



Instruments and Tools for Energy Auditing

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Energy Audits in Industrial Small Medium Enterprises (SMES) - Training Course

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Why Instruments are Key Factor for Auditing?

- Measurements mandatory for some systems in order to assess the system performance.
- Measurements improves the accuracy for the assessment any activity.
- The selection of measurement devices and duration of measurements.
- Measurements are key element for the Analysis of Systems.

What you can not measure you can not control

Energy Audit Instrumentation

- Electrical Systems Performance
 - Multi-meter-Voltage, Amperage
 - Power Meter – Watts, VARs, VA, PF [Cos phi], Harmonics Analysis.
 - Light meter- light levels
 - Personal Protection Equipment
 - Insulating gloves and Safety Tools.

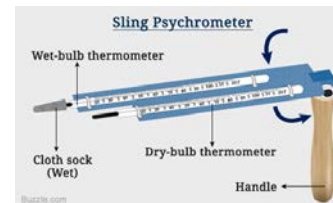


Instruments Utilization

- Clamp Meter; for snapshot and instantaneous readings, quick estimation for the motor loading conditions.
- Power Analyzer; enables detailed measurements for different electrical parameter over predetermined time interval with data logging.
- Light meter: enables instantaneous measurements for the lighting level at any working space.

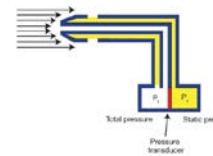
Thermal and Mechanical Instruments

- Flue Gas Analyzer; for measuring the combustion process products and efficiency.
- Pressure Measurements;
 - Manometer
 - Bourdon Gauge
 - Draft Gauge
- Relative Humidity
 - Psychrometer
 - Measures wet bulb and dry bulb temperatures, and we can then calculate the RH
 - Hygrometer
 - Measures Electrical Conductivity



Thermal and Mechanical Instruments

- Rotational Speed Measurement
 - Mechanical Tachometers
 - Contact required
 - Laser Tachometers
 - No contact required
 - Stroboscopes
 - No contact required
- Air Velocity
 - Anemometer – Rotating Vane
 - Pitot Tube
 - Heated Thermocouple
 - Hot Wire Anemometer



Thermal and Mechanical Instruments

- Temperature Measurements

Note- Probe position can affect measurement!

- Thermometer
- Portable Electronic Thermometer
- Thermocouple
- Thermistor
- Non-contact infrared



- Infrared Measuring Equipment

- Infrared Camera System
- Hand-held temperature guns



The real temperature of an object can be found by measuring its emitted radiation.

Standalone Data Loggers



Temp/RH/Light/Ext.



Light On/Off



Motor On/Off



State Open/Closed
Contact Closures

Leak Detectors

- Leak Detection; for steam or compressed air
- Ultrasonic Leak Detectors
 - Basic acoustic receivers
 - Tunable ultrasonic receivers



Tools and Software for Energy Audit Analysis

- Some Free Software Tools
 - Building modeling
 - DOE2
 - eQuest
 - Energy Plus
 - Equipment calculation software
 - MotorMaster+
 - AirMaster
 - 3E Plus
 - PSAT – pump system assessment tool
 - Building modelling – Many!
 - EZSim
 - MarketManager
 - Many others


RETScreen® International

www.retscreen.net

Clean Energy Project Analysis Software


Five Step Standard Analysis

START Settings & Site Conditions



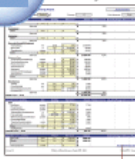
Enter data in shaded cells from top to bottom of each worksheet

1 Energy Model



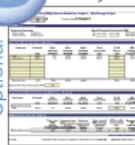
Sub-Worksheet(s)

2 Cost Analysis




3 Emission Analysis

Optional



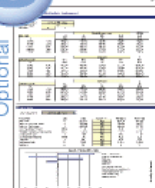
Click on blue hyperlinks or floating icon to access integrated features

4 Financial Analysis



5 Sensitivity & Risk Analysis


Optional




Ready to make **a decision**

Integrated Features


Climate Data




Product Data



Online Manual



Tools



- Distance Learning Course
- Training Material
- Engineering Textbook
- Case Studies
- Marketplace & Maps

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