

Instrumentation

Energy Components at a Glance

What is it?

Tools for making various measurements

Where is it found?

In your toolkit, at the site.

Why is it important?

Garbage in = garbage out

Trust calibrated instruments

To quantify existing situation

To make accurate and meaningful recommendations

What to look for:

Accuracy, repeatability, recent calibration.

Common issues and problems:

How data are collected, indicated, and stored

Process conditions at the time of data collection.

Instrumentation

Ammeter

- Current transformer
- Uses inductance to measure current in a wire
- Instantaneous readout common
- Recording ammeters available
- Is not sufficient for determining motor load
- Power factor must be measured for accurate power measurement

Voltmeter, DVM, Multi-meter

- measures the voltage potential between two points
- analog or digital
- recording type available

Instrumentation

Electric power

Must have Wattmeter to measure electric power accurately

Must have both voltage and current inputs to measure power factor

Measures Volts, Amps, Watts, kW, kWh, pf, kVAR, kVA

Display or recording

Snapshot or integration

- Sampling interval important

True power meters can cope with significant harmonic content. This can be important for electronic ballasts, VFDs.

Some meters indicate or record harmonic content.

Instrumentation

More instrumentation

Thermocouple, RTD for temperature measurement

Lighting loggers

- Battery powered
- time stamp when lights go on and off

Run-time meters

- Wired into motor circuit
- Use motor logger for temporary measurements
- Useful for equipment operating at constant load

Stroboscope

Light meter

Flicker checker

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Combustion efficiency analyzer

- Samples combustion gases
- Composition
 - Oxygen
 - Carbon Dioxide
 - Carbon Monoxide
- Temperature
- Calibrate with each use

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Site visit list

General

- cell phone - check battery
- business cards
- 2 pencils
- calculator
- clipboard
- fresh pad of paper
- safety glasses
- hearing protection
- stop-watch
- flashlight
- pocket knife
- rag
- tape measure
- hard hat
- tachometer
- Brain!

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Power measuring equipment

With any power meter also bring

- electrical tape
- big screwdriver
- small screwdriver
- wire stripper/cutter
- multi-meter to check rms amperage
- check batteries on multimeter

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Meter specific lists

Rustrak

- Big clamp
- Double lamp wire lead
- Small clamp
- Single lamp wire lead
- White box
- Check battery
- Check data has been downloaded

Synergistics

- CTs for appropriate size + extra, bigger, smaller
- Laptop
- Extra disk to give customer
- Extension cord

Instrumentation

Practices

We've said it before, we'll say it again:

Observe all safety precautions

- personal protective gear
- keep your hands to yourself
- if you must point - use plastic pens/pencils

Electrical safety precautions

- Let plant staff or electrician connect electrical metering equipment
- If possible shut equipment off while connecting leads
- While the circuit is being energized
 - Look away
 - Stand 7 ft away
- Buddy system

Instrumentation

Come to the table to see and touch what we brought