Asset Management for Small Water System Operators: In the Field and Beyond

Tuesday, June 13, 2023

ENVIRONMENTAL FINANCE CENTER

WATER PROGRAMS Sacramento State

This program is made possible under a cooperative agreement with US EPA.

Certificate of Completion

This training is approved for 0.2 CEUs for Hawai‘i Water Operators.

To receive CEUs for this training:

- **You must attend the entire session**
- **You must register and attend using your real name and unique email address – group viewing credit will not be acceptable**
- **You must participate in polls**

If you have questions or need assistance, please contact smallsystems@syr.edu.

About Us

The Environmental Finance Center Network (EFCN) is a university-based organization promoting innovative and sustainable environmental solutions while bolstering efforts to manage costs.

EFCN
environmental finance center network

Building TMF Capacity for Small Water Systems

Our Building Technical, Managerial, and Financial Capacity Programs for Small Water and Wastewater Systems provide free training and technical assistance across every state, territory, and tribal nations. Technical assistance is available on a first-come, first-served basis.

The Small Systems Water and Wastewater Teams

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- Financial Planning
- Building Resilience
- Controlling Energy Costs
- Access to Funding Sources
- Mapping & Data Collection
- Regulatory Compliance
- Operator Certification
- Strategic Planning Tools
- Effective Communication
- The Power of Partnerships: Sharing Resources with Neighboring Systems
- Attracting & Retaining Workforce
- Rate Setting & Affordability
- Basic Water Math

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- Asset Management
- Community Engagement
- Data Collection & Analysis
- Maintenance Practices
- Disseminating Information
- Fiscal Planning
- GIS Programming/Planning
- Infrastructure Funding
- Infrastructure Planning & Design
- Operator Training & Certification
- Management/Board Support
- Rate Payer/Citizen support
- Sustainability & Resiliency
- Partnerships & Collaboration
- Water Efficiency & Reuse
- Work Force Development

What is asset management?

Asset management is process for maintaining a desired level of customer service at the most appropriate cost

“Asset management is a process water and wastewater utilities can use to make sure that planned maintenance can be conducted and capital assets (pumps, motors, pipes, etc.) can be repaired, replaced, or upgraded on time and that there is enough money to pay for it.”

US Environmental Protection Agency, Sustainable Water Infrastructure

Asset management isn’t keeping a document lying in a drawer somewhere

It’s a series of actions and steps taken in order to achieve a particular goal:

The responsible upkeep of a utility through sensible decision-making, in and out of the field

EPA's Five Core Components

1. Asset Inventory
What assets do you have & what is their condition?

2. Level of Service
What are the service goals for your system?

3. Criticality
Which are the most important assets to maintain?

4. Life Cycle Costs
How much will it cost for O&M (including asset replacement)?

5. Long Term Funding
How are you going to pay for it all?

What is Level of Service?

It’s the quality of service you are willing and able to provide your customer

Level of Service (LOS)

LOS goals & metrics define what customers and employees can expect from the water utility

- This is the “why” a utility does something
- LOS should be achievable, meaningful, and inform decision making across the utility (including in the field)

Sometimes this is a formal list of goals shared with customers, sometimes it’s a set of internal guidelines for service goalposts, sometimes it’s simply a mission statement

Keep in mind

Service levels are constrained by the following:

Utility's

Ability and willingness to provide a service

- Training
- Funding
- Asset capabilities

Ability and willingness to track performance

- Measurable and meaningful goals get done
- "Sounded nice" goals don't

Customer's

- Want for a service
- Willingness to pay for a service
- Understanding of the service level provided

SMART Goals

Specific	Details exactly what needs to be done
Measureable	Achievement or progress can be measured
Achievable	Objective is accepted by those responsible for achieving it
Realistic	Objective is possible to attain (important for motivational effect)
Time Bound	Time period for achievement is clearly stated

Poll 1:
Does your utility have a defined level of service it strives to provide?

- **Answer 1:** Yes
- **Answer 2:** No
- **Answer 3:** Not sure
- **Answer 4:** Not a utility

If you don’t have a defined LOS, look at:

- Demand for utility services
- Regulatory requirements
- Actual performance

Implementing levels of service goals

All workers in the utility work to meet the utility's LOS goals

For example:

- Operators running treatment plants and maintaining assets
- Customer service representatives logging complaints and tracking work order completion
- Finance managers handling debt service repayments and loans

Measuring how well your utility meets your level of service goals

- Talking to people in and outside your utility is useful
- Listening when people have something to say is even more so
- Benchmarking is your friend

What is benchmarking?

Benchmarking is a way to evaluate your performance against your goals

It’s used to inform decision making and identify performance gaps

4 main types of benchmarking

Internal – comparing departments or practices that are shared across the utility

External – comparing your utility against other similar utilities

Performance – gathering and comparing quantitative (i.e., numerical) data

Used to compare key performance indicators such as set level of service goals against actual performance

Practice – gathering and comparing qualitative (i.e., characteristic) data

Used to check public perception or metrics that don't have an easily quantifiable (numerical) value

For example: field operator interviews to determine "best practice" standard operating procedures (SOPs) or whether the general public thinks your utility is doing as well as a neighboring utility

Internal benchmarking

Comparing departments or practices that are shared across the utility

- Workplace evaluations, surveys, audits
- Site-by-site comparison of adherence to SOPs

External benchmarking

Comparing your utility against other similar utilities

Comparison is effective when you learn why something is different, and whether it will work or be useful for your own utility to implement

Example 1:
Evaluating your utility's facilities with a similar utility in the state

Say you'd like to figure out how well your utility is doing in comparison to other utilities in the state

- Are your procedures most effective at removing pollutants?
- How often does another utility publish public notices in comparison to yours?
- How often does another utility maintain equipment similar to yours?

Performance benchmarking

Gathering and comparing quantitative (i.e., numerical) data

- Used to compare key performance indicators such as set level of service goals (e.g., lower than 2 customer complaints per month or maintenance response time less than 1 hour) against actual performance
- Performance benchmarking can be done internally or externally

Practice benchmarking

Gathering and comparing qualitative (i.e., characteristic) data

- Used to check public perception or metrics that don't have an easily quantifiable (e.g., numerical) value
- Some examples:
  - Field operator interviews to determine "best practice" standard operating procedures
  - Surveys to determine whether the general public thinks your utility is doing as well as a neighboring utility

Poll 2:
Does your utility track maintenance?

- **Answer 1:** Yes, we have an online work order system
- **Answer 2:** Yes, we have a paper work order system
- **Answer 3:** Yes, we have a tracking system (e.g., tally system, work log attached to each asset)
- **Answer 4:** No, we remember what we've done to maintain our utility
- **Answer 5:** No, the only person who knows what was serviced is the operator who serviced the asset
- **Answer 6:** Not a utility

Example 2:
Benchmarking finances against other utilities

- Say a utility has a goal to provide clean water at an affordable rate, in this case at or below the average rates in the state
- How does benchmarking happen in practice?
  - Compare rates to other utilities
  - Compare with similar systems
  - Evaluate the answers you get based on how closely aligned the answers are to your situation

Example 3: Benchmarking SOPs against other utilities

Say a utility wants to update their SOP. This utility struggles with maintaining aged infrastructure with a limited staff and wants to learn about how other utilities handle the same constraints

How does benchmarking happen in practice?

- Compare SOPs with similar systems
  - what works
  - what doesn’t
- Compare workplace safety and satisfaction metrics with similar systems
- Evaluate the answers you get based on how closely aligned the answers are to your situation, and tailor your new SOP to what is most useful and relevant to your situation

What is an asset inventory?

A way to record and monitor the current state of your assets

Poll 3:
Does your utility have an asset inventory?

- **Answer 1:** Yes, my utility has a functional asset inventory
- **Answer 2:** Yes, but we don’t use it
- **Answer 3:** Yes, but it’s incomplete
- **Answer 4:** No, but we’re starting one soon
- **Answer 5:** No, we don’t have one
- **Answer 6:** Not a utility

Why it matters

You need to know what you have to decide what you will need in the future

Knowing more about your assets will enable you to move from emergency maintenance to scheduled maintenance and plan for future costs

How it’s used

An asset inventory is used to:

- make sensible decisions based on information like asset condition
- determine common issues with certain asset types
- decide what maintenance intervals are most effective at reducing emergency maintenance
- plan for expected replacement dates

Break!

What is the life expectancy of an asset?

It’s the useful lifespan of an asset; i.e., the length of time an asset is worthwhile to operate and maintain at the end of which it is more cost-effective to replace the asset than repair or otherwise rehab

Life-cycle costing

- Life-cycle costing means considering all the costs that will be incurred during the lifetime of an asset or service type
- Pipe breaks, pumps get replaced, wells can be decommissioned
- We can’t predict everything, but we can make a pretty good guess with enough information

Defining life-cycle cost

Life-cycle cost = original cost
+ operating costs
+ maintenance costs
+ renewal costs
+ decommissioning costs
– salvage costs (resell value)

Costs to run a utility

- Installing new assets
- Repairing existing assets
- Rehabilitating older assets
- Replacing assets
- Paying workers
- Providing additional perks to the community such as:
  - bill tracking
  - customer service support
- Meeting regulatory requirements such as:
  - compliance with the Lead and Copper Rule
  - providing annual water quality reports

Tracking asset-linked information makes for better decision-making

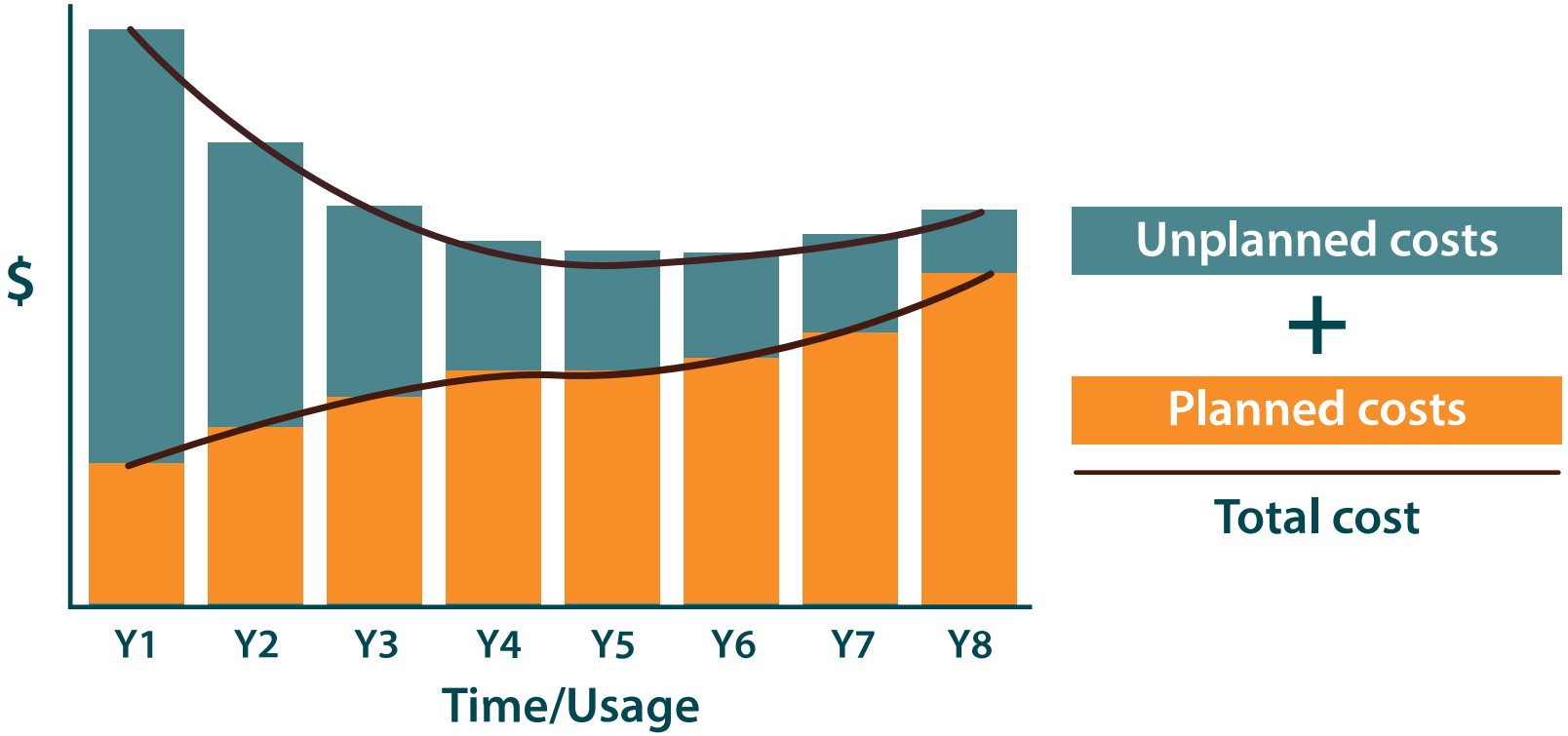
Condition-based monitoring plans and root cause analysis relies on good data

- Asset type, ID, category, size, condition, usage, performance history, failure codes
- Routine inspection and recordkeeping
- Recording information in the same way across the utility
- N/A or incorrect data entry does more harm than good

Costs in the Field

- **Rule of thumb:** Planned maintenance (i.e., preventative maintenance) costs 1/3rd less than unplanned maintenance (i.e., corrective maintenance completed when an asset is already broken) (USEPA 2006, slide 13)
- Reactive emergency maintenance is the most expensive, and should make up no more than 20-25% of total maintenance time (USEPA 2006, slide 38)
- Preventative and predictive maintenance should make up the rest of your efforts

Transition to planned maintenance



Unplanned costs

+

Planned costs

Total cost

(adapted from USEPA, 2006, slide 14)

What is Risk?

Risk is the consequence of failure multiplied by the probability of failure

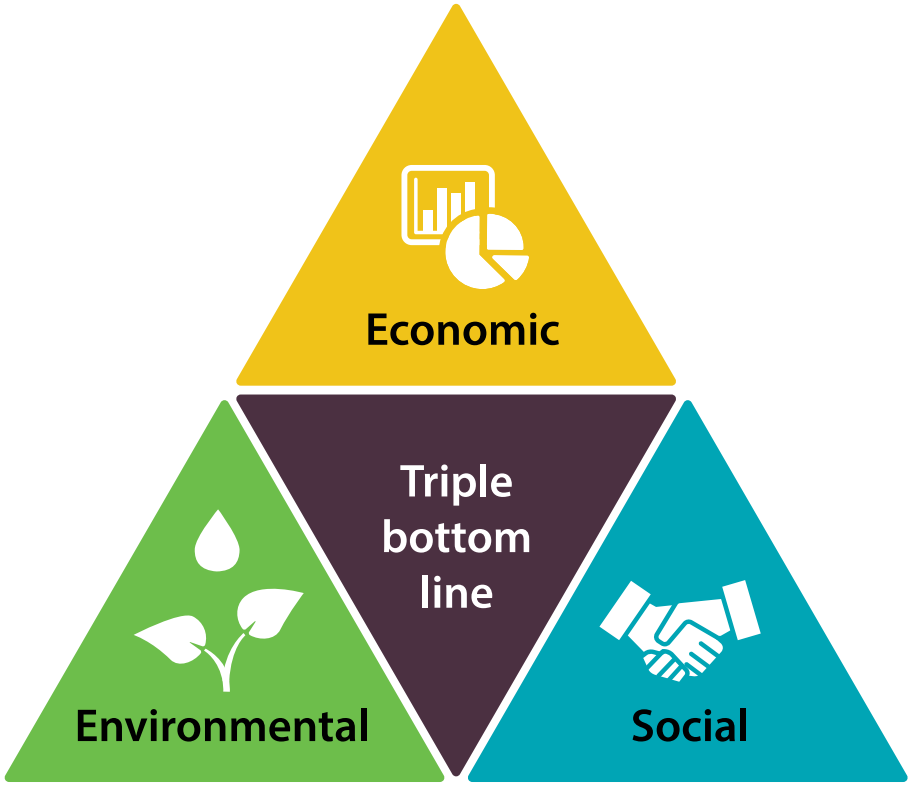
Consequence of Failure

This is the impact of failure

Triple bottom line for sustainability: “People, Planet, Profit”

In the utility world, this is the social, environmental, and economic impact of utility decision-making

- Employee welfare
- Impact on customer quality of life
- Waste management
- Land use
- Financial cost



Probability of Failure

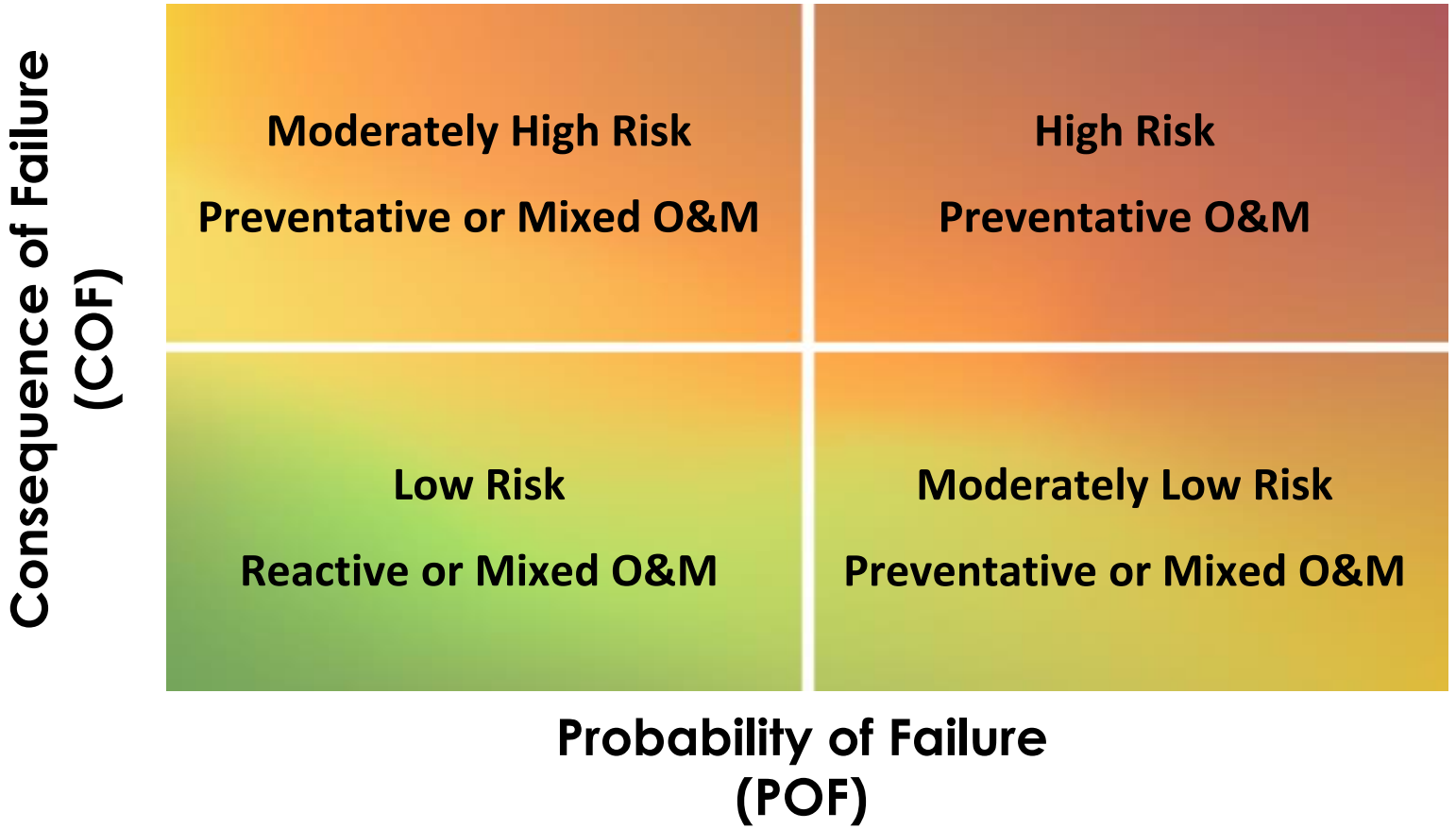
This is the likelihood of failure

This is more like a range of failure – how soon or late an asset is expected to fail

Accuracy depends on how good your information is, which is why a “living” asset inventory based on historical and current experience is so helpful

- Accurate SCADA records
- Average time between failures
- Vendor and industry information
- Other failure records, like a hard copy log

O&M Costs: Based on Risk



Risk mitigation

- Risk mitigation is the reduction or avoidance of risk
- In practice, this is maintaining, repairing, rehabilitating, or replacing your assets rather than running them to failure
- In asset management, that means prioritizing maintenance and replacement of assets that are most likely to fail and have the highest consequence of failure through a cost-benefit analysis

Financing planned projects

- O&M costs are paid through user rates and fees
- Capital projects are ideally paid through capital reserves saved over the past couple years, but can be paid for through grants or loans
- Grants and loan agreements take time to execute
- Changes to rates and fees to pay for future capital projects requires “buy-in” from customers

Poll 4:
Does your utility track costs (e.g., O&M, replacement) and revenue (e.g., payments from customers)?

- **Answer 1:** Yes, we track our costs and revenue stream
- **Answer 2:** Yes, we track some, but not all, costs and revenue
- **Answer 3:** No
- **Answer 4:** Not sure
- **Answer 5:** Not a utility

The relationship between LOS and cost

- “Level of Service” is another way of saying, “This is what the utility will provide to its rate payers”
- “Cost” is the price of providing that level of service
- The “best appropriate cost” is the lowest life cycle cost to provide that level of service
- “Life cycle cost” is the total cost of an asset over its entire lifespan: from planning, design, procurement, installation, maintenance, and eventual removal or replacement

Long-term funding strategies

At the end of the day, we can’t spend more than we make to sustain the utility in the long-term

- Spending more than what your rates allow is unsustainable
- Financing projects with loans means considering interest and repayment terms
- Grant availability varies
- Consider cost-efficient alternatives
  - partnerships with other utilities
  - upskilling staff through mentorship or additional training
  - replacing a seriously time-consuming task or asset with a more efficient one

The role of a small utility operator in asset management

Real-world utility example

Decision

A section of pipe routinely breaks, and up until this point, repairs have been made reactively; a decision is made to track the time and labor spent on this old stretch of pipe and see whether it should be replaced entirely

Practice

Maintenance crew:

Log all breaks in a computerized maintenance management system (CMMS), tracking:

- Cost of repair or rehab
- Downtime
- Manhours used for each service

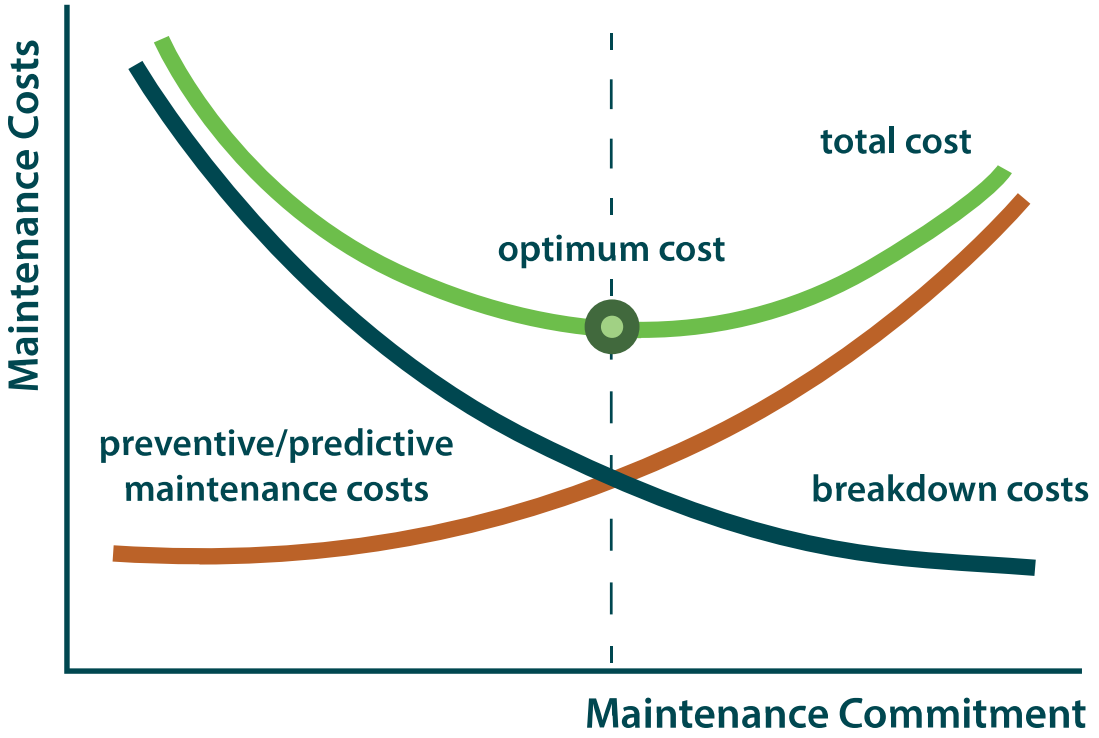
Managers:

Evaluate the data and make a final call

Proactive O&M vs. Run to Failure

- Proactive maintenance is the best call for critical assets with no built-in redundancy
- Running to failure can be the best decision for an unimportant or not-urgently needed asset (e.g., you have another booster pump that can be used during the time the failed pump is being removed and replaced)
- Determining the best strategy for your assets requires tracking and evaluating asset performance and criticality

Cost-benefit analysis in practice



Evaluation, know-how, and practical action

Role of operators and maintenance staff

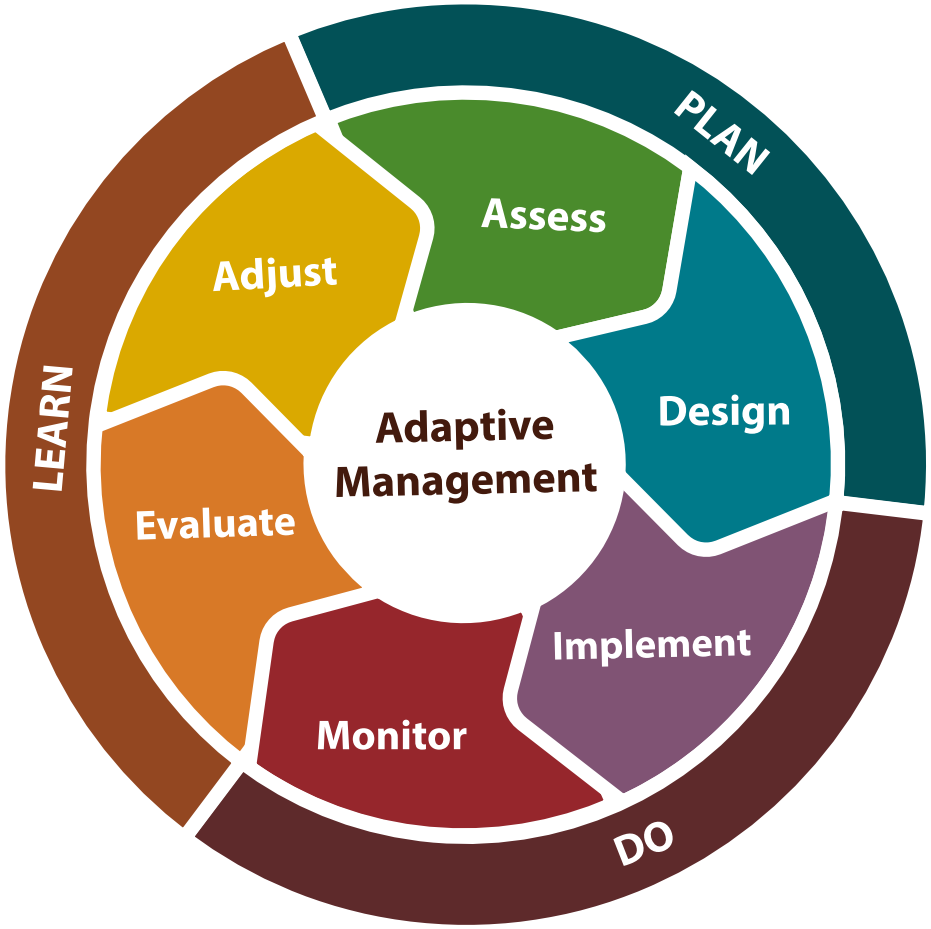
- Maintain and operate assets
- Collect information in the field
- Communicate when you see something odd
- Implement an asset management plan

Responsible asset management

Role of managerial staff

- Evaluate information collected in the field
- Find funding for worthwhile projects
- Explain new procedures to field staff
- Revise the asset management plan when changes are needed

Takeaways


PLAN
DO
LEARN
Assess
Design
Implement
Monitor
Evaluate
Adjust
Adaptive Management

Asset management is a way to determine the lowest cost option while providing the highest level of service over time

Optimizing what you do, where you're doing it, and why is the name of the game

Focus your efforts on the right project, at the right time, for the right reason

Come to a consensus as a utility that what you're doing is meaningful, achievable, and worthwhile

Contact Information

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Technical Assistance

- www.efcnetwork.org/get-help/
- www.efc.csus.edu

EPA Guides

- https://www.epa.gov/dwcapacity/about-asset-management

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References

United States Environmental Protection Agency. 2006. “Step 7. Optimize Operations & Maintenance (O&M) Investment: A Hands-On Approach”. *Fundamentals of Asset Management.* Accessed February 12, 2023.

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