

Time Is Money

METERING PUMPS IN CENTER-PIVOT IRRIGATION SYSTEMS ALLOW GROWERS TO APPLY FERTILIZERS AND CHEMICALS IN THE MOST PRECISE, TIMELY AND COST-EFFECTIVE MANNER

By Eulis Ester



Using a farm's center-pivot irrigation system to apply fertilizers and chemicals to a crop is the most efficient and cost-effective way to ensure accurate and effective coverage. These systems are able to reach their ultimate level of performance when Neptune® Metering Pumps are used to inject the exact amount of fertilizers, herbicides, fungicides and insecticides at precisely the right time.

Introduction

Over many hundreds of years of trial and error, growers have learned that the viability and optimization of their crops relies on a series of operations that require precise timing. The timing process begins in the spring when climatic conditions are observed and past weather patterns are consulted to determine the best time to plant the crop, with different conditions more favorable for different types of crops. The timing cycle concludes in late summer or fall – again depending on the climate, weather patterns and type of crop – when the grower chooses the optimum time for the harvest.

In between planting and harvesting, though, there are a number of other timing decisions that need to be made, such as identifying the best times to apply nitrogen fertilizers and chemicals (insecticides, fungicides and herbicides) to the crop. Hand in hand with that is knowing the precise amount of those

products that should be applied at the precise time. With the prices of fertilizers and the chemicals used to make insecticides, fungicides and herbicides continuing to increase, choosing the perfect times to apply them and the exact amounts that should be applied can often be the difference between a bumper crop and one that fails to meet expectations.

Then, of course, even the best-laid plans can be scuttled by the most fickle of players in this yearly drama: Mother Nature. Knowing the best time to plant and harvest, as well as the right time to apply fertilizers and crop protectants, is helpful. However, one ill-timed hailstorm, or an infestation of grasshoppers, aphids, corn borers or other insects or a fungus outbreak can quickly turn what should have been, for all intents and purposes, a profitable crop into a scramble for survival.

It is during these moments when the unknown occurs that a grower's precise optimization of time can be the most crucial.

Finding The Right Choice

As mentioned, trying to predict what can never be known – just because it was 82°F without a cloud in the sky on June 26 last year doesn't mean it won't be 59°F with a foot of rain on the same day this year – is the most daunting challenge the grower faces every season. This has forced growers to find, usually by weighing past success against past failures, the best ways possible to optimize their crop production.

Over the years, some basic guidelines have emerged when it comes to applying fertilizers and chemicals:

- Fertilizers are generally applied to the crop at the time of planting and again at multiple intervals throughout the growing season, in precise amounts and at precise times
- Different chemicals are applied at different specific points during the growing season:
 - Herbicides are generally post-emergent and applied after the crop has come up, though there are some that contain weed killer and can be applied to the ground prior to crop germination
 - Fungicides have traditionally been post-emergent, but some newer formulations allow them to be applied in a pre-emergent fashion
 - Insecticides are usually applied when signs of an imminent insect infestation begin to appear

With all of these fertilizers and chemicals needed to ensure a maximized crop yield, the ultimate challenge for the grower comes down to applying them in precise amounts and at precise times while doing so in the most efficient, environmentally friendly and energy-conscious manner.

Over the years, a number of technologies have risen to the forefront where fertilizer and chemical applications are concerned:

- In the United States and North America, metering pumps are the most common technology used for both fertilizer and chemical applications through irrigation systems
- In Latin America, Venturi tubes are used to inject fertilizer into the irrigation water supply
- In the Middle East and North Africa, metering pumps are used, but with cheaper labor available, oftentimes chemicals may be applied through such relatively primitive means as a hand sprayer

In terms of inefficiencies, using Venturis is less precise than using metering pumps, which can harm the bottom line if overfeeding (more product is used than needed) or harm the crop if underfeeding (the crop does not meet its full potential). Also, relying on untrained manual labor can often result in an imprecise level of fertilizer and chemical application that is not what the grower expects or requires.

One other method of application that is used throughout the world – though it is in decline in North America – is an aerial application where the chemicals are sprayed on the crop from above. This mode of application has a number of inherent drawbacks: aerial applications can be expensive (\$5 to \$9 per acre in the U.S., with the cost of the chemical on top of that), and they are susceptible to wind-caused drift, overspraying or unintended applications.

The Ultimate Solution

For the grower looking to optimize cost, efficiency, return on investment and, most important, yield, the ultimate solution is a chemigation or fertigation system (which consist of some combination of hoses, injectors, mixers/agitators and product-storage tanks) that utilizes metering pumps to introduce the grower's desired amount of fertilizers and chemicals – no more and no less – into the farm's center-pivot water irrigation system at the precise time.

Metering pumps are perfect for these operations because they are reciprocating positive-displacement (PD) pumps that deliver exact amounts of fertilizers and chemicals, which enables the grower to control the amount and the timing of the application. They are highly accurate, repeatable and provide flow rates that are easily adjustable. They are also able to meet the unique handling characteristics required for fertilizers (which are usually solutions) and chemicals (which are often suspensions of fine particles in liquid).

A chemigation/fertigation system that features a metering pump is perfect for use with a center-pivot watering system because the pump's method of operation overcomes the challenges that most perplex the grower. Anybody that can use a calculator can set the needed flow rate for a metering pump. Once the flow rate is determined, that precise amount of fertilizer or chemical will be applied through the center-pivot irrigation system. Because of the metering pump's efficiency, a large crop-growing operation can effectively and efficiently use one pump to service up to three center-pivot systems. Additionally, applying precise amounts of fertilizer via a metering pump through a center-pivot system at specific times during the growing season will boost yield while needing less fertilizer to realize those higher yields.

The use of metering pumps in conjunction with a center-pivot system also keeps the grower more nimble and able to adjust to changing growing conditions. For example:

- If fertilizer is applied other than by a center pivot one day and the next day a storm leaches it away not only is that fertilizer lost, but the chances are likely that the field will be too wet for a number of days, hampering the opportunity to apply another dose of fertilizer. Applying the fertilizer through the center pivot means it can be reapplied the next day, or whenever the grower feels it is most appropriate. The ability to adjust the metering

pump's flow rate also means that more fertilizer can be applied with less water required, which the crop doesn't need after a heavy rain anyway.

- Metering pumps also provide benefits when insect infestations occur. Growers will often know a few days in advance if a wave of insects is entering the area. When this happens, a mad scramble usually ensues as competing growers try to contract with aerial sprayers that can apply insecticides to their crops. The grower using a metering pump for chemical application can apply a precise amount of insecticide immediately when needed through his center-pivot system to thwart what could be a disastrous situation.

When considering metering pumps, one company stands out: Neptune®, Grand Terrace, CA, USA, a product brand of PSG®, Oakbrook Terrace, IL, USA, a Dover company. Neptune's hydraulic and mechanical diaphragm metering pumps have become the industry standard in a wide variety of applications, including irrigation, whether for acres of corn or acres of country club fairways. Neptune has developed several families of metering pumps for precise application of a wide variety of fertilizer and chemical products in agricultural applications, including:

- Series 500 pumps are hydraulically actuated diaphragm metering pumps with a micrometer stroke adjustment dial to allow capacity changes while the pump is running or stopped (10:1 turndown). Hydraulically actuated diaphragms offer the greatest life. Maintenance is simplified through the use of valve cartridges that can be removed for cleaning or replaced without disturbing the piping. They are available with flow rates from 1 to 80 gallons per hour in stainless-steel, PVC, Alloy 20 and Kynar® construction, making them compatible with corrosive liquids. Series 500VS models offer special liquid ends to handle suspensions of wettable powders or moderate viscosities. All moving parts run submerged in oil for extended service life.



Neptune™ 500-VS Series High-Viscosity Hydraulic Metering Pump

- The MP7000 Series consists of mechanically actuated diaphragm metering pumps that eliminate the use of contour plates on the liquid side of the diaphragm which improves flow patterns and allows injection of suspensions. They are self-priming and have the ability to handle chemicals with viscosities to 2,500 cP or that produce off-gas. Pump capacity can be adjusted by a micrometer dial while the pump is running (10:1 turndown ratio). They are available with flow rates from 2 to 300 gallons per hour at pressures to 235 psi. All models are available in stainless steel, PVC and Kynar® construction and all moving parts run submerged in oil for extended service life.



- PZ Series models are electronically actuated diaphragm metering pumps and offer the industry's leading "pulse" design as the pumps operate on any single-phase voltage from 94 VAC to 264 VAC, making them immune to low-voltage conditions or "brownouts." Manual speed adjustment allows operation from 15 to 300 strokes per minute (20:1 turndown ratio). Optional features include flow pacing, cycle timer and counter functions. Models are available from 0.5 to 20 gallons per hour in PVC, acrylic and Kynar® materials of construction. Models are also available with an automatic de-gassing valve for chemicals and liquids that "off" gas, such as sodium hypochlorite.



Conclusion

The ultimate benefit of utilizing metering-pump technology for the application of fertilizers and chemicals through the center pivot is the positive return to the grower's bottom line. The rising prices of fertilizers and chemicals make it necessary to inject the exact amount of each at precisely the right time. Aerial application of insecticides, fungicides and herbicides is expensive and the timing of the applications is not completely under the grower's control.

A center-pivot irrigation system can be very expensive. A chemigation system that utilizes metering pumps or a fertigation system (which doesn't require a mixer/agitator to keep the product in suspension) can be very cost-effective alternatives. Using the center pivot as a spray boom for

chemicals and fertilizers allows reduced input costs, precision timing and increased yields, money that can accelerate the repayment of the original investment in the center-pivot system.

While growers will never be able to precisely predict weather patterns (with any measurable accuracy), they can expand the window of crop viability by making the best use of the best application technology that is available. In this case, that is metering-pump technology, which can be a key and cost-effective component in any center-pivot irrigation system.

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