



DID YOU KNOW?

In Nebraska, 52% of the irrigated acreage uses electricity to power pumps; however, the remaining diesel and natural gas irrigation systems present a significant electrification opportunity.

Due to their rural location and limited access to appropriate electrical capacity, farmers traditionally have relied on diesel or natural gas engine-driven pumps to power large irrigation systems for crops. New technology solutions now enable farmers to use electric pumps, which reduce emissions and offer significant lifetime savings.

HOW IT WORKS

The primary barrier to using electricity in the field is access to three-phase electric power needed to efficiently operate high horsepower motors. Most rural locations only have access to single-phase power. Two single-phase power options can overcome this barrier.

One option is to install a large (up to 100 hp), single-phase motor and generator technology, for instance a Written-Pole® motor, which can be operated from the existing single-phase distribution system. The Written-Pole® motor starts with low torque and current, which allows the pumps to start without causing flicker and voltage drop problems often encountered with large conventional single-phase motors.

The second option is a single-phase adjustable speed drive that can operate in the range of 10 hp to 100 hp and provide three-phase output from a single-phase source.

APPLICATIONS

Although the primary application for these single-phase technology options is irrigation systems, they also can be used for other agricultural operations or in rural settings:

- Large fans and blowers
- Grinders (e.g. peanut butter grinders)
- Sand mines
- Oil and gas compressors
- Industrial settings requiring large-capacity motors situated on single-phase distribution lines

BENEFITS

Payback in a year or less. With electric pumps, a farmer can save immediately on fuel and maintenance costs and achieve payback in a year or less under varying electric rates. The average lifetime of an electric pump is roughly twice that of a diesel pump which significantly improves lifecycle cost.

Cleaner air; cleaner site. Electric pumps create no local emissions. Eliminating diesel fuel eliminates potential fuel spills and reduces the risk of costly and messy site cleanup.

Electric pumps are a dedicated solution. Some farmers use power takeoff (PTO) from their tractors to power irrigation pumps. PTO consumes diesel fuel, takes the tractor out of field service, and requires worker setup and takedown time.

Reduces motor inrush current. Compared to conventional motors, Written-Pole® motors reduce starting (inrush) currents to an acceptable level. As an example, large conventional single-phase motors draw six to twelve times the normal running starting current and can negatively impact the distribution line voltage and power quality. The starting current of a single-phase Written-Pole® motor is less than twice the full-load current.

Lower impact on entire pumping system. Low starting current means lower temperatures and subsequently reduced component stress. Smoother (soft) starts are especially beneficial in pumping applications where water hammer can cause damage to system components.

LIMITATIONS

Higher capital costs. Farmers remain concerned about the higher initial capital outlay required for electric pumping equipment. Their fears can be allayed with information about the technology's quick payback and other operating benefits.

Customer awareness. Although single-phase electric pump technologies are in use across North America, many farmers remain unaware of their existence or benefits.

Resistance to change. Despite the lifetime savings, ease of operation, and lack of emissions associated with electric pumps, some farmers are still more comfortable with diesel pumps; diesel technology is familiar, they know how to repair it, and they have easy access to fuel.

Availability of electrical infrastructure. Use of electric pumps may require an upgrade to the electrical infrastructure. In some cases, single-phase electric pump options require higher voltage (480 VAC) to reduce the amperage and the conductor sizes for large motors. This may require an additional distribution transformer.

Power quality disturbances and associated mitigation cost. In some instances where adjustable speed drives are deployed, power quality disturbances may occur in the electric distribution system. If the utility has certain restrictions on the harmonic content of the voltage and current injected in the electric distribution system, then additional mitigation equipment is needed to meet those requirements adding additional cost to the customer.