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Practical

# ENERGY EFFICIENCY, DESIGN, ENGINEERING AND AUDITING



## YOU WILL LEARN HOW TO:

- Establish an Energy Savings Strategy for your organisation
- Put together practical energy efficiency plans for your firm that will save money
- Use the energy savings toolkit and checklist from the course in your workplace
- Conduct a simple energy audit of your workplace and collect good data
- Read and interpret data from different types of measurement equipment
- Interpret and analyse case study data and relate this detail to your facility
- Improve employee working conditions and productivity with minimal outlay
- Assist in the reduction of greenhouse gases and improvement of the environment
- Look for opportunities to set demand - side energy management strategies
- Appreciate the importance to your organisation of choices with energy suppliers
- Network with others to discuss alternatives and options for comparable processes

## WHO SHOULD ATTEND:

- Energy Managers
- Consulting Engineers
- Electrical Engineers
- Project Engineers
- Maintenance Engineers
- Electrical Contractors
- Electrical Inspectors
- Building Service Designers
- Electrical and Instrumentation Technicians



*Technology Training that Works*

## THE WORKSHOP

Reducing the energy costs at one's facility must surely be one of the most effective and achievable strategies for lowering operating costs. This workshop gives you the practical tools to identify and implement programs and projects to reduce energy consumption in the most effective and practical ways. You will be provided with the skills and latest knowledge on proven methods of making real savings in your energy bills. You can start such programs as soon as you wish, and start saving immediately thereafter.

You will be greatly surprised at the levels of energy losses and poor efficiency of some of the devices in your facility that consume power when the facility is operational and also the energy consumption of your facility when it is not operational. Did you know that a typical microwave oven consumes more electricity power in the digital clock than it does heating food?

**BOTH OF THESE FACTORS ARE COSTING YOUR ORGANISATION** - energy bills are generally at least 20% of the running costs of a business, so reductions in these bills are directly responsible for better profits.

You will be taught the fundamental principles of energy efficiency by way of looking for points of wastage, assessment of the cost of energy usage and benefits accruing from improved energy efficiency in the facility. Reference points are needed, so the workshop will also show you how to quickly and effectively perform an energy audit of your facility, demonstrating the use of installed instrumentation as well as measuring equipment deployed during the audit.

Once you have the correct information from the audit, you will be taught a simple method of cost analysis to help you make the right decisions for improvement, based on the principle of Rapid Return on Investment (RRI).

This will enable you to implement the optimum energy-efficient solution and thus to start saving money in some cases immediately, but in a worse case a typically short period of time (perhaps 3 to 12 months RRI).

Previous participants have been delighted with the immediate and long term sustainable savings they have been able to make as a result of attending this workshop.

### PRE-REQUISITES

A working knowledge of basic engineering principles is required. Adequate industrial experience in operating and maintaining energy-intensive equipment and processes will enable better appreciation of the topics discussed.

“

*Good quality course material.*

*A valuable source of information.*

Corne Viljoen

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## THE PROGRAM

### DAY ONE

#### MANAGEMENT OVERVIEW OF ENERGY EFFICIENCY

##### WHAT IS ENERGY EFFICIENCY?

- Energy and environment
- Energy forms and conversion
- Energy sources and energy sinks
- Can we make better use of the energy?
- How do we channel waste energy into useful output?
- Energy audit and principles

##### CASE STUDIES

- Schools
- Mines
- Factory

##### BASIC FINANCIALS

- Simple costings and ROI

##### PRACTICAL EXERCISES

- Examination of your facility
- Simple checklist on doing an energy audit

##### ENERGY EFFICIENCY IN PROCESSES USING FUEL DIRECTLY

- Improved efficiencies
- Reduction and re-use of heat wastage
- Recovery of exhaust heat from engines
- Energy efficient designs - equipment and buildings
- Cogeneration for better efficiency

##### ALTERNATIVE ENERGY SOURCES

- Fossil fuels
- Alternatives - renewable energy and hydrogen
- Green energy
- Fuel cells

##### MAIN FORMS OF ENERGY

- Energy converted to electricity for direct use
- Electricity in metal smelting (electrolytic processes)
- Use of fuels for motive power
- Direct use of fuels for heating applications
- Use of fuels as part of a process
- Example from iron production (reduction process using coal)
- Conversion equipment and challenges

##### ELECTRICAL ENERGY GENERATION

- Electricity as the preferred energy carrier
- Conversion systems for electrical energy
- Commonly used fuels
- Methods of improving conversion efficiencies
- Better equipment
- Waste energy recovery
- Process improvements
- Cogeneration for better efficiency
- Combined cycle process for gas turbines

##### ELECTRICAL ENERGY USAGE

- Sectors using the major portion of electricity
- Industrial, domestic, agriculture and agro-processing, mining and metals
- Better efficiencies in electricity usage
- Uses of electricity
- Motive power
- Lighting
- Space heating and cooling
- Better efficiencies in electricity usage

### DAY TWO

#### ENERGY EFFICIENT PRACTICES IN ELECTRICITY USE

- High efficiency motors
- Better T&D practices
- Role of power factor
- Motor rating and efficiency correlation
- Variable speed drives as energy-savers
- Lighting efficiency
- Efficient luminaires
- Use of daylight to supplement artificial lighting
- Intelligent buildings to reduce wastage of electricity

#### ENERGY EFFICIENCY IN CLIMATE CONTROL APPLICATIONS

- Need for climate control
- Industry and comfort examples
- Efficiency in heating
- Reducing heat loss through better design
- Efficiency in cooling
- Building design features to improve cooling
- The paradox of cooling
- Temperature reduction but no energy recovery
- Use of waste heat for cooling
- Comparison between compression refrigeration and absorption chillers
- Examples from industrial applications

#### ENERGY COST STRUCTURE

- Identifying types of energy used
- Tariff structures
- Components of electric tariffs
- Factors in controlling electric costs
- Electric utility incentive programs
- Electric meters
- Gas rates
- Oil, coal, and other rates
- Steam and hot water rates
- Factors in controlling fuel costs

#### INTRODUCTION TO ENERGY AUDITS

- Purpose
- Know your process, fuels and major systems
- Compare energy usage
- Energy use index and energy cost index
- Where energy is used in facilities
- Lighting and HVAC energy use
- Data forms for recording information
- Collecting the actual data
- Walk-through inspections
- Assess energy and cost saving opportunities

#### INSTRUMENTATION FOR AUDITS

- Energy audit instrumentation
- Temperature-measuring instruments
- Combustion efficiency measurement
- Airflow and air leak measurement
- Thermography
- Ultrasonic leak detectors
- Data logging
- Light level meters for checking superfluous lighting
- Electric meters: voltages, current, power, energy and power factor
- Use of software tools in energy audits

#### AUDIT AREAS

- Building
- Motor systems
- Water systems
- Heat recovery areas
- HVAC systems
- Boiler Systems
- Lighting

#### FINANCIALS AND COSTINGS

- Energy audit reports
- Simple economic measures
- The time value of money
- Cost and benefit analysis
- Rate of return
- Life cycle costing
- After tax cash flows

#### SUMMARY AND OPEN DISCUSSION