Water for Profit

READING ENGINE PERFORMANCE CURVES

WATERFORPROFIT

Engine performance curves are important in evaluating the design and operation of irrigation pumping stations.

Introduction

Loss of pumping efficiency and capacity are common with increasing suction head or flow rate requirements. Developing an understanding of the engine performance curve will help ensure proper loading of the engine and fuel economy.

Engine performance curves

Engine performance curves should be readily available from your engine supplier. You should request a copy of the performance curves for the engine and pump and be certain the gear head ratio is clearly marked on the unit and recorded with the curves. This information is necessary to evaluate the effect of system changes or water supply fluctuations on pumping plant efficiency.

A typical engine performance curve is shown in Figure 1. The horizontal axis shows the percentage of rated engine speed. The left vertical axis is the percentage of rated torque. The intersection of 100 per cent rated torque and speed is the maximum rated power for the engine.

In this example, the curves showing 100, 75, 50 and 25 per cent of rated power are plotted. Points A and B are plotted along the 50 per cent rated power curve and show that the same power output can be achieved using various combinations of speed and torque. Imposed on the power curves are lines of equal fuel consumption. For a given engine, the lines may be labelled with values using units such as kg of fuel per kilowatt-hour (pounds of fuel per horsepower hour), or litres per kilowatt hour, and so forth. In this example, these values were replaced with the percentage of minimum fuel use. The point labelled 100 per cent, is the area of best fuel economy.

Fuel efficiency considerations

Since irrigation fuel costs can represent a significant crop production expense, it is important to select an engine and pump configuration which matches the irrigation system conditions and to operate the engine within its high fuel efficiency region.

Changing engine speed to accommodate changes in pumping conditions (i.e. expanding irrigated area or increasing flow rates) can result in very low efficiency pumping. Worse case situations result in decreased water availability and increased pumping costs.

The effect of changing engine speed to accommodate a change in irrigation conditions may be estimated without extensive field testing or subsequent discovery of excessive fuel consumption.

For the engine shown in Figure 1, operating the engine at point A results in much better fuel economy that when operating at point B. If the machine in question was a tractor, the operator would gear up and throttle down to improve efficiency. For irrigation pumps, one option would be to change the gear head to better match the conditions.

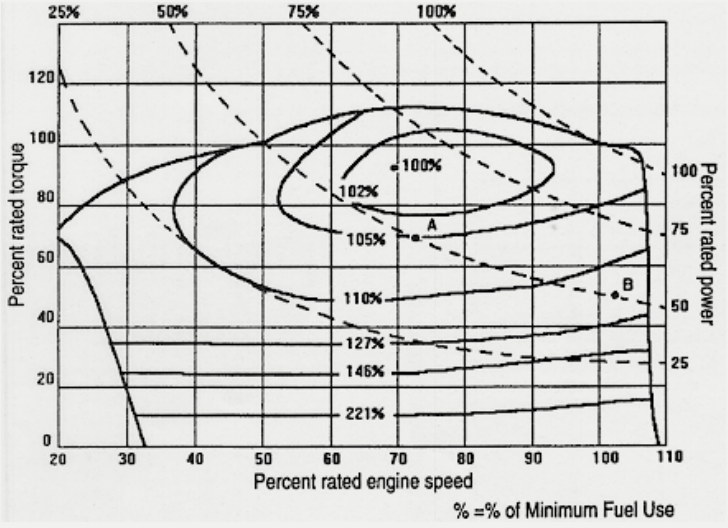

Figure 1: example of an engine performance curve

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For more details contact Growcom on 07 3620 3844.

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