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factsheet

FEEDLOTS

A Framework for Water and Energy Monitoring and Efficiency in Feedlots

Factsheet 19: Energy measurement equipment

This factsheet is an extension of *Factsheet 18: Energy Measurement Tools* (*Figure 1*) and provides more detailed information on various types of meters for measuring energy usage.

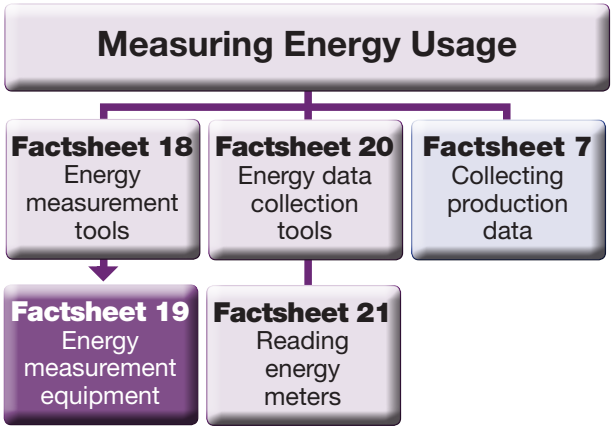

Figure 1: Measuring energy usage flowchart

Direct energy consumption can be calculated from the electricity, gas and diesel fuels used on site. Each of these sources are measured differently. Electricity (kWh) is measured by either electromechanical induction or solid state type meters. Gas is measured through inline flow meters (L or m^3). Diesel fuel is often measured in Litres with inline flow meters at the storage tank .

To compare the various energy sources, the raw data will need to be converted into a standard unit for energy measurement, the megajoule (MJ). This allows for direct comparisons between various activity areas using different power sources, as well as the calculation of a total energy usage across the feedlot.

Electrical energy meters

Electrical energy is measured in kilowatt hours (kWh). However, Tasmania, NSW and Western Australia have introduced some form of kilovolt amps (kVa) or power factor electricity tariffs. In Victoria, it is likely that a kVa tariff will be introduced within the next twelve months.

Key Benefits

- Consider the accuracy, future needs (logging, control etc) and cost when selecting electrical power monitors.
- Electrical power monitors can be supplied and must be installed by a licensed electrical contractor.
- Mechanical flow meters are relatively inexpensive. Check the flow rate range when selecting meter.
- Gas meters can be supplied and installed by a licensed gasfitter.

It is important that the reading in kWh is recorded not the voltage (V) or current (A) or any other parameter.

Each overhead supply line will have a power authority meter (*Figure 2*). The meter may be electromechanical or solid state type meter (Factsheet 18: Energy Measurement Tools). These meters have a high level of accuracy (0.01%).

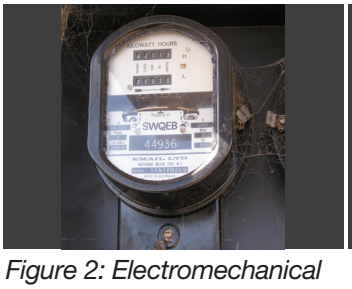

Figure 2: Electromechanical induction meter

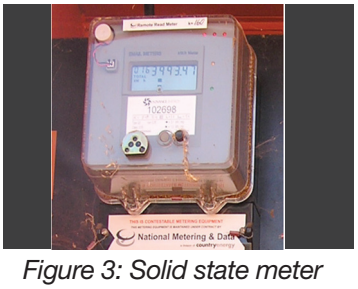

Figure 3: Solid state meter

Power authority meter

The electromechanical induction meter operates by counting the revolutions of an aluminum disc which is made to rotate at a speed proportional to the power. Hence, they are sometimes referred to as rotating disc meters. This is the power meter installed on residences.

Some newer electricity meters are solid state and display the power used on an LCD, which can be read automatically (*Figure 3*). In addition to measuring electricity used, solid state meters can also record other parameters of the load and supply such as maximum demand, power factor, and reactive power used etc. They can also display the power used on each phase separately.

Proprietary power monitors

Proprietary power monitors are available from specialist sensing and instrumentation suppliers. These can be installed within electrical networks to allow metering of processes or equipment. These monitors will need to be installed by a licensed electrical contractor.

Monitors are available to monitor single-phase (50-290v) or three-phase (80-500v) networks. The majority of monitors measure all the main quantities of a three-phase network, including voltage (phase and linked), current (phase and neutral), power (phase and three-phase active), power factor, frequency and working hours and minutes. The quantities are displayed on an LCD.

Power monitors have a relatively small physical size compared with power authority meters. The IME nemo shown in *Figure 4* is enclosed in a 72mm (wide) x 72mm (breadth) x 75mm (depth) housing.

Proprietary power monitors are available with varying levels of accuracy. In general, the more accurate the meter, the more expensive. The IME Conto (*Figure 4*) and Nemo (Figure 5) have a reading accuracy for power of ± 1.0% and ± 0.5% respectively.

Multi-function monitors are available with programmable pulse outputs and RS485 communication for control and logging capabilities.

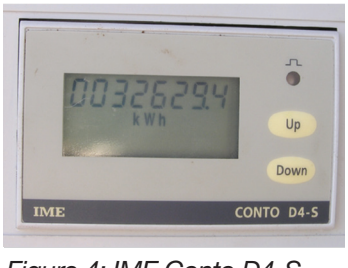

Figure 4: IME Conto D4-S power monitor

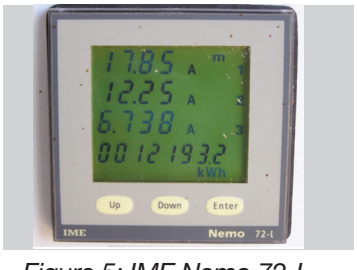

Figure 5: IME Nemo 72-L power monitor

The cost of supply and installation of proprietary monitors will vary according to capabilities and functionality required. Power monitors will also require dedicated current transformation (CT) devices and associated switchgear.

Run hour meter

Run hour meters are available from specialist sensing and instrumentation suppliers. Your local electrical contractor will need to install these devices, and should also be able to source them.

Figure 6: Run hour meter

The hour meters provide a continuous display of total run hours.

Hour meters are available with analogue or LCD display. The analogue display have a sequence of white on black and/or red on black numbers.

Fuel metering

Some enterprises have a metered bowser pump associated with their diesel fuel storage facility. If there is no bowser a simple inline mechanical flow meter can be installed to measure the transfer of diesel or petrol.

Figure 7: Alemite mechanical flow meter

Inline mechanical fuel flow meters are available from fuel suppliers. An example of a Alemite inline flow meter is shown in *Figure 7*.

This meter is a low cost ($500) mechanical fuel meter which can meter fuel accurately between 15 and 120 LPM.

Gas metering

Gas measurement is usually an inline flow meter (*figure 8*) installed between the gas storage tank and the boiler. Gas meters usually report in cubic meters or in litres.

Figure 8: Inline gas flow meter

Gas flow meters come in many different shapes and forms and directly measure the mass flow of gas. Gas meters are expensive and need to be installed by a licensed gasfitter.

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Further information

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