Fundamentals of Asset Management

Step 4. Determine Life Cycle & Replacement Costs

A Hands-On Approach
Tom’s bad day...
First of 5 core questions, continued

1. What is the *value* of my assets?
   - *Why* are cost and value important?
   - *How* is value determined?
   - *How* to determine replacement cost?
AM plan 10-step process

1. What is the current state of my assets?

- Develop Asset Registry
- Assess Performance, Failure Modes
- Determine Residual Life
- Determine Life Cycle & Replacement Costs
- Set Target Levels of Service (LOS)
- Determine Business Risk ("Criticality")
- Optimize O&M Investment
- Optimize Capital Investment
- Determine Funding Strategy
- Build AM Plan
Concepts of cost particularly useful to AM

- **Current replacement cost** - The full cost to replace an asset in its current operating environment
- **Life cycle cost** - The total cost of an item throughout its life, including the costs of planning, design, acquisition, operations, maintenance, and disposal, less any residual value, or the total cost of providing, owning, and maintaining a building or component over a predetermined evaluation period
AM’s two major cost perspectives

<table>
<thead>
<tr>
<th>Direct life cycle costs</th>
<th>Economic costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition</td>
<td>Financial costs</td>
</tr>
<tr>
<td>Operation</td>
<td>• Direct costs to the governmental organization</td>
</tr>
<tr>
<td>Maintenance</td>
<td>• Direct customer costs</td>
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<tr>
<td>Renewal</td>
<td>• Community costs</td>
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<tr>
<td>• Reparation</td>
<td>• Triple bottom line</td>
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<tr>
<td>• Rehabilitation</td>
<td>• Financial and economic</td>
</tr>
<tr>
<td>• Replacement</td>
<td>• Social</td>
</tr>
<tr>
<td>• Disposal and decommissioning</td>
<td>• Environmental</td>
</tr>
</tbody>
</table>

Nature of life cycle costs

Cash requirements and cumulative costs over asset life
Defining life cycle cost

\[
\text{Life cycle cost} = \text{original cost} - \text{salvage value} + \text{operating costs} + \text{maintenance costs} + \text{renewal costs} + \text{decommissioning costs}
\]
Determining life cycle cost

Requires that an organization conduct

1. Either cost tracking
   - Integrating CMMS to financial system
   - Setting up activity-based accounting
   - Storing data over time

2. Or cost allocation

<table>
<thead>
<tr>
<th>Primary Cost Unit</th>
<th>Minor code</th>
<th>Number of Units</th>
<th>$/Unit</th>
<th>Allocated Cost</th>
</tr>
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<tbody>
<tr>
<td>Direct Labor</td>
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<td>Direct Pay</td>
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<td>2.5 hours</td>
<td>$42.00</td>
<td>$105.00</td>
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<td>Overhead</td>
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<td>.5 hours</td>
<td>$6.00</td>
<td>$3.00</td>
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<td>Benefit Burden</td>
<td>1</td>
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<td>$8.20</td>
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<td>FICA, etc</td>
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<td>$2.20</td>
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<td>Materials</td>
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<tr>
<td>Vehicle</td>
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<td>1.5 hours</td>
<td>$47.15</td>
<td>$70.73</td>
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<td>Pipe</td>
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<td>160 feet 8” PVC</td>
<td>$1.20/foot</td>
<td>$192.00</td>
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</tbody>
</table>

CMMS means computerized maintenance management system
Life cycle costing

It’s about understanding trends and drivers

- Operations costs trend
- Maintenance costs trend
Measuring “consequence of failure”: three elements of full economic costs

1. Direct costs to the local government
   - Repair and return to service costs
   - Service outage mitigation costs
   - Utility emergency response costs
   - Public safety costs
   - Administrative and legal costs of damage settlements
   - Lost product costs
Three elements of full economic costs, cont.

2. **Direct customer costs**
   - Property damage costs, including restoration of business
   - Service outage costs
   - Service outage mitigation and substitution costs
   - Access impairment and travel delay costs
   - Health damages
Three elements of full economic costs, cont.

3. **Community costs**
   - Emotional strain and welfare
   - Environmental pollution, erosion, sedimentation
   - Destruction of habitat or damage to it
   - Attractiveness (economic, tourists)
Concepts of *value* particularly useful to AM

- **Depreciated value (book value)**—Value of an asset as determined using generally accepted accounting principles and as reflected on the balance sheet
- **Replacement value**—The current cost to substitute an entire asset with a new or equivalent asset without enhancement of capabilities
Two valuation perspectives

- **Macro view**—aggregation of assets
  - Financials
  - GASB
- **Micro view**—the individual asset
  - Life cycle cost
  - Economic life
  - Optimal renewal decision making

GASB is Governmental Accounting Standards Board
GASB - how GAAP is set

Not-for-profit agency—not a governmental entity

Financial Accounting Foundation (FAF)

Sets governmental GAAP

Financial Accounting Standards Board (FASB)

Governmental Accounting Standards Board (GASB)

Financial Accounting Stds. Advisory Council (FASAC)

Individual Task Forces

Governmental Accounting Stds. Advisory Council (GASAC)

Individual Task Forces

GAAP is generally accepted accounting principles
What GASB is all about

Practices and procedures by which governments...

- **Using** *source documents for such transactions as*
  - Tax receipts
  - Paychecks
  - Invoice payments
  - Debt payments

- **Record** financial transactions
  - In an accounts journal
  - And general ledger

- **And** *report* financial transactions
  - In consolidated annual financial reports

*Focus of GASB’s Statement 34*
What it’s all about – the financial reporting perspective

Wealth (Snapshot)

Profit (Revenue less expenses over specific period of time)

Cash Flow (Over specific Period of time)

Are we building or mining wealth?
Two accounting views

1. Financial accounting
   - GAAP-driven
   - Financial statement reporting—external
   - Meets criterion of fairly presenting the result of operations on financial condition
   - Audit trail paradigm

2. Managerial accounting
   - Not GAAP-driven
   - Instead, business case-driven—decision-focused
   - Cost-focused

GAAP is generally accepted accounting principles
Determining replacement cost

- **Level 1**
  - Original cost x general cost index (e.g., CPI)

- **Level 2**
  - Original cost x sector-based cost index (e.g., ENR, Means, CCI)
  - Brownfields-to-Greenfields conversion costs

- **Level 3**
  - Modern Equivalent Engineered Replacement Asset (MEERA)
  - Detailed site-based cost analysis

CPI is Cost Performance Index, ENR is Engineering News-Record, Means is Means Building Construction Cost Data, CCI is Consumer Confidence Index
Cost vs. accuracy or confidence

Estimated *trade-off* in cost for accuracy or confidence

- What *accuracy* does your organization *want*?
- What can it *afford*?
- What is *justified*?
Which valuation technique?

- **Financial accounting**
  - Used for GASB reporting purposes
  - With choice of
    - *Historic* depreciation
    - Or *modified or preservation* approach

- **Managerial accounting**
  - Used for *renewal or replacement* analysis
  - And *long-term* funding strategies, including rate setting
  - With choice of
    - *Condition-based* renewal
    - Or *depreciated* replacement

GASB is Governmental Accounting Standards Board
Key points from this session

What is the value of my assets?

Key Points:
- Asset valuation is the “common benchmark” against which the decision to repair, refurbish or replace is made.
- Historic depreciation has little relevance to long lived assets where the management intent is to preserve the asset.
- Far more relevant are the replacement value-based techniques.

Associated Techniques:
- Valuation and costing
- Straight-line depreciation
- Condition-based depreciation
- Renewal/Replacement costing
- Depreciated replacement cost
- Deprival cost
### Tom’s spreadsheet

#### Microsoft Excel - EPA Seminar Master.xlsx

<table>
<thead>
<tr>
<th>Asset Register and Hierarchy</th>
<th>Installed Date</th>
<th>Asset Class</th>
<th>Original Cost</th>
<th>Estimated Effective Life</th>
<th>Condition Rating</th>
<th>Annual Day</th>
<th>Accum Day</th>
<th>Current Loss</th>
<th>Minimum Condition</th>
<th>Backup Reduction (Redundancy)</th>
<th>Probability of Failure</th>
<th>Consequence of Failure</th>
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**Notes:**

- **Installed Date:** [Year, Month, Day]
- **Asset Class:** [Classification]
- **Original Cost:** [Amount]
- **Estimated Effective Life:** [Years]
- **Condition Rating:** [Rating]
- **Annual Day:** [Number]
- **Accum Day:** [Number]
- **Current Loss:** [Amount]
- **Minimum Condition:** [Rating]
- **Backup Reduction (Redundancy):** [Percentage]
- **Probability of Failure:** [Probability]
- **Consequence of Failure:** [Consequence]

**In-Use Equipment:**

- **In-Use:** [Yes/No]
- **Failure Rate:** [Rate]
- **Maintenance:** [Frequency]
- **Last Maintenance:** [Date]

**Other Details:**

- **Type:** [Type]
- **Location:** [Location]
- **Usage:** [Usage]
- **Status:** [Status]

**References:**

- [Source 1]
- [Source 2]
- [Source 3]