemmers and Hoppers: Key tools in making great wine

By: Cheryl Gray

A crucial step in making a good wine a better one is to keep things out that don't belong.

That process starts in the vineyard, where hoppers are used to collect the grapes, while destemmers separate the fruit from what some in the industry call "MOG," which is winery shorthand for "material other than grapes." For every vineyard, which brand and type of destemmers and hoppers used largely depends upon the volume of the harvest.

Family-owned Mercer Estates Winery in Washington processes tons of grapes during harvest. Its vineyards stretch across Horse Heaven Hills, which is bounded on the north by Washington's Yakima Valley and on the south by the Columbia River. The winery does releases twice a year—in May and October—and distributes its wines to more than 30 states. The demands of an operation this size require vigilance over its grapes that technology and years of expertise provide. Jeremy Santo is the company's winemaker.

"With the size of the loads coming to the winery (22 tons in three gondolas per truck), we use a hopper large enough to unload one gondola at a time to complete the truckload. Here at the winery, we do have the ability to use a destemmer while receiving grape loads, but rarely use it. Because of the ability to selectively harvest in the vineyards,