



Daley's Water Service Pty Ltd
Specialising in
Water & Energy Efficiency

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Steps to Design CPLM systems

It is important that the following design principles are followed for individual sites and all information is included in any design. Take the time to ensure you get this right and you should get a good return on your investment. This design should be included with the price of the machine. As an independent third party I can review the design and the various options and limitations.

- Budget what volume of irrigation water is required in addition to average rainfall for the selected crop types, peak evaporation rates for each month.
- Field survey should be carried out to identify obstructions, soil infiltration rate and soil water holding capacity.
- Calculate the system capacity at mm per day.
- Test the quality of water being used.
- Calculate your expected return on investment over the life of the machine. (15 to 20 years)
- Minimise the pumping and operational cost by ensure that the right type of pump, pipes and sprays are installed to achieve required flow rates and pressure levels;
- Maximise the system uniformity capabilities. (Centre Pivots can achieve coefficient uniformity's of 95%)
- Spray design is only a small part of the cost but is largely responsible for system performance. Ground clearance of sprays, pressure regulator requirements, wind conditions and the types of seed to be germinated all need to be considered.
- Ensure the instantaneous application rates don't exceed the soil infiltration rates limitations. This will cause water to pool, running off taking valuable nutrients with it and potentially cause wheel ruts at the towers
- Minimise potential for wheel ruts. The design of span lengths and size needs careful consideration as long spans weigh more, also putting more load on drive chain. The rate of water applied on new cultivation should be no more than 5mm for the first two irrigations
- The use of End Guns is something to avoid as this will affect system performance.
- Power restraints or fitting system run times into OFF Peak power tariffs.
- Ensure that any associated water delivery infrastructure (such as pipes, channels, gates, bore, valves and culverts) are both correctly sized and located.
- Ask dealer to provide in writing Daily application rates, minimum performance %, rotation time or travel speed, number of sprays used, span lengths and sizes, overhang lengths and sizes, wheel and tyre types sizes. Warranty periods for installation and equipment.
- It is a good idea to withhold 10% of final payment to the dealer until a system performance test is done.

It is also important that irrigators considering CPLM understand some of the key measures which influence machine performance, and which need to be considered when determining the system requirements at the design stage. Four of the most important measures are:

1. **Application efficiency** is measure of the actual water that ends up being available to the crop, and is measured as a %. It is equal to the volume of water delivered to the crop root zone divided by the total volume of water pumped. Losses include spray losses of fine water droplets; evaporative losses from soil and plant surfaces, runoff and drainage below the root zone. If runoff and deep drainage are negligible, then Application efficiency is determined by spray and evaporative losses. Normally for over crop sprays it is between 90% and 95%.
2. **Instantaneous Application rate** is a measure of the rate at which water is applied by an individual spray to a very small area, and is usually measured as l/sec or similar. It is normally 1.3-1.5 times greater than the average application rate. Most CPLM machines are fitted with rotating, spinning or static plate type sprays which overcome the high instantaneous application rates however End Guns and ½ circle sprays can create high instantaneous application rates **by** not having individual streamlets that apply water to any one point.
4. **Distribution of Uniformity** is a measure of how evenly irrigation water is applied across the whole field, and is measured as a %. There is always going to be some variation, but the key is to manage it within acceptable limits. Good design, installation and maintenance are keys to this.

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