Life Cycle Cost Training

Life Cycle Cost (LCC) is a basic engineering training course. LCC usually follows the Reliability Engineering Principles class for acquiring knowledge of reliability models. **Life Cycle Cost** training covers fundamentals of how to cost projects and equipment selection while taking into account equipment survival/failure and the total cost incurred during the project life.

LCC are summations of cost estimates from inception to disposal for both equipment and projects as determined by an analytical study and estimate of total costs experienced during their life. The objective of LCC analysis is to choose the most cost-effective approach from a series of alternatives so the least long-term cost of ownership is achieved. Another name for LCC is total cost of ownership. LCC studies marry together engineering details about equipment life/death/support and capital cost to reach a single number called net present value (NPV) which describes the time value of money expended over the life of the project. More details on the subject on this website are accessible by hyperlink below.

Life Cycle Cost is a 2-day short course for economic selection of equipment considering:

1. Equipment grades and cost,
2. Life limiting conditions for installation,
3. Life limiting conditions from operating practices and
4. Life limiting conditions from maintenance practices.
5. Justifying critical spare parts
6. NPV and how to select the winning case by use of trade-off boxes

Life cycle cost analysis provides answers for this training effort in a net present value (NPV) format by Monte Carlo simulation using Excel spreadsheets. The Excel computer spreadsheet model provided with the course can be altered to reflect many different types of equipment. Students are encouraged to use the model as a basic building block for equipment in a plant so that capital equipment decisions can be made logically and quickly with updates for prices and life-performance.

The Monte Carlo model begins with the inherent reliability of components in a system. The inherent reliability is decreased by use of factors developed from practical engineering surveys to show the effects of installation and use practices. The model starts with the birth of components and component life is consumed as the model operates over time. As components fail, they are replaced and the accounts are charged for the repairs--the replacement can be altered by choice of maintenance strategies. The result is a practical model driven by reliability and costs.

The class room Monte Carlo computer simulation example finds the best net present value for a given set of data--pumps are used for the training example as they represent the most common equipment in most continuous process manufacturing plants and ships.

The problems involve ANSI pumps, ANSI enhanced pumps, API pumps, solo and dual pump configurations, fix when broken or good maintenance practices, and three grades of installation and operating conditions. The simulation example uses an Excel spreadsheet and the 36 problems will be divided to give the students hands-on time for observing the simulation techniques (1,000+MHz pentium computers are preferred for the simulation). LCC results from the simulation, in NPV format, are examined for trade-off conditions using the effectiveness equation to find alternatives that satisfy boundary conditions for the business.

Templates are provided for calculating costs by using discounted cash flow and net present value calculations using spreadsheet software. Simulation software, in Excel format, is provided to the students to simulate equipment failures and finding the cost of replacements over many years.

The **LCC** course emphasizes making long-term cost of ownership decisions rather than only choosing the lowest first cost. The **LCC** course shows how to merge cost data and reliability data for making business decisions that improve stockholder wealth for items described below:

- **Life cycle cost definitions**
- **Why use LCC?**
- **Alternatives for engineering considerations**
- **LCC overview template for the task**
- **Sustaining cost templates**
- **Effectiveness equation trade-off tools for LCC**
- **Reliability**
- **Capability**
- **LCC facts driven by data**
- **Alternatives with acquisition/sustaining costs**
- **Choosing the analytical cost model**
- **Cost profiles for each year of study**
- **Pareto charts of vital few cost contributors**
- **Risk studies of high cost items and occurrences**
- **Adding uncertainty to the LCC results**
- **How both end-user and suppliers use LCC**
- **Economic business facts of life for engineers**
- **Discounted cash flow and net present value**
- **Acquisition cost templates**
- **SAE LCC cost template**
- **Availability**
- **Maintainability**
- **Trade-off format benchmark diagrams**
- **Defining the LCC problem**
- **Preparing the cost breakdown tree**
- **Gathering cost estimates and cost models**
- **Break-even charts for alternatives**
- **Sensitivity analysis of high cost items**
- **Selecting preferred course of action using LCC**
- **References from the literature**
- **Performing NPV Monte Carlo simulations**
- **Using NPV and the effectiveness trade-offs**

Subjects discussed in the course are generally connected to money issues. Engineers can learn enough accounting and business principles to communicate with accountants; however few accountants are willing to learn the engineering details for reliability calculations. Engineers must learn enough cost details to improve their teamwork with accountants. LCC helps engineers **think like MBAs** and **act like engineers** for profit making enterprises.

This training program is conducted in the clients training facilities. Required equipment to be supplied by the client for the class are:

1. High intensity overhead projector with screen for use with the instructors computer,
2. One or two flip charts,
3. 1,000+MHz Pentium computers with Excel 7.0+ software for each student (or for worst cases, 2 students per computer).

Lecture on the fundamentals of LCC consumes 1/2 to 3/4 of the first day. Computer simulation consumes the remainder of the time for the two-day long class. The training class commences at 8:00 AM and concludes at 5:00 PM for the first day (3:00 PM on the second day) with 45 minutes for lunch and two 10-minute breaks during each day.

Refer to price lists for information about training costs. Check schedules for available times. Download a copy of a short Life Cycle Cost brochure as a (32K) PDF file—if you need a PDF reader, download the free Adobe software.

You can also download some technical papers from this site. The first group of papers shows how to use RAPTOR software for life cycle cost decisions. The second group of papers shows other methods for finding life cycle costs. The problems of the month show how to use Monte Carlo simulations in Excel to solve difficult problems for life/costs.

Papers

1. How To Justify Equipment Improvement Using Life Cycle Costs and Reliability Principles
2. Why You Need Practical Reliability Details To Define Life Cycle Costs For Your Products and Competitors Produces
3. How To Justify Machinery Improvements Using Reliability Engineering Principles

And

1. Life Cycle Cost and Good Practices
2. Life Cycle Cost & Reliability for Process Equipment
3. Life Cycle Cost Tutorial

Problems Of The Month

1. January 2005—Find Annual Costs For Life Cycle Cost Calculations With Planned Replacements
2. December 2004—Find Annual Costs For Life cycle Cost Calculations (Without Planned Replacements)
3. December 2002—Reliability And Life Cycle Cost

Software For Downloads

1. Life cycle Cost Excel Spreadsheet
2. Life Cycle Cost Monte Carlo simulation
3. Excel Replacement Before Failure Monte Carlo Simulation (from January ’05 Problem Of The Month)
4. Excel Replacement At Failure Monte Carlo Simulation (from December ’04 Problem Of The Month)

Other web pages on this site

1. Life Cycle Cost Issues

You can download a PDF copy of this page by clicking here.

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