

Effective Capital Planning and Asset Management

**National Association of
Regulatory Utility Commissioners**

Committee on Water

February 19, 2007

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American Water Scope & Size



- American Water serves approx. 18 million people in 29 States and Canada.
- Approx. 7,000 employees provide water, wastewater, and other related services. We are an owner and operator.
- We are the largest, most geographically diverse investor owned water service provider in the Country.
- In 2005, AW revenues were approx. \$2.0 billion.
- Comprised of 400+ individual water systems
 - Ranging in size from 25 customers to over 300,000 customers
 - Wide range of sources of supply, customer makeup, and demographics
- **Issues facing American Water systems are representative of those impacting water industry as a whole.**



Voorhees, NJ

Future Capital Needs in the Water and Wastewater Industries

Estimated Capital Investment Requirements

Drinking Water: \$151 billion to \$446 billion through 2019 (point estimate = \$274 billion)

Clean Water: \$331 billion to \$450 billion through 2019 (point estimate = \$388 billion)

Total: \$485 billion to \$896 billion through 2019 (point estimate = \$662 billion)

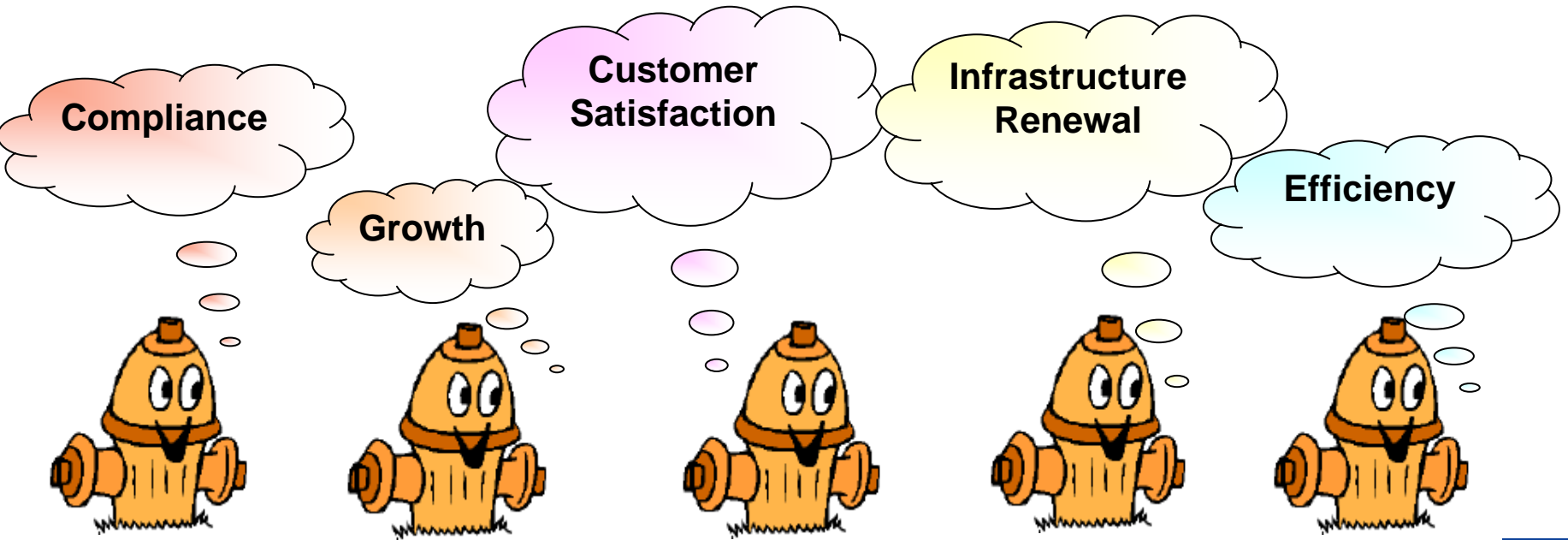
2002 USEPA Clean Water & Drinking Water Infrastructure Gap Analysis

Optimizing capital investment requires effective coordination of “top down” direction (strategies) and “bottom up” system-specific needs.

Three tools to achieve this balance of top-down and bottom-up Capital Planning are:

- **Asset Investment Strategies**
- **Comprehensive Planning Studies**
- **Project Prioritization Model**

Core Needs for Successfully Serving Our Customers



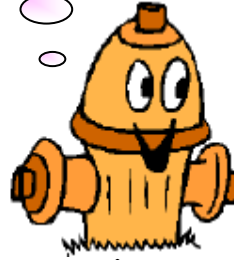
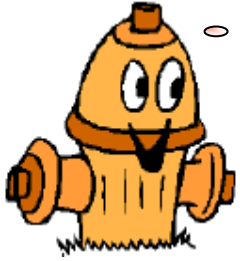
Compliance

Growth

Customer Satisfaction

Infrastructure Renewal

Efficiency



Provide facilities which can meet regulatory requirements and quality goals

Provide facilities to enable customer growth and revenue growth

Provide facilities to enable AW to meet and exceed customer expectations

Rehabilitate or replace the infrastructure to ensure the long-term performance of our assets

Implement projects or programs that are justified through cost savings

Our Capital Expenditures are Enablers for successfully meeting our customers needs

Asset Investment Strategies

Capital Investment Strategy Statement:

- Capital Investment and Environmental Benefit
- Capacity
- Regulatory Compliance and Water Quality Goals
- Reliability and Quality of Service
- Renewal of Network Assets
- Renewal of Business Support Assets
- Renewal of Supply and Treatment Assets
- Operational Risk Management
- Efficiency

The tough questions in ALL of these areas are bought forward together

*Through Asset Investment Strategies,
we put all the questions on the table at once*

Should we pay a little more for a solution that uses “green energy”?

How much should we spend on Partnership and other voluntary goals?

How quickly should we refurbish our old facilities?

Which is higher priority – a new main serving the nursing home, or an emergency generator for the treatment plant?



Some Questions a “Renewal of Network Assets” Strategy would address

How much will it cost to reduce non-revenue water and the number of breaks?

Are we spending the right amount on pipeline replacement? Are we facing a large deferred cost?

The main under the river has never failed...but it's indispensable. Should I replace it now?

What level of IT spending is necessary for optimum management of our assets?



Should each district use the same trigger for investing in infrastructure renewal?

Renewal of Buried Infrastructure



- Buried infrastructure renewal plan should be based on performance of the asset, not just age
 - Break history, damage claims, water quality problems, non-revenue water, etc.
 - A backlog of priority projects generally still exists
- In most locations, in upcoming years, infrastructure renewal investment will still be based on high priority asset failure projects
- The amount of pipelines reaching the end of their useful life is accelerating; even with aggressive and effective pipeline renewal programs, there is no guarantee that non-revenue water and main breaks will decrease

Comprehensive Planning Studies

- Engineering analysis and report identifying needed capital improvements
- Conducted for the local service area individually
- Uses defined Planning Criteria, based on Asset Investment Strategies
 - For example, what level of service will we provide in the event of a power outage?
Flood? Drought? Fire?
- Brings together input from key internal stakeholders – engineering, operations, management, finance, environmental, etc.
- Includes:
 - Demand Projections
 - Source of Supply analysis
 - Treatment facility analysis
 - Pumping and storage analysis
 - Distribution system analysis – including hydraulic modeling
- Results in list of needed major capital improvements for the service area

Prioritization Model

- A tool to enhance the decision making process.
- Each potential project scored against eight (8) criteria.
- Aligns Capex with core service goals.
- Provides consistency.
- Projects ranked objectively.
- Engages multiple functional groups (i.e. Production, Distribution, Water Quality, Customer Service, etc.).
- Helps avoid improper prioritization of the ‘squeaky wheel’ projects.

The Model is a Tool to help but not replace proper professional judgment

Table 2 - Evaluation Criteria

Criteria No.	Evaluation Criteria	Criteria Weight	Criteria Description
1	Provide Reliable Service/Prevent Disruptions	85	Provides Continuous Reliable Service and/or Prevents Service Disruptions
2	Provides Adequate Capacity / Promotes Growth	85	Ensures Adequate Source and/or Production Capacity and Supports System Growth
3	Improve Customer Satisfaction-Water Quality	70	Improves Water Quality to Increase Customer Satisfaction
4	Improve Customer Satisfaction - Pressure	65	Improves Low or High Customer Service Pressures
5	Improves Fire Protection	60	Improves Available Fire Flow and/or Increases Available Storage Volume
6	Reduction of Op. costs and/or NRW	50	Reduces risk/liability to company and/or reduces NRW
7	Attains Regulatory Compliance	100	Achieves Partnership Goals, Regulatory Compliance, and/or Current and Potential Standards
8	Enhances Safety - AW personnel and/or public	65	Enhances a Safe Work Environment and Improves Community Safety and System Operations

Table 3 - Project Scoring Guidelines

Criteria	Weight	Impact	Score
Provides Reliable Service / Prevents Disruption	85	No Impact	0
		Avoids Potential Service Disruption (1-9):	
		Low Probability of Occurrence / Low Impact	1
		Med Probability of Occurrence / Low Impact	2
		High Probability of Occurrence / Low Impact	3
		Low Probability of Occurrence / Med Impact	4
		Med Probability of Occurrence / Med Impact	5
		High Probability of Occurrence / Med Impact	6
		Low Probability of Occurrence / High Impact	7
		Med Probability of Occurrence / High Impact	8
High Probability of Occurrence / High Impact	9		
Affects Critical Customer (hospital, nursing home)	10		
<p>Definitions - this category: <i>Low Probability of Occurrence: no historical main breaks or facility outages, facility in good condition</i> <i>Med Probability of Occurrence: 1-3 historical main breaks; 1 - 3 outages per year</i> <i>High Probability of Occurrence: >3 historical main breaks; > 3 outages per year</i></p> <p><i>Low Impact: <25 customers affected; no critical customers</i> <i>Medium Impact: 25-100 customers affected; no critical customers</i> <i>High Impact: >100 customers affected; no critical customers</i></p>			

Asset Management

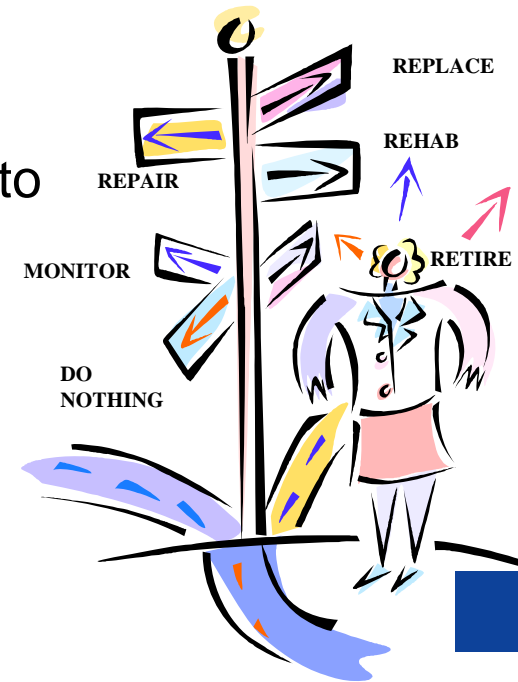
Definition:

Asset Management is a systematic process to obtain the maximum value from physical assets. The operational definition is stated in terms of the components of value – the costs and benefits of ownership: managing assets to minimize the total costs of owning and operating them while delivering the level of service that customers desire.

-American Water Works Association

Asset Management

- Know your assets
- Know their condition
- Maximize the duration and quality of performance to meet customer standards
- Be prepared for asset failures
- Provide mitigation for high risk failures
- Plan and implement orderly replacement of deteriorating assets



Know your assets

- Inventory should be complete, accurate, and up-to-date
- Optimize opportunities (e.g., main break repair) to gather information
- Data systems should be integrated to allow efficient, effective analysis and reporting



Know your assets: Some Challenges Facing Water Utilities

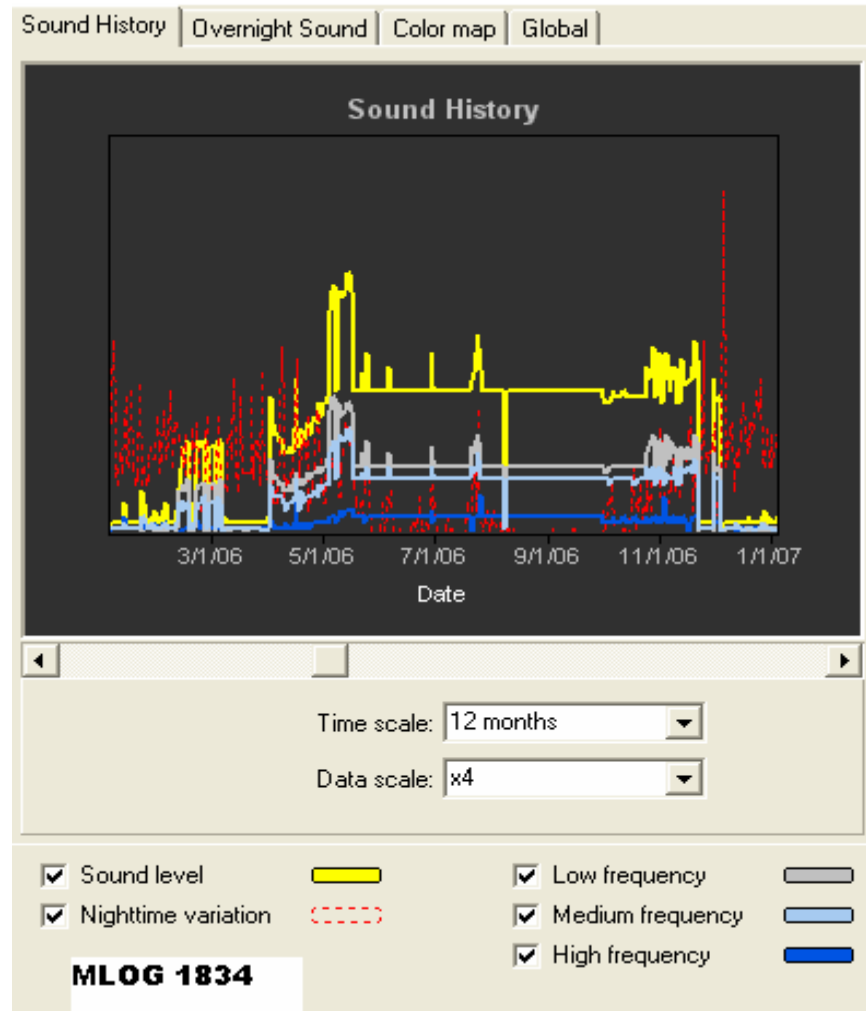
- Water and wastewater is a fragmented industry in the U.S.
- Consolidation, including acquisitions of non-viable systems, present challenges due to varying condition of data, differences in software and data collection practices.
- The task of collecting, validating, & maintaining data is huge. Individual assets total in the millions.
- The need to automate, integrate and enhance IT systems is significant.

Maximize the duration and quality of performance

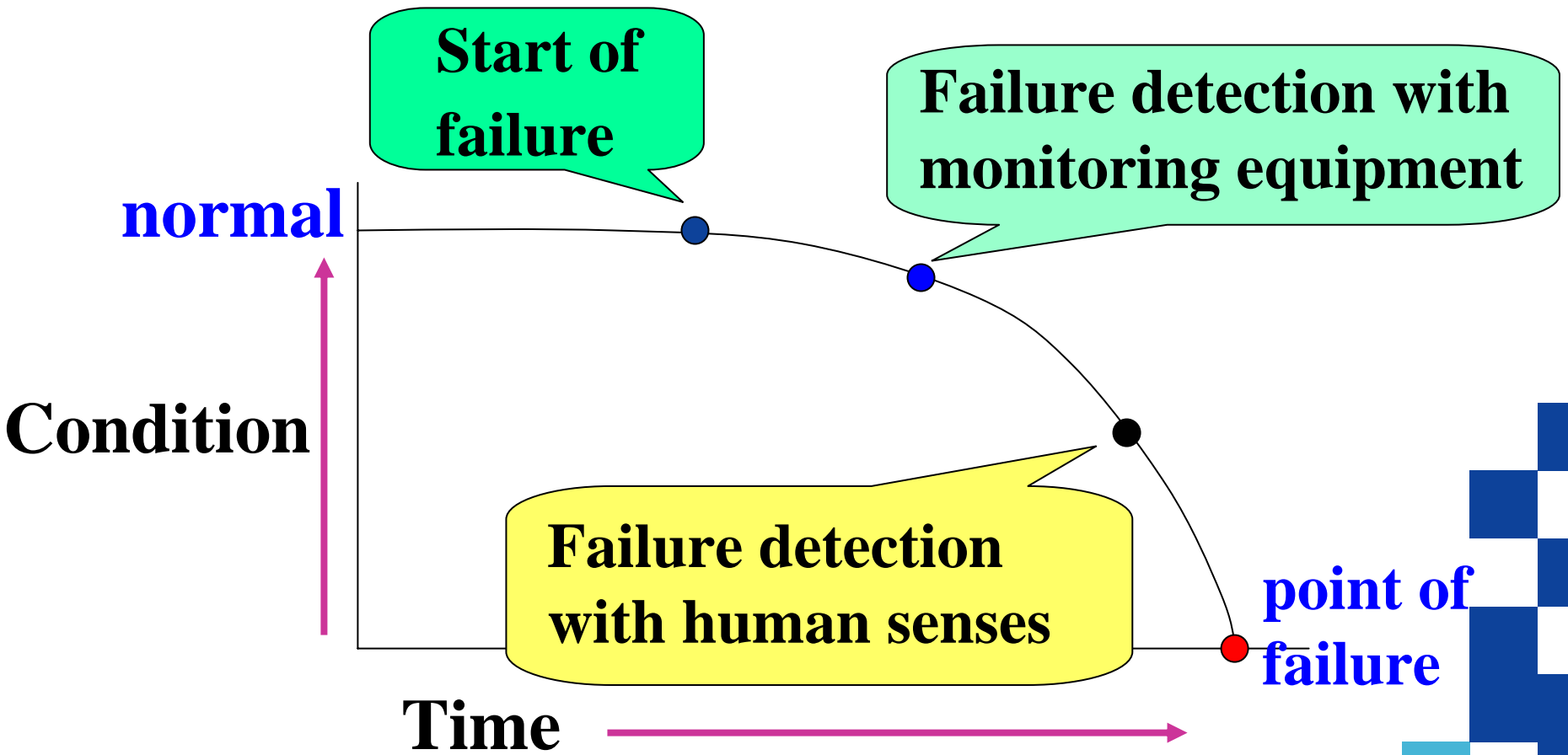
- Use life lengthening rehabilitation and preservation techniques where practical (pipe lining rehabilitation, cathodic protection)
- Use predictors of failure

Example: Leak Monitoring

AW has begun using innovative techniques to monitor pipelines acoustically every day to spot leaks before they become serious breaks.



Condition - Failure Curve

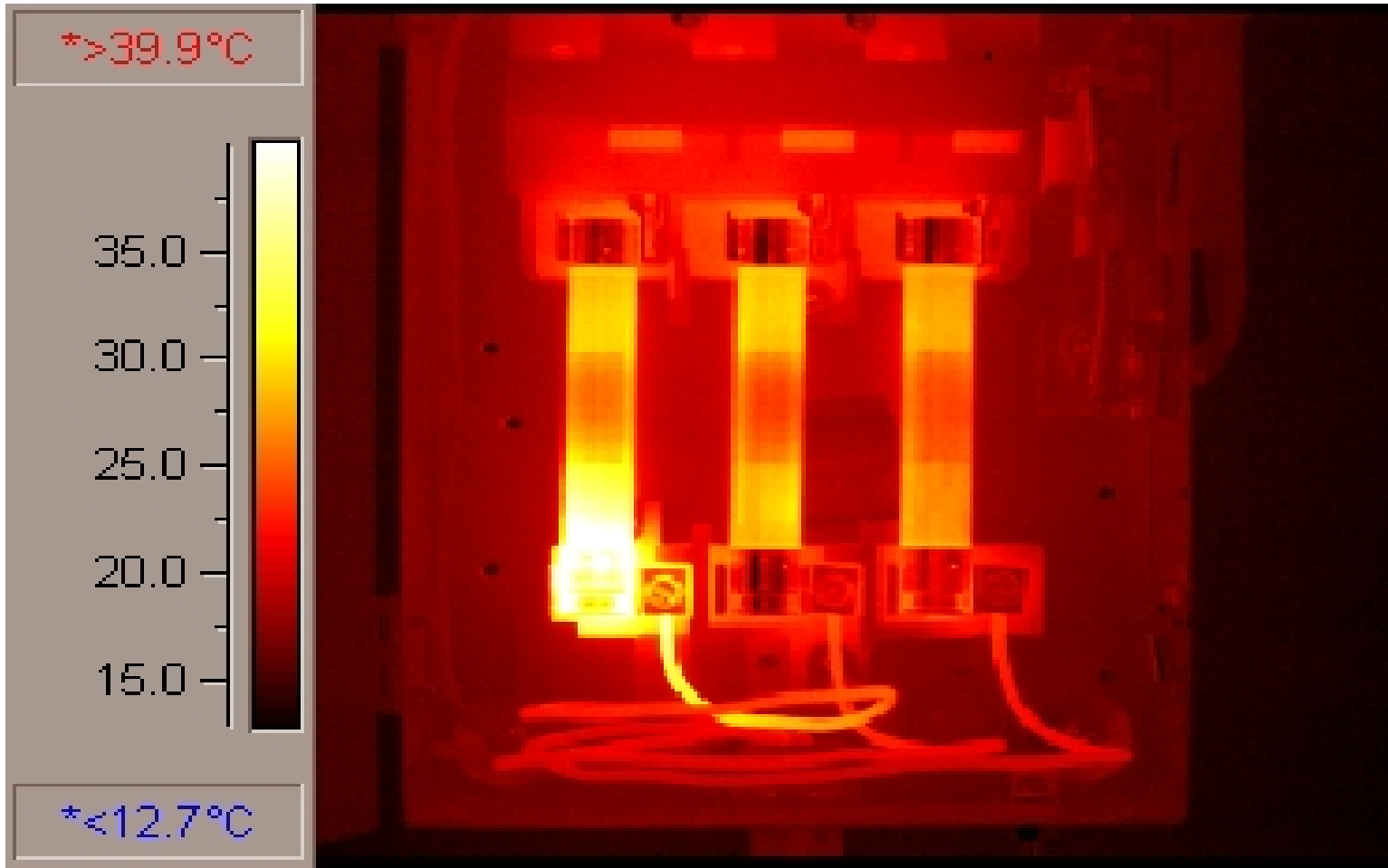


Asset Management: Conditioned Based Maintenance

Promising technologies include:

- **Instrument verification and calibration**
- **Vibration analysis**
- **Thermographic (infrared) inspections**
- **Ultrasonic leak detection – elect./mech./psi**
- **Motor winding inspection and analysis**

Asset Management: Thermography – Infrared Imaging



Annual Maintenance Cost Per Horsepower for the Four Maintenance Strategies

RCM \$6

Systematic approach of root cause analysis and defining maintenance requirements for components in a system - Maintenance efforts are based on the consequences of failure.

Predictive \$7-9

Systematic approach of regular machine monitoring to determine machine condition. (Conditioned Based)

Preventive \$11-13

Time scheduled tasks performed to minimize the risk of operational failure.

Reactive \$17-18

(Run to failure) - Equipment is allowed to run until failure when it is repaired or replaced.

Reference: O&M Best Practices - A Guide to Achieving Operational Efficiency by Pacific Northwest National Laboratory for U.S. Department of Energy, December 2002, Chapter 5.

Be prepared for asset failures that affect performance

Redundant systems, spare parts, and emergency planning should be part of a complete asset management operation plan

Main breaks occur at the least desirable times like cold weather periods

Why Cold Weather?

- o Cold temperatures change soil characteristics and increase transmission of surface loads to pipe below.
- o Cold weather affects systems supplied by surface water more significantly. Differences between temperature of treated water in pipelines and soil around pipe stress pipe. Water expands as it approaches freezing, placing additional internal stress on pipe.

Provide monitoring, assessment and mitigation for high risk failures

- Recent experiences with pre-stressed concrete pipe highlight need for assessment investment in large pipes before committing to large capital program
- Contingency plans such as pipe rerouting plans, secondary pipelines, valve shut-down plans, hydraulic modeling, should be in place for critical assets.

Plan orderly replacement of deteriorating assets

- Short term implementation plan must examine performance factors, consequences of failure, assessment data, relevant indicators, and opportunity to coordinate with other activities (e.g., street paving).

- Long term strategic plan needs to forecast the remaining lifespan of various types and ages of pipe.

Some Closing Thoughts on Capital Planning and Asset Management

- Top-down strategic planning and bottom up assessment of needs are both necessary components of effective capital planning
- Water companies must set out criteria for planning and a methodology to assess competing needs
- Information technology will be a key part of effective life-cycle management of our assets
- A long term commitment to ongoing asset maintenance, repair and replacement will be needed to continue to provide high quality service to our customers

Thank You!

Comments?

Questions?