

Lecture_1

Course Instructor:

Dr. Muhammad Farooq

Assistant Professor

enqr.farooq@uet.edu.pk



PAKISTAN

About the Instructor

SCOTLAND

NEW-YORK USA

KHANA KABA, MAKKA

LONDON, ENGLAND

PARIS, FRANCE

EDINBURGH

BEIJING, CHINA

CitySightseeing

frankfurt

GERMANY

BARCELONA, SPAIN

DUBAI, UAE

ROME, ITALY

Course Outline

- ▶ Fundamental Concepts:
- ▶ Fuel use survey, energy models, energy balances, energy and non-energy flows, commercial and non-commercial energy sources, energy industries, energy production and distribution, end use by purpose, shorter period and regional balances.
- ▶ Energy planning and Demand Analysis:
- ▶ Drivers of energy demand, concepts of energy intensity and elasticity, statistical tools and techniques for demand forecasting, scenarios development, interpretation of results and policy implications

- ▶ Energy surveys and energy audits;
- ▶ Laws of energy and materials flows, checklists for energy managers, generation, evaluation and optimization of options for energy conservation, Energy analysis, ISO-50001, principles of energy analysis, energy analysis methodologies, Process and auditing requirements of ISO-50001 certification, Benefits of adopting energy management system.
- ▶

Recommended Books:

- ▶ Energy Management Handbook 8th Edition (Wayne C. Turner and Steve Doty)
- ▶ Thomas Tietenberg. Environmental and Natural Resource Economics, 10th edition, (Boston, MA: Addison Wesley, 2012).

Student Project /CEP/ Assignment:

- ▶ Tour a building with a professional to learn 1st hand how to identify energy efficiency opportunities;
- ▶ Identify and seek permission to benchmark a building in the community;
- ▶ Gather energy bill data and building attributes needed to benchmark;
- ▶ Schedule a visit to the building to walk through the building to confirm building attributes visually and gain a thorough understanding about how the building is operating;
- ▶ Discuss findings in class and brainstorm solutions to cost-effectively increase energy efficiency;
- ▶ Research and refine energy efficiency opportunities;
- ▶ Write a technical research paper using the benchmarking results, information learned from visiting the building, and researched solutions; and
- ▶ Present the reported recommendations to the class using a visual presentation medium such as a slide or video presentation.

What is Energy Management?

- ▶ Energy management is doing more with the same amount of energy or less energy.
- ▶ Energy management saves money and makes buildings more comfortable, healthy, and safe.

Why Energy Management

- Reduces consumption
- Increases comfort & safety
- Reduces pollution
- Makes our economy stronger
- Increases our energy security
- Provides school personnel with real time energy and performance data to manage the building's energy needs



The main focus

- ▶ Need to balance the global energy crisis
- ▶ Focus towards Renewable energy
- ▶ Reducing the usage of Non Renewable energy reserves.
- ▶ Law of conservation and energy transformation principles.

Efficiency vs. Conservation

- Energy efficiency involves the use of technology that requires less energy to perform the same function.
 - Focuses on the equipment or machinery being used
 - One example is installing LED light bulbs throughout the house
- Energy conservation includes any behavior that results in the use of less energy.
 - Focuses on the behavior of people
 - One example is using daylighting through windows rather than turning on the lights

5 Steps to Energy Management



Understanding your energy usage and cost



Review your energy management systems



Develop an energy management improvement plan



Understand energy use and key opportunities



Implement and track energy improvements





Understanding your energy usage and cost

Electricity Tax Invoice

Customer Invoice address

Total (\$) amount due
\$11,313.14

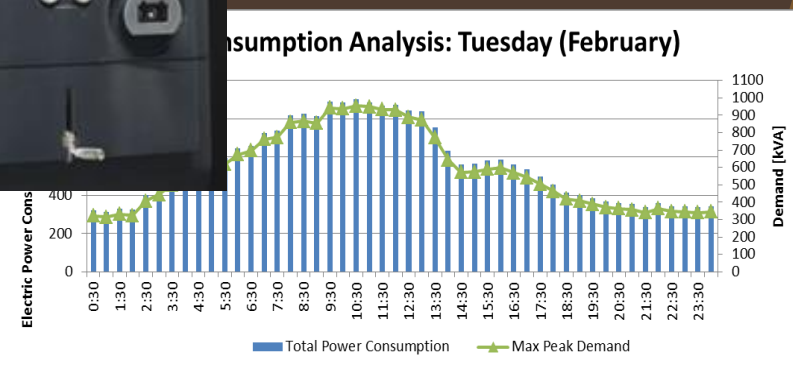
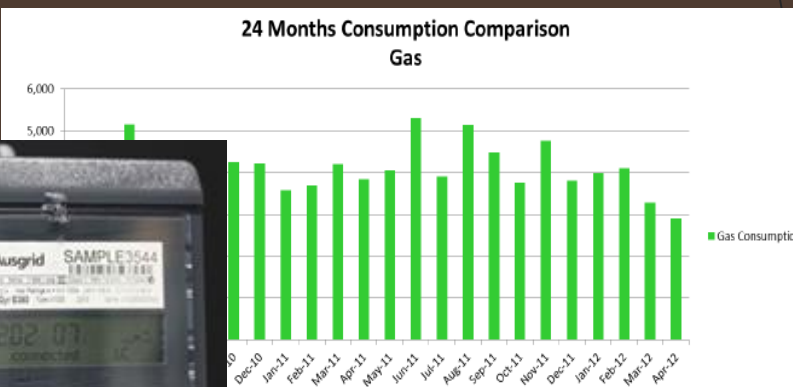
Due by 02

Invoice number
 Invoice period 01 SEP 2013 TO 30
 Invoice date 03
 P/O number

SUMMARY OF CHARGES

| | |
|---|--------------------|
| Opening Balance | 65.66CR |
| Energy Charges | 2,625.94 |
| Market Charges | 26.54 |
| Metering and Other Charges | 206.55 |
| Environmental and Carbon Charges | 1,827.64 |
| Network Charges | 5,657.69 |
| Subtotal | 10,344.36 |
| Goods and Services Tax (GST) | 1,034.44 |
| CURRENT CHARGES (INCLUDING GST \$1,034.44) | \$11,378.80 |
| TOTAL CHARGES | \$11,313.14 |

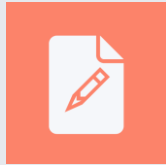
NMI
 Supply emergency 13 13 88
 Account enquiries 1300 36 24 66





Review your energy management systems

- ✓ Senior management commitment
- ✓ Understanding of energy savings potential
- ✓ Energy targets and key performance indicators
- ✓ Energy metering and monitoring
- ✓ Energy management reporting
- ✓ Energy supply management
- ✓ Operating and maintenance procedures
- ✓ Accountabilities for energy management
- ✓ Training and awareness procedures
- ✓ Compliance with legal and/or regulatory requirements




Develop an energy management improvement plan

Develop an energy management plan-- See the AMPC template

AUSTRALIAN MEAT PROCESSOR CORPORATION

T (02) 9436 0042 F (02) 9436 0343 E AMPC@AMPC.COM.AU WWW.AMPC.COM.AU



APPENDIX A – TEMPLATE ENERGY MANAGEMENT PLAN

The following appendix is an EMP template which a duly authorized and responsible employee at a small to medium meat processing business could adopt.

ENERGY MANAGEMENT PLAN FOR “XYZ” MEAT PROCESSING FACILITY

Prepared by: xxx
Date: DD/MM/YYYY

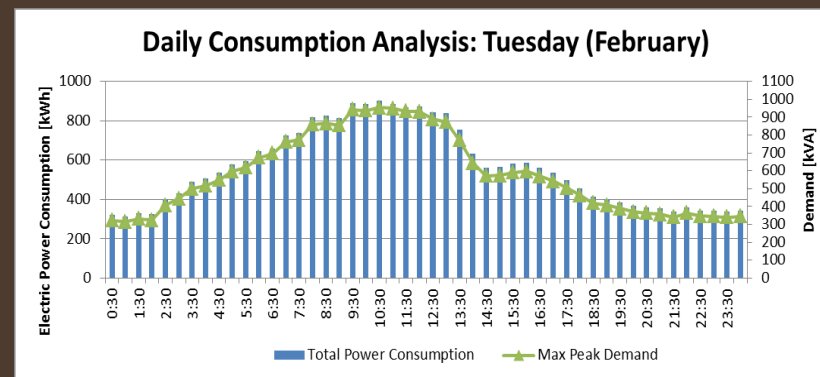
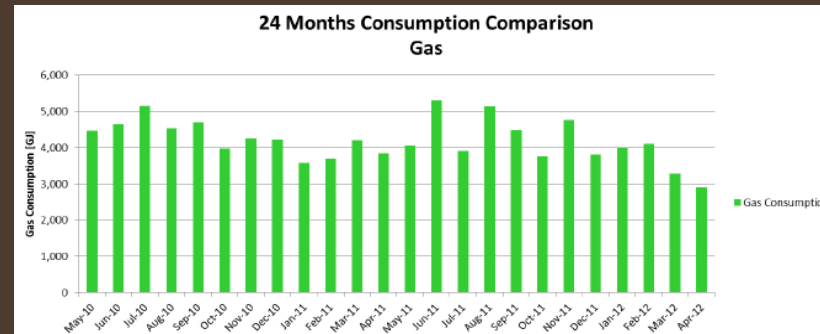
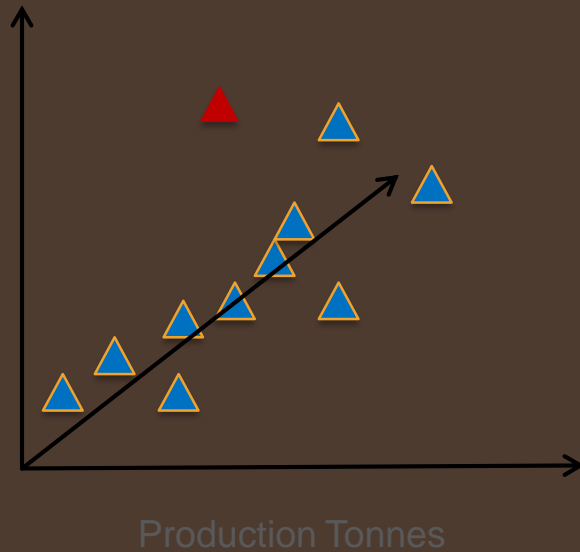
Table of Contents

| | |
|--|----|
| SUMMARY | 13 |
| INTRODUCTION | 13 |
| ENERGY POLICY | 13 |
| ENERGY USAGE AND COST | 13 |
| REVIEW OF MANAGEMENT SYSTEMS | 15 |
| ENERGY MANAGEMENT IMPROVEMENT PLAN | 19 |
| ENERGY EFFICIENCY OPPORTUNITIES | 19 |
| IMPLEMENTATION, MEASUREMENT AND VERIFICATION PLAN | 21 |
| COMMUNICATION AND REPORTING OF RESULTS | 22 |





Understand energy use and key opportunities



AMPC energy baseline tool

AUSTRALIAN MEAT PROCESSORS ASSOCIATION

T (02) 9436 0042 F (02) 9436 0343 E AMPC@AMPC.COM.AU WWW.AMPC.COM.AU

Baseline period: July 2011 to June 2012

Baseline Energy Consumption

| Energy Type | Quantity p.a. | Units |
|--------------|---------------|----------------|
| Electricity | 120 | MWh p.a. |
| Natural gas | 1200 | GJ p.a. |
| LPG | 1200 | GJ p.a. |
| Coal | 48 | Tonnes |
| Other | 376 | GJ p.a. |
| Total | 2,944 | GJ p.a. |

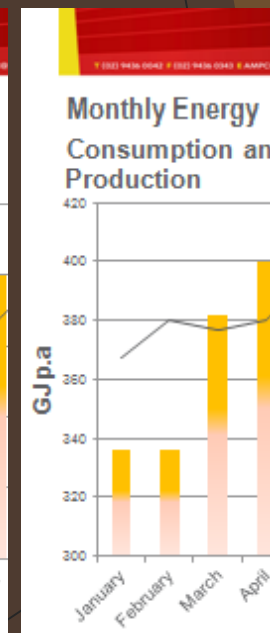
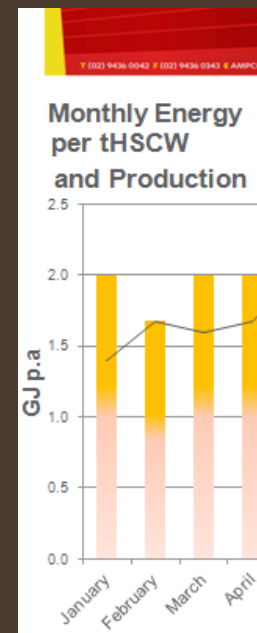
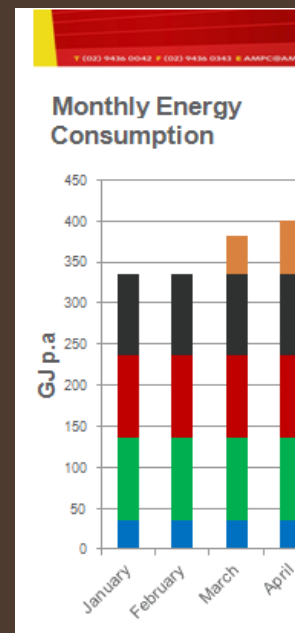
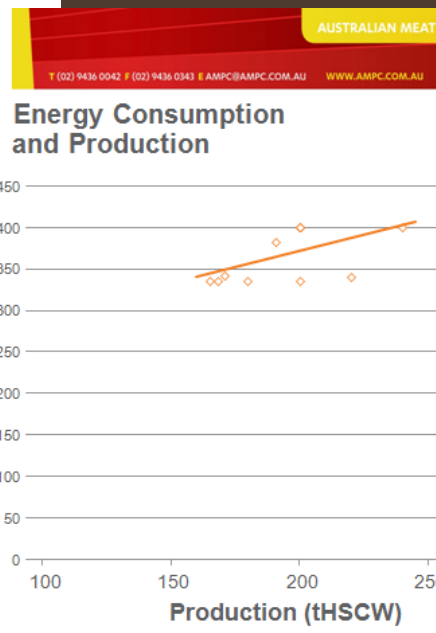
Production over period: 2,335 tHSCW

Indicators

| Indicator | Total Energy Consumption | Total Electric Consum |
|--|--------------------------|-----------------------|
| | GJ/tHSCW | kWh/tH |
| Energy Consumption per tonne hot standard carcass weight | 1.9 | 51 |

Energy Consumption (GJ)

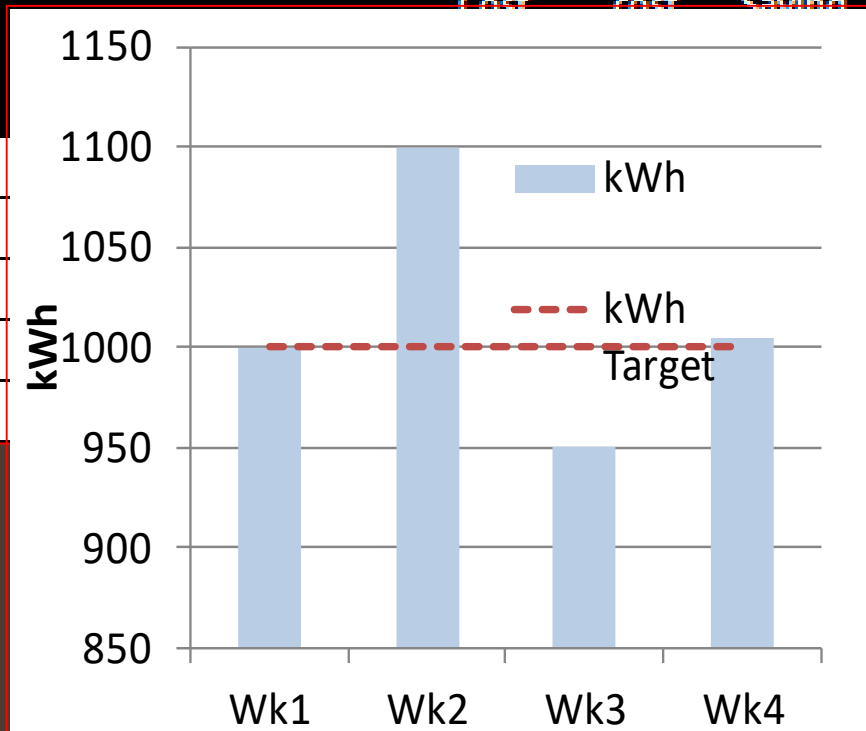
■ Electricity
■ Natural gas





Implement and track energy improvements

| No. | Opportunity | Responsibility | Capital Cost | Opex cost | Energy Savings | Cost Savings (\$) | Payback (Years) | Completion Date | Status |
|-----|-------------|----------------|--------------|-----------|----------------|-------------------|-----------------|-----------------|--------|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |



How effectively are we
managing our energy costs
today?

It's time for a candid review.

...

Are we selecting our activities
rationally, or by whim? ...

Are our economic criteria
realistic, or wishful thinking? ...

Are we paying enough attention
to risk? ...

Are we keeping our activities
profitable? ...

Let's see ...

“ENERGY MANAGEMENT” MEANS LOWERING COST BY:

- ▶ **ELIMINATING UNNECESSARY ENERGY USE**
- ▶ **IMPROVING THE EFFICIENCY OF NEEDED ENERGY USE**
- ▶ **BUYING ENERGY AT LOWER NET PRICES**
- ▶ **ADJUSTING OPERATIONS TO ALLOW PURCHASING ENERGY AT LOWER PRICES**

THE FOUR STEPS

- (1) Identify ALL your opportunities.**
- (2) Prioritize your actions rationally.**
- (3) Accomplish your activities successfully.**
- (4) Maintain your activities.**

Note that, ...

the steps of effective energy management are the *SAME* as for the management of all productive functions.

STEP 1

Identify ALL Your Opportunities

- ▶ Before you take ANY action, find ALL your opportunities.
- ▶ The big difference of energy management is that the number of options to consider is much larger than for other important functions.

STEP 1

Identify ALL Your Opportunities

- ▶ The biggest hazard to energy management is the itch to do things before knowing all the options.
- ▶ Finding your best cost saving opportunities is like an Easter egg hunt. You don't know which eggs have the biggest prizes until you find them all.

Manager: “Mr. Andresen, please give us a ‘short list’ of ways to make our facility efficient.”

Andresen : “If I could do that, I wouldn’t have spent 20 years writing a book about energy efficiency that weighs 8 pounds.”

It is your responsibility as an energy manager to avoid spending your organization's money until you are certain where it can be spent most effectively.

A Competent Energy Manager:

- ▶ Does not wait passively for proposals.
- ▶ Aggressively finds every opportunity within the facility for lowering energy cost.
- ▶ Relentlessly educates himself about every method of lowering energy cost that could apply to his facility.

STEP 1

Identify ALL Your Opportunities

- ▶ Unlike most other business activities, you need a formal process, usually called an “energy audit”, to find all your opportunities.
- ▶ A good “energy audit” takes time and costs money, but not much of either, compared to your overall program.

STEP 1

Identify ALL Your Opportunities

- ▶ Even today, competent energy audits are rare.
- ▶ This is the greatest deficiency of present energy management, resulting in continued high energy costs, waste of money on ineffective action, and inadequate respect for energy managers.³¹

The energy audit is the foundation on which your entire energy management program rests.

A deficient energy audit WILL cause a deficient energy management program.

STEP 1

Identify ALL Your Opportunities

- ▶ **The energy auditor requires scientific and engineering education, broad practical experience, and solid judgement.**
- ▶ **The energy auditor needs a thorough understanding of ALL opportunities, not just a few.**

Vendors can't do energy audits!

The energy auditor should have
NO CONFLICTING INTERESTS.

Umm, ...

Who did YOUR energy audit?

STEP 2

Prioritize Your Activities Rationally

- ▶ The sequence of your activities is a major factor in the economic benefit of your energy management program.
- ▶ Consider all the criteria that matter, not just the economic criteria.
- ▶ Calculate with realistic numbers.

STEP 2

Prioritize Your Activities Rationally

- ▶ **Limit consideration to measures of proven reliability.**
- ▶ **Consider the ability of your staff to accomplish and maintain each measure.**

The best cost saving measures usually are boring, i.e.: ordinary and inexpensive. The staff understand them easily.

The worst measures usually are ego gratifying, i.e.: “innovative”, complex, and expensive. The fact that you don't really understand them is part of the thrill.

STEP 2

Prioritize Your Activities Rationally

- ▶ Cost, by itself, is almost never a significant selection factor.
- ▶ Because, IF the measure works as expected, it provides a higher rate of return than most other investments.
- ▶ So, you can borrow the money, if necessary.

The largest cost of energy conservation is FAILURE.

If an activity does not work, it will not pay back.

Therefore, ...

the most important fiduciary
responsibility of the energy
manager is to
ELIMINATE FAILURE.

STEP 3

Accomplish Your Activities Properly

- ▶ Each cost saving activity is an independent project that requires its own knowledge, equipment, and people.
- ▶ The key to success is doing your homework before initiating each activity.

STEP 4

Maintain Your Activities Endlessly

- ▶ **Almost nothing continues to operate successfully by itself.**
- ▶ **Each energy management activity requires continuing support.**
- ▶ **Integrate the maintenance of each activity seamlessly into your overall operations.**

So, ...

How does YOUR energy
management program compare
to the best program that is
possible?

Keep tuning your program.
There is always room for
improvement.

Energy management NEVER
ENDS.

And finally, ...

Your program will be a success when the top managers of your organization understand that energy management produces the highest profits in the organization.