

Variable Speed Drives are a vastly under-used technology for optimizing energy efficiency on farms

Much more electricity than needed is used on farms across the country every day by systems that are working harder than they have to, resulting in unnecessarily high energy costs for farmers. By fitting VSDs on irrigation systems, fans and other electric motors, farmers can dramatically and immediately cut energy consumption and reduce operating costs.

“Electric motors are running at full speed, regardless of the actual output needed. Many motors are also over-sized and rarely or never required to deliver on maximum demand. VSDs reduce the output of technologies such as pumps or fans by controlling motor speed to ensure that it runs no faster than it has to – a variable speed drive lowers motor speed to match actual demand, which cuts energy consumption by substantial margins,” explains Eskom’s Senior General Manager Andrew Etzinger.

For farmers that are unable to upgrade to new, energy efficient motors, VSDs are a cost-effective way to adjust and optimize old and incorrectly sized motors. Variable speed drives can help to reduce energy consumption by optimizing the energy use of many systems and technologies, including:

- Drying, greenhouse, broiler house and layer hen house fans;
- Vacuum pumps, cold and freezer rooms, and the compressors of bulk milk tanks in dairy parlours;
- Hammer mills, mixers, conveyer belts, coolers, sieves, roller mills, extruders and pellitizers;
- Irrigation pumps;
- Air-conditioning; and
- Cold storage.

In the case of an irrigation system where different sizes of land are irrigated using the same pump, a VSD can be utilized to adapt the speed according to the respective water and pressure requirements of the different sizes of land - rather than having the motor running at full speed and all the excess energy being dissipated by the pump’s pressure regulator.

An Eskom study of 12 farmers in 2011/12, irrigating in various provinces reported energy savings of between 7.09% and 51.18% - with an average saving of a third (34%) - when using VSDs and applying the Ruraflex tariff. In one case, using a VSD translated into a 17% (388 kWh) reduction in the energy consumption of a 40-hectare centre pivot system - at Eskom’s Landrate tariff of 0.83 R/kWh this means a saving of R322 over the 33-hour irrigation cycle.

In a broiler or green house, up to six fans of the same size requiring a similar load can be connected to one VSD, which would then adjust the operation of the fans according to changing air flow requirements. Should it happen that a system with six fans, each absorbing 1 kW, would need only 50%

of the designed airflow, the variable speed drive would reduce the speed of the motors to reduce the air flow to the required 50%, reducing consumption to 0,75 kW.

In dairy operations, a variable frequency drive, which adjusts the energy use of a pump to meet the need of a milking machine, whether it is during the milking cycle or the washing cycle, can result in significant energy savings.

Switching to energy efficient technologies requires some capital outlay. However, depending on the long-term electricity savings, farmers can expect a relatively quick return on investment. A thorough feasibility study beforehand is however essential. Aside from energy savings, VSDs have the following additional benefits:

- Protecting electric motors and cables against faults, thereby increasing the life span of whole systems;
- Balancing and regulating voltage to electric motors;
- Smooth soft starting, thereby reducing starting current and maintenance;
- Automatic restarting after power failures;
- Limited riding through power dips;
- Reducing mechanical stresses and damages;
- Correcting power factors (some makes);
- Built-in recording of energy consumption and energy saved (some makes);
- Emergency set points and trips to protect equipment and motors;
- Automatic speed control;
- Precise process control;
- No more broken “tyre type” couplings on pumps due to high starting torques;
- Improved management of irrigation or other electricity uses outside peak hours;
- Communication with moisture gauges;
- Easy integration with SCADA or existing PLC systems;
- Versatile and adaptable; and
- Simple to install, configure and use.

In some instances it is not feasible to use a VSD because the variables are not large enough to bring about sufficient savings to justify the capital outlay. In those cases, however, it is often worth installing a soft starter or changing the pump impellor.

Eskom recommends that a proper feasibility study be done before making any energy saving technology purchases. Offering advice on how to make the switch to energy efficient technologies and implement energy use behavioural change, Eskom Energy Advisors excel in:

- Assessing the current and future energy needs of a farm –
 - ❖ Analysing the energy consumption of a farm or specific processes on a farm;
 - ❖ Identifying areas of energy wastage on a farm;
- Identifying the most cost effective and energy efficient technology solutions for a farm;
- Advising on how and where to access the latest energy efficient technologies; and

- Assisting with the measurement and verification of energy use savings as a result of energy efficiency interventions.

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