

Hitachi Industrial Equipment & Solutions America, LLC



Using General Purpose Inverters for Cost-Effective, Reliable Pump Control in Irrigation Applications

Balancing Water and Energy Efficiency With Crop Output

Farmers are under significant pressure to increase crop production while balancing more efficient consumption of energy and water resources. Federal initiatives like the Environmental Quality Incentives Program (EQIP), provides financial assistance to farmers to help plan and implement practices that address these resource concerns — including more efficient irrigation systems.

Variable speed drives to efficiently control pumping motors in irrigation systems are one key example of an EQIP qualifying investment. \$.67B will be spent in North America alone for Variable Frequency Drives in pumping applications. With unprecedented alignment between both the need for better irrigation and funding sources, there has never been stronger demand for the technology that enables efficient irrigation solutions.

Achieving Optimal Irrigation Requires More Flexibility Than Simple Flow and Pressure Control

Many farmers use a center pivot system of pump, piping, and water distribution components to irrigate their fields. When compared to manually operated valves, variable speed drives controlling the pump motors in these systems offer much more efficient control of irrigation flow rates. But, while a variable speed drive can control flow by keeping pressure at a given setpoint, control panel builders must account for other conditions to truly optimize irrigation including:

- **Pipe damage that results from over pressure and water hammer in long pipe runs, potentially flooding fields and ruining crops**
- **Undetected loss of prime that results in continuously running pumps and premature motor burnout**
- **Undetected leaks in pump motor seals leading to pump failure**
- **Changing crop conditions that dictate flow/pressure setpoint changes**

With so much riding on irrigation, farmers are naturally looking for systems that not only help them use resources efficiently to maximize their crop output, but also deliver consistently optimized irrigation levels to crops, and are automated and simple to operate.

So how can you ensure that the variable speed drive component helps deliver the irrigation system farmers are demanding? The answer likely lies as much or more in the software capability of the inverter as it does with its hardware.

\$1.6B

EQIP Funding in recently passed 2014 Farm Bill – a 23% increase over 2008 Farm Bill funding

80%

share of US total consumptive water use withdrawn for irrigation



90%

share of total farm energy use associated with pumps moving water to irrigate crops



3 Ways a Software Approach Improves Irrigation Systems Over Using Pumping Specific Inverter Hardware

Panel builders often solve irrigation specific challenges with a pumping specific inverter and extra hardware components. This may include a PLC with seal leak detection relays, soft starters, and other pump monitoring equipment devices connected to the PLC, which then controls the inverter PID output to the pumps. A more software-centric approach however can reduce the cost, add flexibility and make it easier for the farmer to operate the irrigation system.

Cost

Pumping specific inverters are built to handle a wide variety of pumping applications with capabilities beyond irrigation needs. A general purpose variable torque inverter is typically 20% less cost than pump specific inverters, and can be controlled with specialized irrigation software that eliminates the need for extra control devices like timing relays, PLCs, etc.. With software-delivered capabilities, farmers only pay for the control panel functions they need.



Flexibility

As irrigation requirements change over time or new capabilities like Variable Rate Irrigation (VRI) are desired, a simple software update can easily incorporate new features into the control panel. No additional hardware is required in the panel and the useful life of the farmers' original investment is extended. Using software, contractors can offer increasingly sophisticated pump controls without the extra component installation and maintenance costs.

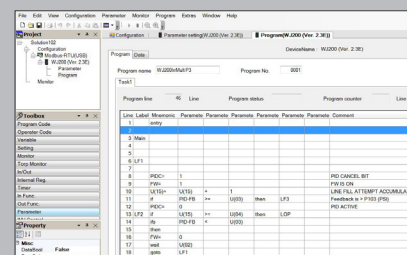


Simplicity

Specialty pumps with extra hardware components add complexity. This complexity can lead to operator error that wastes water and energy and even decreases motor life due to overuse. Many pump specific inverters have a dizzying array of parameters for PID control that confuse the farmer. This makes setup and operation difficult and irrigation results unreliable. In contrast, software built specifically for irrigation applications can continuously control the PID output of a general purpose inverter while monitoring for seal leaks, pipe breaks, loss of prime etc. — even execute a line fill cycle that eliminates water hammer. For the farmer this means virtual push-button simplicity, lower maintenance costs and consistently optimized irrigation.

Easy-Sequence Software Enables A Lower Cost General Purpose Inverter Solution Better Suited To Irrigation Applications

Utilizing the Easy-Sequence (EzSQ) software built into Hitachi inverters, Hitachi offers an automated system that eliminates many of the function specific components of other center pivot panel solutions. The irrigation pump program incorporates PLC-like capability into the inverter. Using EzSQ, panel builders can create sophisticated programs to control inverter operation that precisely match farmer's center pivot irrigation requirements.



For more information

Visit <https://www.hitachi-iesa.com/ac-drives-inverters/wj-200-series>, or call 980-500-7141 today for information on how to build more cost-effective irrigation control solutions using Hitachi's EzSQ software and general purpose inverters.

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