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White Paper

Siemens agricultural pump panels: Basic control in a rough environment

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Electrical equipment mounted in the great outdoors has to protect itself while providing a high level of reliability. Wimpy units don't survive.

Large farms generally have a variety of irrigation or other water pumping requirements. Applications in the olden days with a hand pump or powered by a windmill gave way to engines and motors with the arrival of rural electrification. Controlling those pump motors ought to be a simple matter, but the conditions on farms make the situation more complex and challenging.

Edges of the electrical grid

Since farms are in sparsely populated areas, the local electrical distribution is also thinner. Where towns and cities offer more constant use to smooth out current flow, rural customers have a more constrained supply and large single users can cause disruptions. This causes phase imbalances and other types of anomalies that can be hard on motors and electrical equipment.

There are various power conditioning strategies available, but few farms are able to deploy these due to their complexity and expense. Operators simply get used to the performance of the local grid and do their best, realizing it can shorten the lifespan of the equipment.

Exposure to the elements

Most of the equipment installed remotely on farms is outside, fully exposed to rain, snow, sun, wind and all the elements over the course of a year. This shouldn't be a problem provided equipment has appropriate classifications for that kind of service, but it is unforgiving and any weakness, such as a compromised seal or damaged paint, will quickly become worse. Water infiltrating cabinets and motor housings corrodes wiring, terminal blocks, bearings and the enclosures themselves.

Pump panels are typically installed as a service entrance: They are mounted on a utility pole with three-phase power overhead, 230 or 460 Vac, coming in through a conduit hub on top. This fitting has to be carefully sealed to keep out water, and the top of the conduit has to be positioned properly with the right fittings to avoid serving as a water pipe, collecting rain and channeling it into the enclosure.

The connection to the motor itself comes out the bottom of the pump panel enclosure using water-tight flexible conduit. This has to be sealed as well at both ends to avoid allowing water into the motor terminations.

Designed for the application

A pump panel has to be designed to perform well in this kind of environment for the long haul. There isn't time on a farm to give equipment much TLC, so there is a high premium placed on durability and longevity. Siemens builds its pump panel enclosures using galvanized steel that receives a durable baked-on powder coating to avoid the internal and external rust common in these installations.

Siemens Class 82 Slim Line NEMA-Rated Pump Panel family offers an excellent combination of performance sophistication and durability while minimizing cost.

The printed circuit board in the overload relay is fully coated to lock out moisture and avoid corrosion of the board and components. Terminal blocks use corrosion-resistant materials so wiring can be changed or repaired without having to fight rusty screws even after many years in this hostile service.

Protection for invisible challenges

As mentioned earlier, there are frequent grid and power quality problems in rural areas. A basic pump panel cannot correct for phase imbalances or voltage sags, but with the right capabilities, it can offer a high level of protection for the motor.

Motor starters and pump panels have long been equipped with thermal overloads. If the motor draws too much current, they get hot and interrupt the power. It's a very simple function and it provides a level of protection that is adequate for most situations. However, it cannot detect many of the kinds of power anomalies that are common in these environments.

More sophisticated devices are available that can offer a much higher level of protection without increasing costs significantly. Solid-state overload relays, such as Siemens ESP200, can detect and respond to far more subtle problems than a thermal overload.

The installer can set the full-load amperage anywhere across a wide 4-to-1 current span, and then configure it for trip class 5, 10, 20 or 30. That in itself is more than a thermal overload can do, but there are additional functions. The unit can be set to trip in the case of a phase imbalance, phase loss, or ground fault. Selection of these functions will depend on the kinds of problems in the immediate area, and the level of protection for that specific motor. In some situations, running at a critical time and risking the motor life is more important than protection, and that strategy can be built into the function. Or, if there is a trip, it can reset itself automatically after a period of time when the anomaly is hopefully resolved.

Functionality matching the larger system

A well-head or irrigation pump is normally controlled by a larger system that calls for it to turn on and off when needed. Since those switching mechanisms are not all the same, it is important to have flexibility in the pump panel so it can be configured to match. Siemens Class 82 Slim Line NEMA-Rated Pump Panel has a control switch mounted for access without opening the enclosure. It has provision for manual starting and stopping, or an automatic mode which can be configured for multiple kinds of external mechanisms.

The right kind of pump panel, when mounted properly, can provide a high level of physical protection for the equipment, while minimizing the effects of electrical disruptions. Siemens Class 82 Slim Line NEMA-Rated Pump Panel family offers an excellent combination of performance sophistication and durability while minimizing cost.

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