

ENGINEERING
TOMORROW



Case story | VLT® AQUA Drive FC 202

Danfoss efficiencies help South African farmer to free up energy and **achieve production goals**

155,000+ kWh annual energy savings

In recent years, South African energy security has been constrained, and while macroeconomic steps are in progress to correct this, the continuing unreliability of the country's electricity supply, together with escalating costs, can affect farming in several ways. This includes operations planning, spoiling of produce, and erratic irrigation schedules. The Development Bank of Southern Africa recognizes South Africa as being a water-scarce country, so energy efficiency in assisting with irrigation is critically important.

**>155
MWh**

annual energy
savings



| drives.danfoss.com

Danfoss, together with engineering components provider BMG, an authorized DrivePro® service partner of Danfoss, supplied a commercial maize farmer with the technology required to combat challenges around electricity sufficiency, for more effective irrigation purposes and to increase production capacity.

BMG's engineering products and services support the industrial, manufacturing, mining and agricultural sectors in 15 countries in sub-Saharan Africa, through over 100 branches. Its Boer Slim/Smart Farming initiative offers South African farmers sustainability solutions that focus on effective food production.

Challenge: Free up existing electricity supply to increase production capacity



"A joint Danfoss-BMG collaboration assisted a commercial maize (corn) farmer in Barkly West, Northern Cape province, to tackle the hurdles posed by an inadequate energy supply, which could not be increased by other means. The region where the farm is situated receives little rainfall annually, making effective irrigation critical for successful crop yield."

- Sydney Govender,
Danfoss Country Sales Manager,
Drives SSA

"Pumping and irrigation were the largest consumers of power on this maize-producing farm. The project required assisting the farmer, who was limited by a power supply of only 200 kVA +/- 300 A, to significantly reduce the cost of irrigation per hectare. Additionally, the farmer wanted to expand his crop production to include pecan nuts, but was unable to because of these limitations. He therefore needed to reduce the cost of irrigation and use the limited power supply more efficiently."



- Mick Baugh,
Electronics Manager,
Electromechanical Division, BMG





Challenge: Inefficiencies in **existing system**

At the project's outset, one of the pump sets supplied five centre pivots and some orchards.

- The first pump set consisted of 1 x 37 kW, 1 x 22 kW and 2 x 11 kW pumps.
- This equated to an installed power of 81 kW, with an absorbed power of 75 kW, which meant that the pump set drew a current of +/- 150 A.

- Additionally, the pumps were started by star / delta starters, and the only form of flow control was valves.

Govender clarifies, "The energy shortage was the farmer's main concern, with costs being a secondary consideration. We therefore aimed to free up the existing electricity supply to use elsewhere and thereby increase production capacity. The use of AC drives on a pump set was the perfect solution to provide the benefits required."

Solution: Installation of Danfoss drives on all pump sets

The proposal was as follows:

- To install Danfoss VLT® AQUA Drive FC 202 on all pumps.
- To control these pumps by means of pressure transducers set to match the varying demands of the different irrigation scenarios that presented themselves.
- To stop using the valves to limit flow, as this was highly inefficient.

"Danfoss VLT® AQUA Drive FC 202, which offers additional energy savings compared with traditional variable speed drive controls, has been designed for water and wastewater applications, including irrigation," Govender says.

"These AC drives were fitted to all pumps in this installation and controlled by pressure transducers that were set to match the varying demands of different irrigation requirements."

Benefits of Danfoss AC drives

Reasons to choose the Danfoss VLT® AQUA Drive FC 202

- A soft start/stop facility prevents water hammer on starting and stopping the pumps, reducing the possibility of burst pipes and wear and tear on couplings, pumps and pipes.
- They are available from BMG in IP55 enclosures, which do not require dedicated panels for mounting, eliminating the need for additional cooling and ventilation measures to extract heat during operation.
- Closed loop controllers eliminate the need for a pump controller and valves for flow-control, so a pressure transducer is the only peripheral component required.

Baugh adds, "BMG, as an authorized Danfoss service partner, with accredited technical staff and an extensive spares stock holding, is able to offer farmers support all year round. With regards to DrivePro® services, we stock a number of service exchange units and spare parts at the nearest BMG branch, in Kimberley."

Results: More efficiency, freed energy

After the installation of the four drives and setting the set point to 2.8 bar, the Danfoss-BMG team was able to run this same pump set with an average absorbed power of 51 kW, a saving of +/- 24 kW/hr or 50 A compared to the previous direct on line application (DOL) using throttling valves, with a projected annual power saving of +/- 155,000 kWh/year.

It is noteworthy that the farmer began with a set of four drives on four pumps and, because of the energy saving he experienced, he eventually installed drives on every pump on his farm "At the last count," says Baugh, there were over 20 drives on the farm.

With the installation of drives on all pump sets, the power supply is used more efficiently, resulting in improved existing crop production and the expansion into pecan nut farming.

Baugh says the energy saving was calculated using the Danfoss VLT® Energy Box, software tool as follows:

- Previously, the annual consumed energy was 279,524 kW hours/year.
- After the drives were fitted, this was reduced to 124,033 kW hours/year.
- This therefore equates to a saving of 155,491 kW hours/year savings.

Moving forward: Both individual plus macro-economic benefits

Govender notes, "Maize is South Africa's most important field crop, being a staple food for many of its citizens, as well as making a significant contribution to the economy. To compete more effectively in global markets, South Africa has to reduce its logistics and production costs, but this is difficult while the country's power grid remains constrained.

"The featured Danfoss/BMG initiatives show how the farmer was able to free up energy, which was then channelled elsewhere to increase productivity. If more farmers were able to follow this example, this would assist individual farmers, while simultaneously allowing them to play their own incremental role in improving the country's macroeconomics while the electricity supply continues to be constrained."

