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A HUMOROUS APPROACH TO LIFE CYCLE COSTING SINCE YOU HAVE TO DO IT ANYWAYS

DON JUHASZ, P.E. CEM DIR ENERGY RESOURCE MANAGEMENT
DEFENSE LOGISICS AGENCY

Life Cycle Costing Analysis (LCCA)

Life-Cycle Cost Analysis

$$\text{Payback (Yrs)} = \frac{\text{Annual Energy Savings (\$)} + \text{Annual Maint. Savings (\$)}}{\text{All Project Costs (Contract + SIOH + Design) (\$)}}$$

Simple vs. Discounted

$$\text{Savings to Investment Ratio} = \frac{\text{Savings Over Life (\$)}}{\text{All Project Costs (\$)}}$$

Life in years defined by type of system

Building Life Cycle Costing (BLCC) program

National Institute of Standards and Technology (NIST) Handbook 135 & Annual Supplements

How Much Do I Really Know?

- An Erg is about what level?

1) The energy for a mosquito to do a push-up
2) The amount produced by an atomic bomb
3) The amount required to push a 5,000 lb car 100 yards up a 1% slope
4) More than combining all the above
5) Do I really need to care?

An Example of LCCA

- Background: A 40-ton (480,000 BTU/hr child water capacity) Chiller was installed in 1990 with an original COP (Coefficient of Performance) of 3.5
- The building has increased the number of occupants by 40% and the amount of task lighting, cubicles, individual appliances has increased by 60% and the number of individuals computers has increased by 60% and only the number of printers has decreased by 70%.
- The building has flex hours and is occupied from 5:45 am to 6:45 pm on normal work day. The controls are pneumatic and set to operate from 5:30 am to 7pm daily (365 days/yr) as the maintenance folks hate to mess with programming a schedule for weekends and Holidays so they leave it at a fixed schedule.
- The chiller no longer cools adequately when the outside temperature is above 90° F.

An Example of LCCA

- You are assigned as the Energy Manager or the Design Engineer, or the Facilities Manager to resolve the complaints of lack of cooling.
- You check your utility bills and discover that the summer electrical bills have increases at least 25% over the last three years compared to the years prior. You now need to know three amounts 1)What is it now costing you 2)What is the costs difference with a replacement or upgrade 3)What do you have to pay to have the upgrade?
- You are current paying $5 per KW/mo. demand and $.10/KWhr at your location. What is your LCCA? Lets do a simple payback:

❖ Current unit is rated at using 40 KW (we know it is worse than that but we will start with this number. Also, by the definition a COP a 3.5 rating is when one (1) KW input is required for every one ton of a/c output. The chiller is needed for an average of 4 months a year (mid May – mid Sept) or 120 days. Although the hours of operation are set for 13-1/2 hours/day, the chiller will only average 10 hours/day over the 120 days of use. Now we are ready to start engineering.

How Much Do I Really Know?

- What is bigger a Horse Power (HP) or a Kilowatt (KW)?

The LCCA Answer

- The existing unit is costing you the following per year
  - In Demand: 40KW x $5/KW/Mo. =$200/Mo.
  - In Energy Costs: 40KW x 120 days/yr x 10hr/day x $.10/KW-hr = $4,800/yr.
  - Total utility costs are based on racketing demand costs and in this case the demand is not racketed therefore total demand cost is: $800/yr + $4,800/yr or $5,600 annual utility cost.
  - Now, What is the energy requirements of a new unit?

The LCCA Answer

- The new unit evaluated has a COP of 8.0 or uses 17.5 KW and the annual estimated cost would be:
  - In Demand: 17.5KW x $5/KW/Mo. =$87.50/Mo.
  - In Energy Costs: 17.5KW x 120 days/yr x 10hr/day x $.10/KW-hr = $2,100/yr.
  - Total annual utility costs are:

    Demand cost is: $350/yr + $2,100/yr or $2,450 annual utility cost.

    The annual difference is ($5,600 - $2,450) = **$3,150/yr**

The LCCA Answer on Simple Payback

- You check RS Means and your on line estimator for a 40-Ton self contain water chiller with a COP of 8.0:
  - Hardware and delivery cost of $28,200
  - Installation and removal Costs of $2,400
  - Total replacement Cost of $30,600
- If you are replacing the unit just on the energy savings then your simple payback is: $30,600/$3,150 = **9.7 years**
- If you are replacing it because the current one is at the end of its useful life, then the labor cost stay the same and the cost differential is only the difference between a 3.5 COP and an 8.0 COP which is $4,400 or a payback of **1.4 years**.

How Much Do I Really Know?

- What do you call a Power outage?

Rules of Thumb Based on Energy Savings

- Programmable Thermostats: 1-4 year payback
- Lighting w/ occupancy or motion sensors (Indoors and Outdoors):1-5 year payback
- Controls on 24/7 operating equipment (HVAC, DHW pumps, exhaust fans): 3-8 year payback
- Maintenance Issues (filters, insulation, manual mode, weather-stripping and caulking): 1-9 year payback
- Motors (fans 7 pumps): 3-6 year payback
- Boilers: 8-20 years payback
- A/C Equipment split units: 5-12 years Chillers: 6-15 years
- Envelope Improvements: 6-18 years Windows: 8-20 years
- Ground Source Heat Pumps: 8-25 year payback

How Much Do I Really Know?

- When two atoms collided, one stole an electron from the other.

Why was the one atom so sure the other stole an electron?

The Way Ahead – Making a Difference

- As LEADERS
  - Highlight energy reduction as an Organization imperative
  - Use your leadership to change your organizational actions and wasteful energy processes
  - Ensure construction standards incorporate high performance design principles and use Life Cycle Costing in your Decision Matrices
  - Create incentives and consequence programs
  - Practice what you preach

DEFENSE LOGISTICS AGENCY

AMERICA'S COMBAT LOGISTICS SUPPORT AGENCY

Don Juhasz P.E. CEM don.juhasz@dla.mil