

Waste Not, Want Not

AS WATER-SUPPLY CONCERNS GROW, DRIP-IRRIGATION SYSTEMS FEATURING HYDRAULIC DIAPHRAGM PUMPS, SUCH AS THE 500-S SERIES FROM NEPTUNE™ CHEMICAL PUMP COMPANY, CAN OPTIMIZE WATER AND FERTILIZER USE

By Tom O'Donnell



Mother Nature may be the main provider of water to a field, but sometimes she needs help from man-made irrigation systems.

There's no question that water is the lifeblood for nearly every industry in the world. Farms, nurseries, greenhouses, orchards, vineyards and golf courses are just a few that rely on a steady, reliable supply of water to keep their crops lush and viable or, in the case of golf courses, visually appealing and attractive for the user. For the most part, Mother Nature is the main source for the supply of water that is necessary to keep these operations running as expected. However, there are undoubtedly times when she needs some assistance.

To aid in the instances of water-supply shortage – as in the case of drought conditions or an insufficient municipal water supply – various systems have been specifically designed to make sure the required amount of water gets to where and when it is needed most. Furthermore, as concerns about water conservation also continue to grow, these systems have been designed to apply just the right

quantity of water at the right time, which eliminates wasteful over-application, evaporation and run-off.

One system of water delivery that has been growing in popularity in recent years is drip irrigation, which is also referred to as micro-irrigation, trickle irrigation or localized irrigation. Drip irrigation relies on a network of valves, piping, tubing – called “drip tape” – and emitters that allow water to drip slowly to the roots of the plants, either aboveground through direct application to the soil's surface, or via the root zone located 12 to 18 inches below ground. Drip irrigation is preferable to other forms of irrigation because the water – and any fertilizer or nutrients that also need to be applied – is targeted for application directly to the roots, which results in more targeted water and fertilizer/nutrient usage, and lower costs.

This white paper will highlight the best pump technology – hydraulic diaphragm metering pumps – and why they are the leading choice for injecting the chemicals and acids that keep drip-irrigation systems operating at their best efficiency, while knowing that any inefficiencies can result in sub-par crop yields or a golf course that is an unflattering shade of brown rather than the expected lush green.

The Challenge

Though some may say that drip irrigation is one of the most noteworthy innovations in agriculture in the last 80 years, installing and operating a drip-irrigation system does have its challenges. Careful consideration must be given to a variety of factors before installing a drip-irrigation system, such as land topography, soil type (sandy loam or light soil is the best), crop type, climactic conditions and water availability.

Other potential challenges for drip irrigation include:

- **Expense** – Initial costs can be higher than other types of irrigation systems.
- **Longevity** – Drip tape can be susceptible to damage, especially from the sun if used aboveground.
- **Convenience** – Drip tape may be unsatisfactory if herbicides or top-dressed fertilizers require sprinkler irrigation for activation.
- **Cleanup Costs** – After harvest, drip tape may need to be rewound, disposed of or recycled.
- **Germination Concerns** – In lighter soils, subsurface drip irrigation may be unable to adequately wet the soil surface for germination.

These challenges are accompanied by another major challenge within a drip-irrigation system: clogging. A single drip-irrigation system can cover up to 160 acres, which means an abundance of drip tape is required to handle large volumes of water. The problems arise when the water, which might or might not be filtered, leaves behind lime or scale deposits that can build up over time and clog the drip tape. This prevents the water from being applied in a consistent manner. Additionally, any water that remains in the drip tape can be a catalyst in the formation and growth of algae, which will also clog the tape and adversely affect the system's performance.

To combat these performance-harming impediments, a chemical, such as sodium hypochlorite, or an acid, such as

sulfuric acid, will be pumped into the water stream at precise dosages in order to thwart the buildup of lime or scale, and the growth of algae.

The final challenge in this scenario is identifying and implementing the proper pump technology, one that can reliably handle the chemicals, acids and fertilizers that are the staple of drip-irrigation systems, while also providing the precise flow rates that are required.

The Solution

As mentioned, the best choice for chemical, acid and fertilizer/nutrient injection in drip-irrigation applications is hydraulic diaphragm metering pump technology. When considering these types of pumps, one company has risen to the fore: Neptune™ Chemical Pump Company, headquartered in North Wales, PA, USA. Neptune's hydraulic diaphragm metering pumps – specifically the 500-S Series – have become the industry standard in drip irrigation.

Chemical, acid, and fertilizer/nutrient injection into a drip-irrigation system is a very precise operation. The various components are stored in a tank with transfer lines that run to the main water line. An injection quill is used to enter the water line, which allows the chemicals, acids or fertilizers/nutrients to be introduced, usually via a user-determined schedule and timer, into the water



At the heart of this drip irrigation system is the Neptune 500-S Series metering pump.



500-S Series Metering Pump from Neptune Chemical Pump Co.

stream. The flow of these products into the drip-irrigation system must be precise and constant, and one pump is generally used to supply the product to an area as large as 150 or 160 acres.

500-S Series hydraulic diaphragm metering pumps are ideal for this type of application because they:

- Are able to inject a precise and controlled amount of chemical
- Feature an internal relief valve
- Provide leak-free operation
- Can handle higher pumping pressures than mechanical diaphragm pumps
- Are low maintenance
- Can have a variable-speed motor
- Require low energy usage
- Have an easily adjustable micrometer dial that can be adjusted whether the pump is running or stopped

In fact, Neptune has designed its 500-S Series pumps to operate 24/7/365 in the harshest conditions and last for up to 20 years of service, a reliability record that most mechanical, piston or electronic diaphragm pumps can't come close to matching. Hydraulic diaphragm pumps also have a flow-rate deviation of less than 1%, while the flow-rate deviation for mechanical pumps can approach 3%,

which is a level of inaccuracy that cannot be tolerated in certain applications.

Neptune has not only created its 500-S Series pumps, which can be of either simplex or duplex design, to meet the needs of drip-irrigation applications, but to also provide ease-of-use to the operator. The pumps feature a 10-turn micrometer dial that can be calibrated to 1% increments from 10% to 100% of flow capacity, with the color-contrasted dial protected by a clear PVC covering. Additionally, the pump's stroke mechanism moves only when adjusted, which eliminates unnecessary wear, while the piston is powered through the complete stroke length at all capacities to remove any concerns about excessive stress, wear or shock.

The 500-S Series pumps also feature a Variable Oil By-Pass™ stroke adjustment option that delivers better valve performance than metering pumps with variable-linkage designs. The valve checks optimize performance because they have extra time to seat since they are idle during the by-pass portion of the suction and discharge strokes. The pumps also offer EZE-CLEAN™ Valves with cartridges that can be removed for cleaning without the need to disturb the pump's piping.

Because sodium hypochlorite and sulfuric acid, along with many plant fertilizers and nutrients, have differing material-compatibility requirements, Neptune offers the 500-S Series pumps with a choice of materials of construction for the pump body, valves and seats, including 316 stainless steel, C-20, PVC and Kynar®. Valve checks are available in 316 stainless steel, C-20 and glass.

500-S Series pumps are capable of producing up to 94 gallons per hour (356 liters per hour) of flow at 100 pounds of pressure (188 gph/712 L/hr if the pump is duplexed). Operational temperatures range from 125°F to 200°F (52°C to 93°C) with maximum pressures from 150 to 3,000 psi (11 to 210 bar).

Conclusion

Water use and conservation is becoming a hot-button issue across the country. This is forcing the use of innovative thinking and the creation of systems that are designed to use our precious water supply most effectively and efficiently in the industries that rely on it for their survival. Drip irrigation is one of the innovations that has been proven to optimize water usage, whether it's watering a field of alfalfa, or keeping a fairway lush and green.

The fact that drip-irrigation systems are highly sensitive to lime or scale buildup and algae growth, not to mention expensive to install, means that they must be treated with the utmost care. The chemicals, acids and fertilizers/nutrients that are injected into the system are crucial to the successful operation of the system and, by extension, the viability of the farm, greenhouse, orchard or golf course. Therefore, reliable injection of chemicals, acids and fertilizers/nutrients into the drip-irrigation system relies on a trustworthy, highly accurate pump. Pumps that can't deliver the desired flow rate or are prone to failures and breakdowns, can do irreparable harm to a crop, resulting in loss of revenue and economic hardship for the operator. Over the years, the most reliable pump technology for these crucial operations has proven to be hydraulic diaphragm metering pump technology, namely in the form of the 500-S Series pump from Neptune Chemical Pump Co.

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Neptune offers a complete family of 500 Series Hydraulic Diaphragm Metering Pumps.



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