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ENERGY SAVINGS PERFORMANCE AND
MEASUREMENT & VERIFICATION
ONLINE TRAINING COURSE

KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP
ENERGY SPECIALIST CURRICULUM

ENERGY EFFICIENCY SPECIALIST

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ENERGY MONITORING, TARGETING AND
REPORTING
FOR ENERGY PROFESSIONALS

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WHAT SHOULD YOU LEARN

Energy Monitoring, Targeting and Reporting

Elements of Energy Monitoring, Targeting and Reporting

Objectives and Benefits of an MT&R Program

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ENERGY MONITORING, TARGETING AND REPORTING



Energy monitoring and targeting is primarily a management technique that uses energy information as a basis to eliminate waste, reduce and control current level of energy use and improve the existing operating procedures. It builds on the principle "you can't manage what you don't measure". It essentially combines the principles of energy use and statistics.

While, monitoring is essentially aimed at establishing the existing pattern of energy consumption, targeting is the identification of energy consumption level which is desirable as a management goal to work towards energy conservation.

Monitoring and Targeting is a management technique in which all plant and building utilities such as fuel, steam, refrigeration, compressed air, water, effluent, and electricity are managed as controllable resources in the same way that raw materials, finished product inventory, building occupancy, personnel and capital are managed.



ENERGY MONITORING, TARGETING AND REPORTING



It involves a systematic, disciplined division of the facility into Energy Cost Centers. The utilities used in each centre are closely monitored, and the energy used is compared with production volume or any other suitable measure of operation. Once this information is available on a regular basis, targets can be set, variances can be spotted and interpreted, and remedial actions can be taken and implemented.

The Monitoring and Targeting programs have been so effective that they show typical reductions in annual energy costs in various industrial sectors between 5 and 20%.



ENERGY MONITORING, TARGETING AND REPORTING



MT&R is a powerful management technique for

- ✓ Analyzing the historical energy performance of industrial, commercial, and institutional facilities
- ✓ Setting energy reduction targets
- ✓ Controlling current energy performance and,
- ✓ Projecting future energy budgets.

The working definitions that commonly apply are the following:

Energy Monitoring is the regular collection and analysis of information on energy use.



ELEMENTS OF MONITORING & TARGETING SYSTEM

The essential elements of M&T system are:

- ✓ Recording -Measuring and recording energy consumption
- ✓ Analysing -Correlating energy consumption to a measured output, such as production quantity
- ✓ Comparing -Comparing energy consumption to an appropriate standard or benchmark
- ✓ Setting Targets -Setting targets to reduce or control energy consumption
- ✓ Monitoring -Comparing energy consumption to the set target on a regular basis
- ✓ Reporting -Reporting the results including any variances from the targets which have been set
- ✓ Controlling -Implementing management measures to correct any variances, which may have occurred.

Particularly M&T system will involve the following:

- ✓ Checking the accuracy of energy invoices
- ✓ Allocating energy costs to specific departments (Energy Accounting Centres)
- ✓ Determining energy performance/efficiency
- ✓ Recording energy use, so that projects intended to improve energy efficiency can be checked
- ✓ Highlighting performance problems in equipment or systems

A RATIONALE FOR MONITORING, TARGETING AND REPORTING

The energy used by any business varies with production processes, volumes and input. Determining the relationship of energy use to key performance indicators will allow you to determine:

- ✓ Whether your current energy is better or worse than before
- ✓ Trends in energy consumption that reflects seasonal, weekly, and other operational parameters
- ✓ How much your future energy use is likely to vary if you change aspects of your business
- ✓ Specific areas of wasted energy
- ✓ Comparison with other business with similar characteristics - This "benchmarking" process will provide valuable indications of effectiveness of your operations as well as energy use
- ✓ How much your business has reacted to changes in the past
- ✓ How to develop performance targets for an energy management program

ENERGY CONVERSION UNIT TABLE

Energy Monitoring is the regular collection and analysis of information on energy use.

Its purpose is to:

- ✓ Establish a basis of management control
- ✓ To determine when and why energy consumption is deviating from an established pattern
- ✓ To provide a basis for taking management action where necessary.

Targeting is the identification of levels of energy consumption towards which it is desirable, as a management objective, to work.

Reporting closes the loop, by putting the management information generated in a form that enables ongoing control of energy use, the achievement of reduction targets, and the verification of savings.

THE KEY STEPS IN AN EFFECTIVE MT&R PROCESS ARE

- ✓ Measurement of energy consumption over time
- ✓ Measurement of the independent variables that influence energy consumption (weather, production, occupancy) over corresponding time intervals
- ✓ Development of a relationship (the energy performance model) between energy and the independent variables
- ✓ Historical analysis of energy performance ; and trends into the future
- ✓ Definition of reduction targets
- ✓ Frequent comparison of actual consumption to targets
- ✓ Reporting of consumption and target variances
- ✓ Taking action to address variances and ensure targets are met.



INDEPENDENT VARIABLES

In addition to energy data for each ECC, the applicable factors of influence, or independent variables, must be measured. Some examples include:

Operating Hours/Occupancy In office buildings, schools, hospitals, retail stores, warehouses, accommodation facilities, energy consumption depends primarily on the weather through the heating and cooling systems, and secondarily on patterns of use such as operating hours and occupancy. Electricity and fuel each have their own dependencies or combination of dependencies specific to each facility's systems.



INDEPENDENT VARIABLES +

Production Level Energy use in manufacturing and industrial facilities depends strongly on production level or a measure of the facility's output, in units, tons, or some other appropriate unit. Also, energy use in these operations often exhibits a strong dependence upon weather.

Degree Days Degree days are a measure of the outside temperature for a given period and can often be used to predict the amount of heating and cooling energy a building requires.



EXAMPLE USING DEGREE DAYS

Table 1: Sample Energy Data for a School
Heating Degree Days Total Electricity kWh

Feb 01	577	82,800
Mar 01	613	80,640
Apr 01	490	73,440
May 01	279	43,920
Jun 01	179	33,840
Jul 01	29	18,720
Aug 01	31	10,080
Sep 01	40	11,520
Oct 01	172	26,640
Nov 01	316	50,400
Dec 01	456	62,640
Jan 02	579	84,240



USE STRAIGHT LINE LINEAR REGRESSION

$$Y = mX + b$$

Y = kWh of electric use per month

X = number of degree days per month

m, b are slope and intercept from analysis

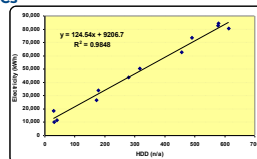
How do you do this?

Many calculators can do this Spreadsheet programs like Excel,

Lotus,

Statistical packages for PCs

School Building



ENERGY COST CENTER

The organizational basis for MT&R is the energy cost center (ECC).

An ECC is a unit for which energy use may be measured along with other factors that influence the energy consumption.

For example, the ECC might be: a single building in a portfolio of properties, a production unit or department in a plant, or a major energy consuming system such as the heating plant.

Basic criteria for the designation of an ECC are:

- Energy consumption can be measured in isolation
- The cost of measurement can be justified by potential savings
- The ECC must correspond to existing business structures
- Someone must be accountable for the ECC a factor of influence must be measurable.

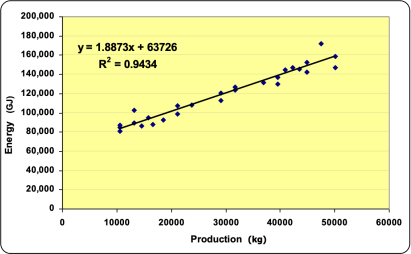


TABLE 2: SAMPLE ENERGY DATA FOR A FOOD PROCESSING PLANT

Table 2: Sample Energy Data for a Food Processing Plant

Month	Production, kg	Total Process Energy, GJ
Jan 02	39,600	137,244
Feb 02	21,120	107,620
Mar 02	15,840	94,630
Apr 02	13,200	82,044
May 02	44,880	152,845
Jun 02	47,520	171,792
Jul 02	31,680	126,754
Aug 02	10,560	84,905
Sep 02	29,040	120,510
Oct 02	23,520	108,651
Nov 02	10,560	87,491
Dec 02	13,200	89,379
Jan 03	39,600	131,255
Feb 03	40,800	144,886
Mar 03	42,000	145,882
Apr 03	50,400	158,760
May 03	10,560	82,102
Jun 03	14,520	86,234
Jul 03	29,040	125,613
Aug 03	21,120	98,710
Sep 03	16,560	88,233
Oct 03	29,040	112,843
Nov 03	18,480	92,512
Dec 03	46,800	142,386
Jan 04	50,400	147,653
Feb 04	42,960	147,231
Mar 04	31,680	123,359

FOOD PROCESSING PLANT



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