

PRECISION VRI – TECHNICAL FEATURES



PRECISION VRI (VARIABLE RATE IRRIGATION)

Total irrigation flexibility – depending on your unique irrigation needs.

Precision VRI provides total irrigation flexibility—depending on your unique irrigation needs.

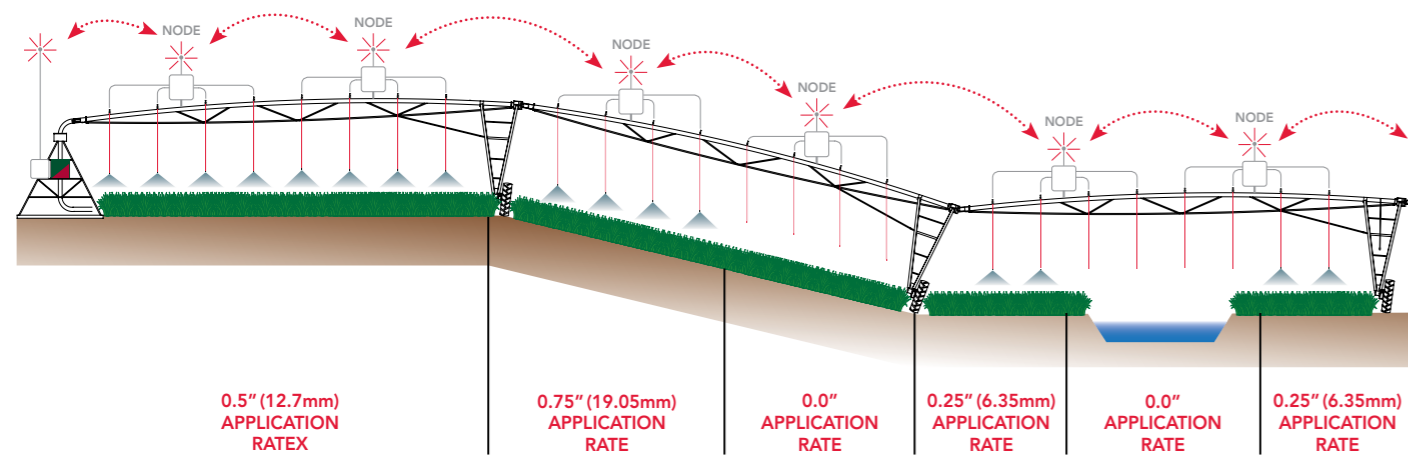
Precision VRI allows different amounts of water to be applied along any part of the length of the irrigator at any one time. This is achieved by individually pulsing sprinklers on and off, while also controlling the system speed to modify the application depth along the length of the irrigator.

Precision VRI is compatible with the following irrigation systems: centre pivot, lateral, pivoting lateral and reverse pivoting lateral. It can be installed on new irrigation systems or as an add-on to existing systems.

Precision VRI Features and Benefits

- Individual sprinkler or zone control
- Conserves water and uses less energy
- Infinite number of irrigation zones
- Flexible polygon-shaped application areas
- Paddock-proven pulsing technology
- Simple map-based software provides complete control
- Works on most makes and models of centre pivot and lateral systems

SYSTEM CONFIGURATION



INDIVIDUAL SPRINKLER CONTROL

Each sprinkler is programmed to turn on/off or pulse at a customised rate depending on crop, terrain or obstacle.

Precision VRI Controller

The Precision VRI controller consists of an IP44 system, an x86 based Panel PC running proprietary control software, and an interface board for reading inputs, controlling outputs, and communicating with the wireless nodes.

- Controls the irrigator ground speed and the water outlets including individual sprinklers and the end gun (as an optional extra).
- The Precision VRI controller reads the irrigation plan and uses data from other inputs (such as GPS coordinates) to calculate which valves need to be actuated at any one time.
- Communication within the system is via wireless links from the Precision VRI controller to the wireless nodes. Node control signals are packet-based, thus any form of

information desirable for control of the irrigator can be transmitted to the wireless nodes.

- The Precision VRI controller is placed next to the irrigator's main controller (generally situated at or near the centre of the irrigator), operating on 12V DC.
- The Precision VRI controller contains a Windows-based touchscreen panel PC. A large number of plans that can be loaded into the Precision VRI controller if desired.

Wireless Nodes

The wireless nodes consist of a watertight enclosure and a Printed Circuit Board (PCB) containing the wireless transceiver, processor and drivers to individually control four latching relays.

- Each wireless node provides both power and control signals via wired connections to four (or less) valves.

- The wireless node will either turn the sprinklers on, off or pulse at a duty cycle determined by the Precision VRI controller.
- Each wireless node is powered by a common 24V DC power line.
- Each wireless node also acts as a wireless repeater to send signals further up and down the length of the irrigator.

Wiring Loom

- The looms consist of a power cable that runs between wireless nodes and four wires from the wireless node to control each valve.
- Each loom is pre-wired into the wireless nodes at the factory.

Power Source

- 1 x 90-264VAC input, 24VDC output, 225W switch mode power supply with constant current limiting.
- The system converts power from the high voltage line and provides 24V DC to the power line.

GPS

The GPS system consists of an industrial grade GPS unit with high receiver sensitivity (waterproof -30°C to +80°C operating temperature range).

- A GPS unit at the end of the pivot (or one GPS unit at each end of a lateral-move) sends a signal back through the wireless node network to notify the Precision VRI controller the position of the irrigator. The Precision VRI controller uses this position to calculate the valve control signals at this point.

PC Software

- Irrigation plans are created in the WMC Map farm mapping software.
- The WMC Map software takes in to account both source and field information to optimise water application for each irrigation plan.
- Irrigation plans are loaded into the controller either manually via a USB stick or through a wireless connection.

Latching Solenoid Valves

The latching solenoid valves consist of a 1 x ¾" (19.05mm) pilot operated valve and a 1 x 24v (50ohm) latching coil.

- Each sprinkler is individually controlled by a magnetic latching solenoid valve connected to one output from a wireless node.
- Each valve controls the flow of water through a single outlet.
- The valve coil is 24V DC and requires a pulse in one polarity to open, and a pulse in the opposite polarity to close.
- As the valves are magnetic latching solenoid valves power is supplied only when it is necessary to actuate each valve, constant power is not required to maintain the valves in either an "on" or an "off" state. Advantages of the low power latching valve system include reduced costs, power consumption and means installation by a registered electrician is not required.
- The solenoid valves are solid brass, however plastic valves are also available as an alternative where brass is not suitable.

IRRIGATION PLANNING CAPABILITY

Control of the irrigator speed and individual valves allows the amount of water applied to each area to be carefully regulated, optimising water application. Water application can be optimised for both the area irrigated and the water source. Irrigation plans are created based on applicable input information; this may include source information and field information.

Source information relates to the water source supplying water to the irrigation system, the Precision VRI system configures water output so as to optimise use of the water source. Source information can include min/max water pressure and flow rate provided by the pump as well as water quota information, i.e., maximum consented water volume or water flow rate. Water output can be planned

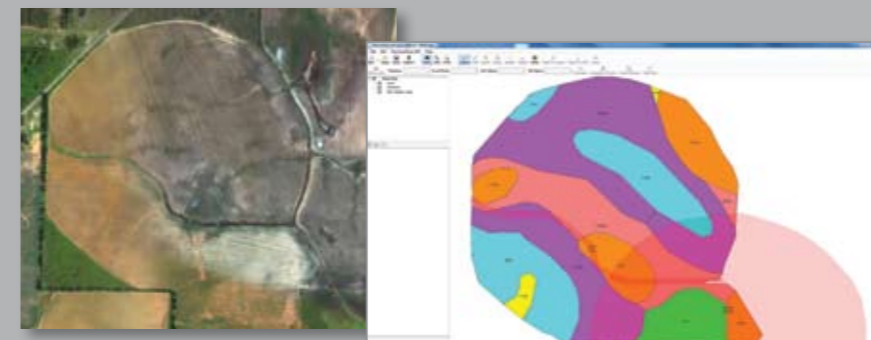
in accordance with source information, which can be monitored in real time.

Field information relating to the area irrigated can include aerial photographs, soil data maps, crop parameters, infra-red image maps and any user-defined information. User-defined information may include avoidance areas

such as races/tracks, ponds, troughs, specific paddocks or un-productive areas. As field information is constructed in "layers" many different types of field information may be considered when creating irrigation plans. These user defined areas can be defined by the user with a handheld GPS and imported into the system software.

CREATING IRRIGATION PLANS

1. The WMC Map software received by the customer is preloaded with the applicable irrigator data relevant to each system ready to create irrigation plans from.
2. Initially a map of the irrigated area must be created in WMC Map. Maps can be created using points collected from a GPS device, ortho-corrected aerial photography references or polygons exported from Google Earth.™
3. Within the map "management zones" are set from the field information in which different application rates are applied. As the Precision VRI system allows individual control of every sprinkler along an irrigator there are no spatial or profile limitations to the management zones.
4. Precision VRI irrigation plans are either saved to a USB stick and manually imported into the Precision VRI controller or transmitted wirelessly or through a cellular modem.



DEFINE MULTIPLE APPLICATION ZONES USING THE CUSTOM MAPPING TOOL

Zones may be defined by soil type, topography, crop type or field obstacles. The variable rate program is then loaded into the Precision VRI controller that directs individual sprinklers through wireless nodes. Sprinklers will turn on or off for zone control or pulse at the precise speed to achieve full variable rate application.

PRECISION VRI FEATURES

Speed Control

- The Precision VRI controller is able to control the speed of the irrigator allowing to speed up and turn on more sprinklers if a lower depth is required over the entire length of the machine, thus reducing return time.
- Control of the speed is accomplished by interrupting the irrigators speed signal line. The maximum machine speed at any point is determined by the part of the machine that needs to apply the most water (with all sprinklers on 100% of the time), sprinklers are pulsed over areas that require less water to be applied.
- Speed control options exist for both electric and hydraulic powered systems.

Remote Monitoring

- With a wireless or GSM connection the controller can be monitored and programmed remotely from any computer connected to the internet.

Chemigation/Fertigation

- The Precision VRI system is capable of controlled delivery of chemicals and/or fertilisers to an area. Chemicals and fertilisers can be introduced into irrigators by various injection systems. The control arrangement of the Precision VRI system allows precise delivery of desired amounts of chemical and fertilisers to different parts of the area to be treated beneath the irrigator.

Automatic Switching between Lateral and Pivot Modes

- Precision VRI can take care of changing application rates to suit either pivot or linear mode without needing to change sprinkler nozzles. The Precision VRI system simply compensates to make sure the correct application rate is applied by pulsing the entire sprinkler set to suit. This saves time and hassle, avoids potential mistakes and provides for much more even application of irrigation water with all sprinklers working.
- Different plans can be specified for forward and reverse mode (mostly used for laterals or part-circles to reduce/eliminate over-watering at each end of the run). The Precision VRI controller has the ability to detect which way the machine is running and what plan should be applied.

Uneven Sprinkler Uniformity Compensation

- If the sprinkler chart is not designed well, or there are parts where a set of sprinklers apply a non-uniform application, the Precision VRI system has the ability to compensate producing a more uniform application.

Fail Safe Features

- The Precision VRI system has an operation mode switch which is fitted into the irrigator's main controller. Shall it be required this enables the irrigator to be switched to normal irrigation mode to at any time.
- Communication within the system is via wireless links with the node controllers. The node controllers act as repeaters in the wireless network, this allows the system to maintain functionality regardless of the irrigator length, as any number of control nodes can be added, each acting as a repeater in the communication network.
- This communication system mitigates against single mode failure, if one node fails it will drop out of the network however the nodes either side of it will maintain the network by communicating with each other.
- By default, nodes are configured to open all valves if there is no main controller signal after 5 minutes. Conversely, the Precision VRI controller can be programmed to close all of the valves should no signal be received.
- Simulation within the irrigation plan software allows for any low flow areas to be identified and dealt with accordingly, preventing the pump reaching its minimum limit.



Precision VRI will pulse the valves at a rate to even out water distribution and produce a uniform application depth along the irrigator.

To find out how to save water and energy while achieving higher yields with Precision VRI, visit www.zimmatic.com or talk to your local Zimmatic by Lindsay dealer.



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