Energy Efficiency Information Grants

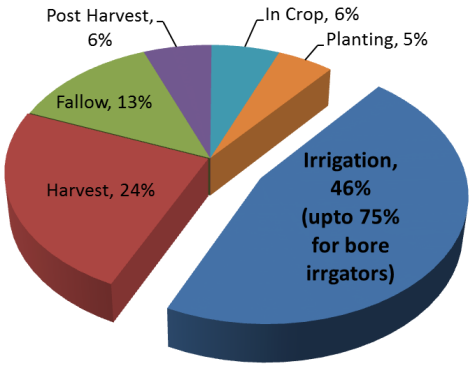
Pumping Efficiency

Improving Energy Efficiency on Irrigated Australian Cotton Farms

The Improving Energy Efficiency on Irrigated Australian Cotton Farms project aims to deliver an industry-wide awareness campaign that provides tailored energy efficiency information and tools to irrigators and their advisors. This activity received funding from the Department of Industry as part of the Energy Efficiency Information Grants Program.

Pump Efficiency

Water pumping is 46% to 75% of the total direct energy use as large quantities of water are pumped for irrigation. How efficiently this happens depends on the efficiency of the pump stations. Performing a pump test highlights opportunities for significant improvements in pump efficiency and therefore significant cost savings.



Typical direct on-farm energy use for a cotton grower

One particular pump test conducted in the cotton industry reduced running costs by 44%, as this pump station was operated outside the efficient parameters of both the pump and motor.

Conducting a Pump Test

A pump efficiency assessment requires the measurement of input and output energy. The Input energy is either the diesel or electricity that is used by the motor. The energy

Performing a pump test can make significant dollar savings.

out of the pump is a measure of water flow rate and lift. This requires pressure measurement before and after the pump as well as a flow rate measurement. From this, the combined efficiency of the pump and motor can be calculated as well as the cost to pump one mega litre of water. This information gives appropriate recommendations to improve the efficiency (and operating cost) of pump stations and provides a benchmark across the industry.

Typical lift pump station setup for a pump test

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Common Problems at Pump Stations

The most common problem heard is: "I'm not getting enough water" and cavitation is the most common reason. Cavitation causes significant damage to the impeller and is usually cause by suction lifts that are too great. This means that the pump is not operating on the pump curve. Flow rates start to reduce and the pump does not conform to pump design specifications. This increases fuel consumption and may cause vibrational damage to the pump station (eg broken pump shafts).

Fuel flow meters measuring diesel in-flow and return.

Another reason for not pumping enough water is incorrect pump station set-up. Common setup problems include: the pump level being too high, causing a high suction pressure; suction pipe diameters being too small, restricting water flow rate; pulley ratios not matching pump and engine specifications; and an insufficient number of belts to transfer power from engine to pump.

Ensure the pump and engine are matched to the application.

Matching Pump to Engine

To ensure a pump station is operating efficiently it is critical to determine what conditions the system will function under. This means identifying the minimum and maximum water flow rates, surveying the elevation difference between water levels and incorporating pipe losses to estimate the total dynamic head. From this, the correct pump speed can be selected and matched to an engine to operate efficiently across the desired operating range.

In Summary

Research has identified water pumping as a high energy consumer with an associated high energy cost. Performing pump tests will define the cost to move water and establish any potential efficiency improvements in management or infrastructure and hence reduce running costs of the pump station. Ensuring the engine and pump are matched to the application is critical to an efficient operation.

For further information on Pumping Efficiency or the Improving Energy Efficiency on Irrigated Australian Cotton Farms project please contact the Cotton Research and Development Corporation on 02 6792 4088 or the CottonInfo Team member in your area.

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