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MONITORING AND CONTROLS

BENEFITS OF VARIABLE FREQUENCY CONVERTERS (VFDs)

Need for performance regulation

Irrigation conditions will change from one year to another, from one season to another season, or even on a daily basis. This makes performance regulation of pumps indispensable for irrigation.

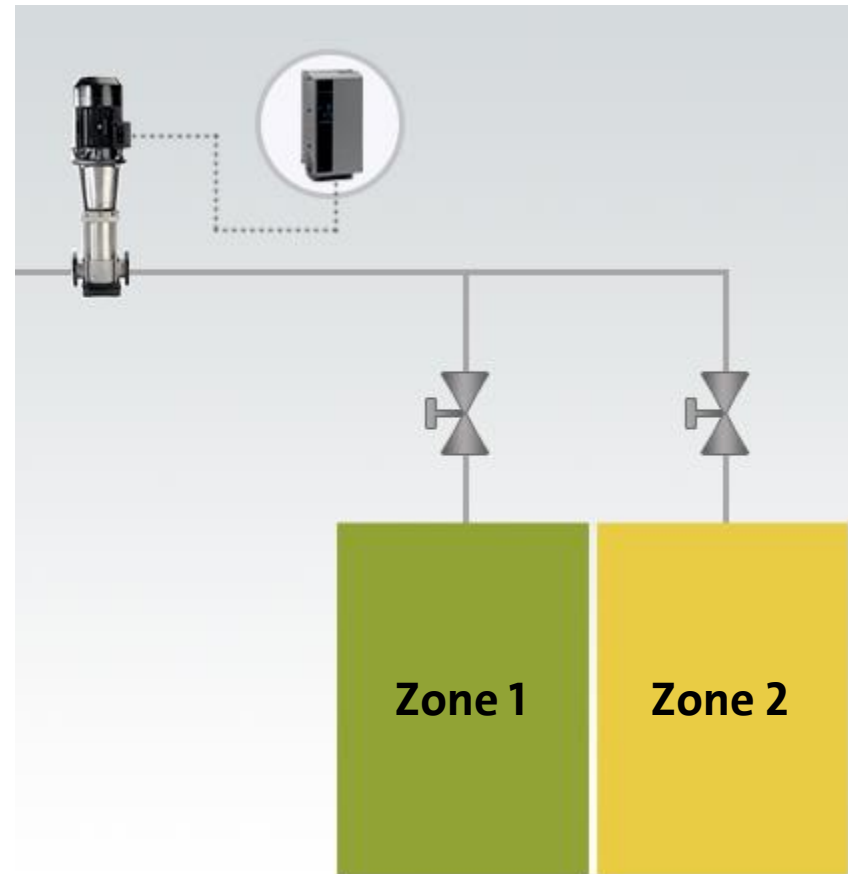


Opening and closing irrigation zones

The irrigation system is split into more than one zone when:

- Water requirement varies for different crops.
- The same crop is planted and harvested at a different time to extend the season.

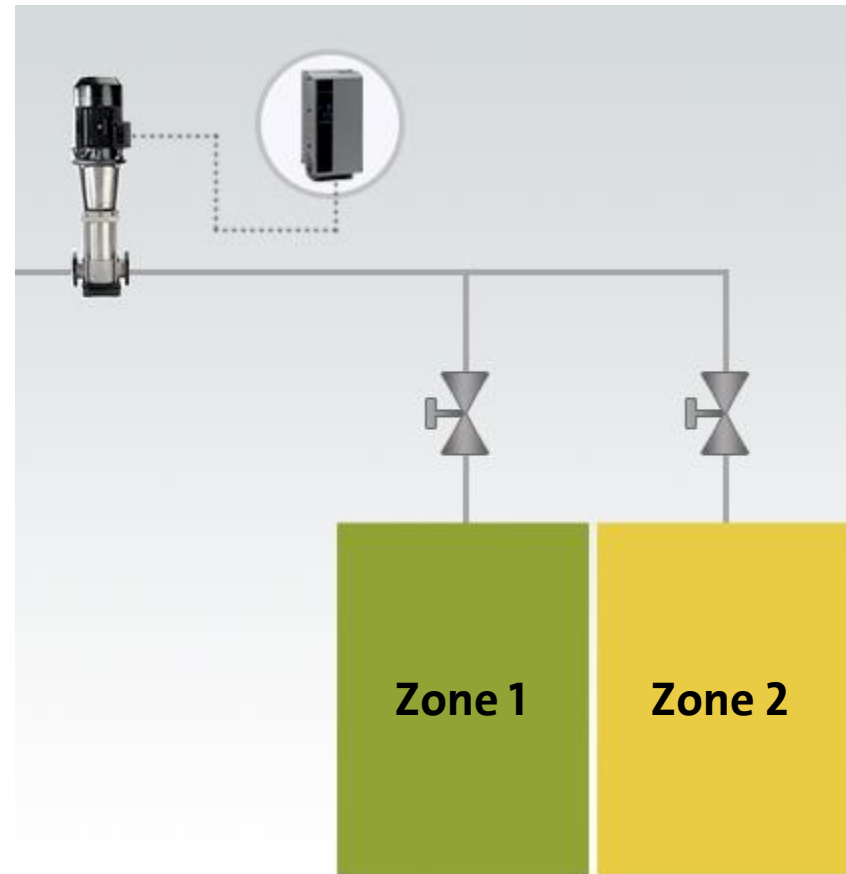
The amount of water needed when both zones are open is double of what is required for one zone. If the pump has enough capacity to cover both zones, it is evident that it is too big for a single zone.



Opening and closing irrigation zones (continued)

If the valve for Zone 2 is closed, the pressure to Zone 1 will increase. This increase in pressure can have the following three negative consequences:

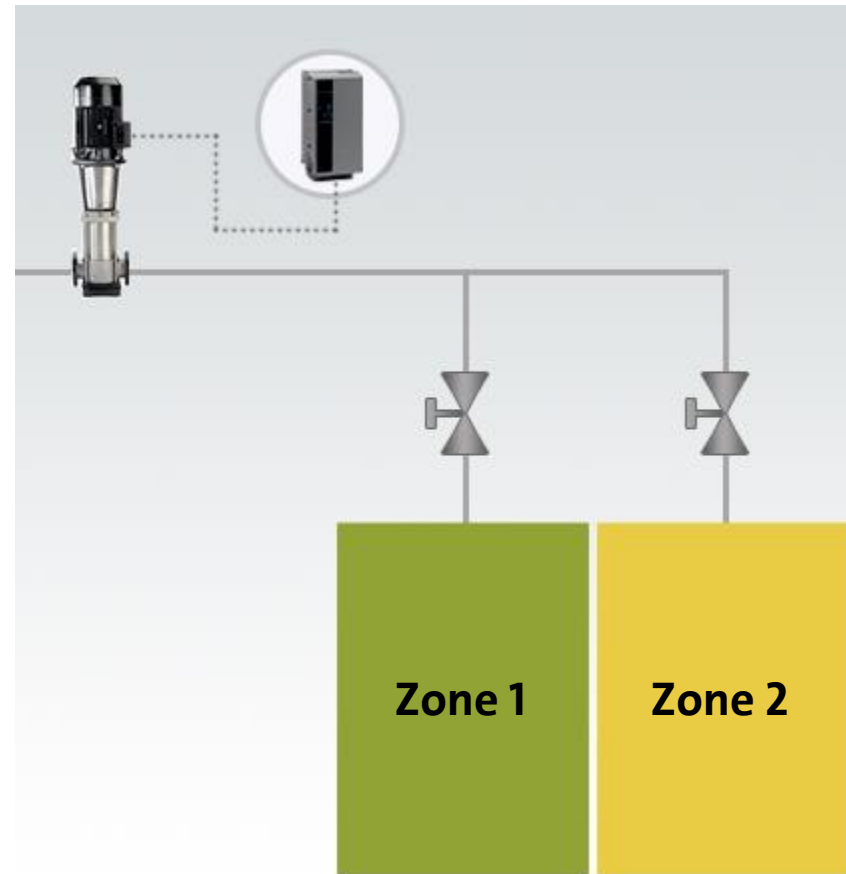
- It may reduce the uniformity of the sprinklers because they will now operate at a pressure above their design points.
- It may force too much water through the system to the crop.
- Even the energy consumption of the pump is slightly lower when compared with supplying to both zones, this will lead to an increase in kWh per m³ of water.



Opening and closing irrigation zones (continued)

With a VFD installed with the pump, the pressure to Zone 1 will still increase when the valve to Zone 2 is closed. But, a pressure sensor will signal the VFD to reduce the pressure, and thereby the speed of the pump, to the point where the pressure is exactly the same as it was before Zone 2 was shut off.

With that adjustment, both the pressure and flow to Zone 1 remains the same as before Zone 2 was shut off. With only one zone open, the power consumption of the pump will be reduced to almost half of what it was when both zones were open.

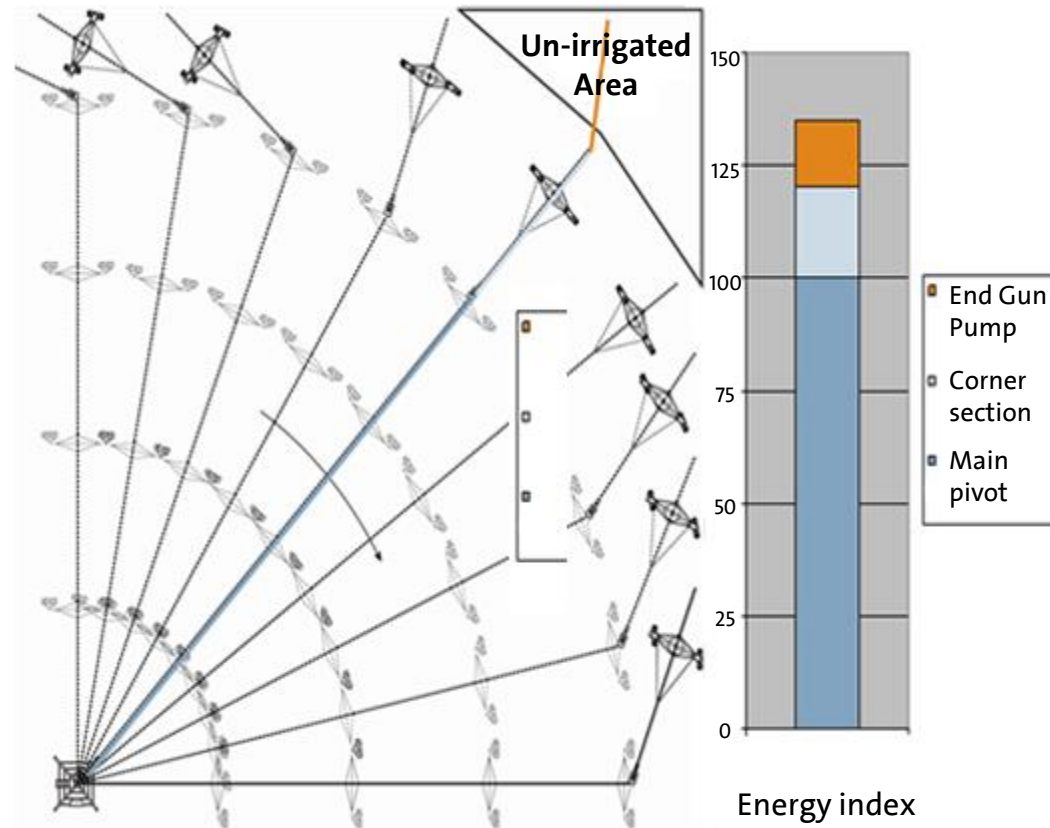


Pivots with corner section and end gun

A pivot equipped with a corner section or an end gun requires more pressure and flow when it is on than when it is off.

Installing a VFD with the main pivot saves minimum 20% of the energy.

The VFD also ensures that the pressure on the sprinklers remain constant, thereby reducing water consumption.

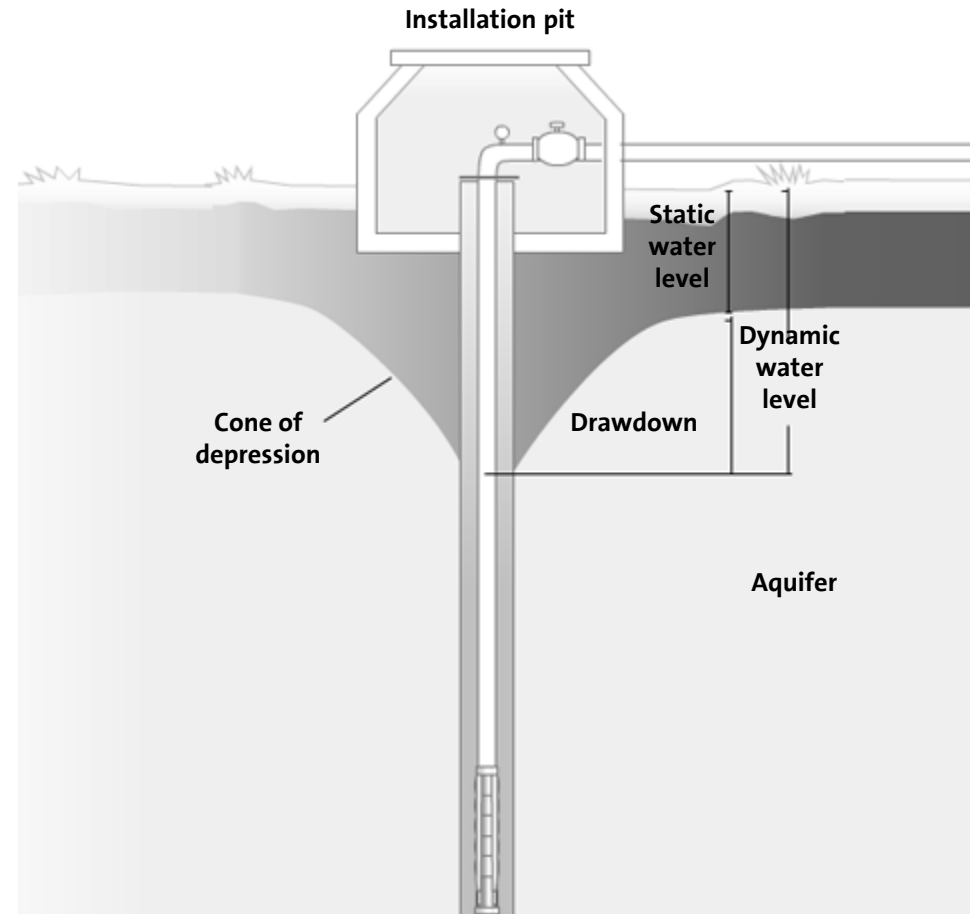


Varying pump inlet pressure

Pump inlet pressure can vary significantly, especially for deep-well submersible pumps. Also, the water table typically varies over a season or from one year to another.

Installing a VFD with the pump regulates the performance of the pump and maintains the pump outlet pressure at a constant level.

This type of regulation helps maintain an optimal irrigation process.

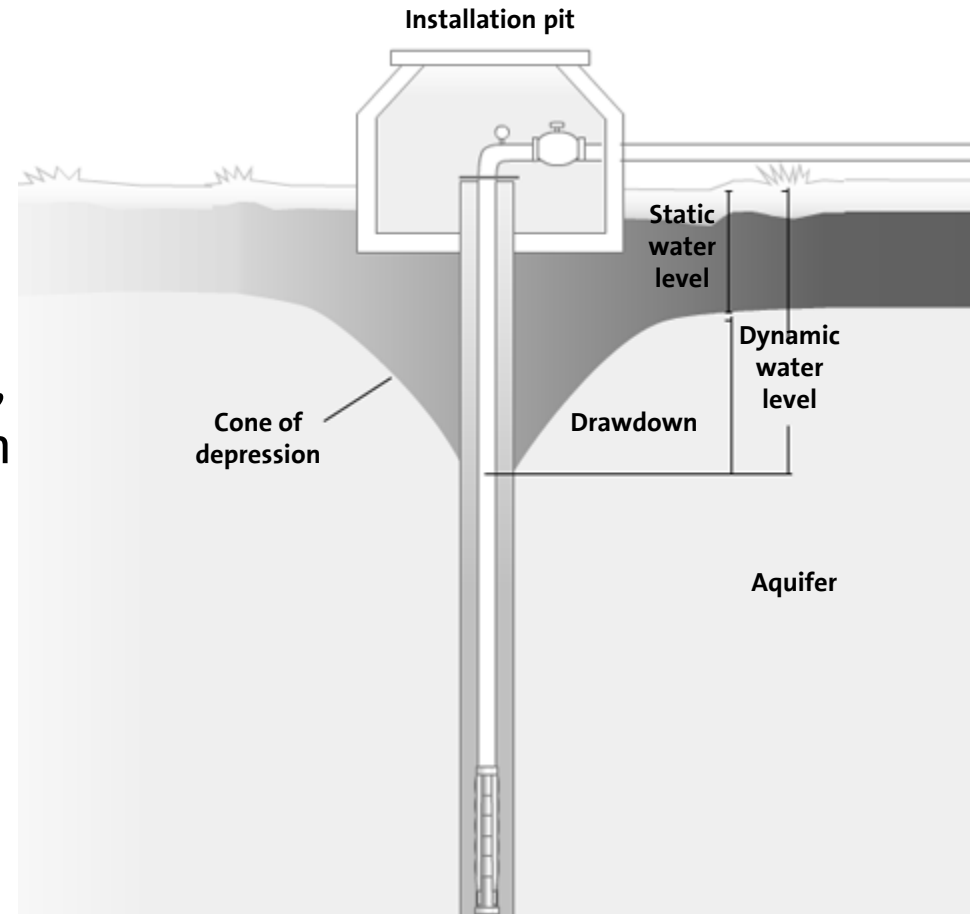


Varying pump inlet pressure (continued)

Some wells drilled in a bedrock formation are so low yielding that the well itself serves the function of a reservoir.

When an irrigation cycle is completed, the well is almost empty, but between cycles it slowly fills up. The variable depth of the water can be significant in such cases, and can affect pump performance.

A VFD can compensate for these variations and ensure that the pressure and flow remain at the preset levels.



Over-frequency drive

If the irrigation area is expanded, it becomes necessary to add a bigger or an additional pump. In such cases, there might be an alternative solution to the problem. When the frequency, and thereby the pump speed is increased, the performance of the pump is also increased.

However, a higher performance requires higher horsepower or kW, and therefore a bigger motor.



Soft start and stop

A VFD:

- Provides soft start and soft stop, thereby minimising the risk of water hammer in the system.
- Eliminates the need for further motor overload protection.



Disadvantages of VFDs

There is power loss in VFD of 1-3% depending on the brand.

And not every application benefits from the addition of a VFD.

For example, there are no benefits from an energy point of view when filling an open reservoir or pond from groundwater a source, because it simply requires running the pump at full speed until the reservoir or pond is full.

Simple turn the pump on and off when needed in those applications.





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