



REMEDY PERFORMANCE REPORTING

driving remediation system optimization and site progression

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Agenda

- A Programmatic Approach to OM&M
- Field Data and Optimization
- Key Performance Indicators (KPIs)

A PROGRAMMATIC APPROACH

establishing a framework

Types of OM&M Projects

Groundwater extraction
Vapor extraction
Air sparging, biosparging
Multi-phase extraction
NAPL recovery
Vapor mitigation
ISCO and ozone sparging
Storm/ surface water treatment
Leachate recovery and treatment
Landfill gas management

Soil cap
Barrier wall
(sheet piling)
Permeable reactive
barriers
Landfill cap
Phytoremediation
NAPL sorbent socks
MNA

ISCO
ISCR
Bioremediation
MNA
Surfactant
In-situ activated carbon
Dewatering
Vacuum truck programs

Active (Mechanical)



Passive (Non-mechanical)



Other (Short-term, temporary)



OM&M Program Benchmarking

Program Element	Major Oil	Major Oil	Major Oil	Divers. Mfg	Major Oil	Aero. Mfg	Chem. Mfg	Pipeline Co.	Power Utility
Defined OM&M Practices									
Defined Work Scopes / Units									
Defined MOC Processes									
Performance Scorecards									
MMS									
Defined Technical Reporting Requirements									
Defined Financial Reporting Requirements									
Formal Site Review / Audit Process									

OM&M Priority Benchmarking



Remediation introduces immediate risks that were not present prior to implementation.

Why is Management of Change Important?

Changes occur during OM&M

- Often less rigorously evaluated and reviewed
- May be “field determinations”
- Introduces new or different risks
 - > Injury to site workers
 - > Permit non-compliance
 - > Loss of treatment efficiency
 - > Exceed design flow rates
 - > Damage to equipment



Audits and Peer Reviews

Safety & Compliance Audits

- Internal and/or third party
- Avoid injury and related costs
- Avoid downtime
- Avoid regulatory and public scrutiny:
 - > Consent orders, permit non-compliance
 - > Re-work

*Engage stakeholders in the process.
Assign action items and accountability for
further vetting and/or implementation.*

Peer Reviews

- Get new perspectives on languishing issues
- Break status quo for continuous improvement



FIELD DATA AND OPTIMIZATION

working together

Workflow Proces

The screenshot displays the eMent Enterprise software interface. The top section shows 'Meter Readings' with a table of data. Below this is the 'PM Schedules' section with a table of maintenance tasks. At the bottom is a detailed work order form for 'Air Compressor 90 Day Service'.

Tran ID	Date Taken	Taken By	Meter Reading
40Q0M2B4N	09/13/2014	WIC	190
40Q0M3ZVP	09/13/2014	WIC	200
40Q0M0V6	09/13/2014	IMPORT	200

Asset ID	Product	Calendar Based Freq.	Calendar Type	Brief Description	Last PM Date	Last PM Work Order No.	Hours	Assign To
01	1.00	1.00 Months	Static	Monthly Sump-Pump and Basin Check	01/24/2020	06/21/2013	1196	1.00 ABC Company (Tom Jefferson)
01	0.00	N/A	Static	LUBRICATION			0	0.00 The Green-Wilcoff (Cauldwell)

Work Order Details:

WO No: 103
WO Date: 05/26/07
WO Type: P/I
Status: H
Completed Date: 06/21/07
Downtime: 0

Sched. Date: 05/26/07
Est. Hours: 2
Asset ID: 1003
Asset Description: Compressor, Air
Building: Main
Floor: Ground
Request #: 06/26
Requested By: P.M. Schedule
Assign To Type: Employee
Assign To: Acme Company (Jeff Werth)

Brief Description: Air Compressor 90 Day Service

Work Description:

1. Perform normal tour checks and operations.
2. Change compressor crankcase oil.
3. Clean air intake filter.
4. Check air dryer, automatic condensate drains, and air tank for proper operation. Clean condenser coils and cover grill.
5. Inspect belt alignment and condition. Adjust or replace belts as required.
6. Check for corrosion and scale on water cooled units.
7. Clean heat exchange surfaces.
8. Check accuracy of gauges with calibrated test gauge.
9. On two stage compressor, check intermediate pressure.
10. Test relief valves, replace if leaking or the relief range is incorrect. Do not readjust safety relief valves in the field.
11. Check operation of compressor unloaders, repair or replace if not loading and unloading properly.
12. Check compressor suction and discharge valves for proper operation. Replace leaking valves.
13. Check cut in and out compressor pressure controller, readjust if necessary for proper air pressure requirements. Do not exceed ASME maximum tank pressure.
14. Check to make sure belt guard is installed prior to putting air compressor back in service.
15. No pressure vessel is to have its hand hole or man hole covers removed unless the vessel is at atmospheric pressure.

Work Order Preparation

Fieldwork Scheduling

Deliverable Tracking

Document Management

V&V

Work completed

Deliverables
submitted

Permit
compliance

Select System Data

Flow rate	NAPL thickness	Operator hours	Process data (pressure, flow)
Mass flow rate	Mass recovered	Utility costs	
NAPL recovery rate	COC concentrations	Uptime	Chemical usage rate
Pore volumes recovered	PID and LEL	Sustainability factors	Equipment hour meter
Groundwater geochemistry	Groundwater elevation	Waste generation	Permit compliance data

Every piece of data collected should be used.

Timely review data and trends.

If data is not being used,

- 1. Should it be used?*
- 2. Is it valuable for later use?*
- 3. Should it be collected?*

Remedial Process Optimization (RPO)

Remedy Optimization

Protective of human health and environment

Hydraulic control and plume capture

Subsurface barrier

Groundwater extraction system

Contaminant concentrations
in soil and groundwater

Stabilization, reduction

Vapor intrusion mitigation

Soil cap condition

Permit and regulatory compliance

Process Optimization

Flow rates and pressure

Process stream chemistry

Contaminants, pH

Equipment cycling rates, condition, life cycle

Treatment train effectiveness and necessity

Chemical/consumable usage

Waste generation volume and frequency

Data collection needs

Field

Laboratory

Control logic appropriateness

Process safety management

Industry Optimization Approaches

- Traditionally viewed as separate from OM&M
 - > Defined process
 - > Holistic review of remedy success/progress
 - > Cost review
 - > Treatment train evaluation
 - > Safety review
- Increasingly considered part of OM&M
 - > Some have defined process
 - > Expectations often less clearly defined
 - “Reduce cost”
 - “Site progression”
 - > May be expected as “value-added” service

*Ensure remedy performance is routinely monitored and continuously improved.
Optimization almost always leads to the need to implement a management of change process.*

KEY PERFORMANCE INDICATORS

selecting the right metrics

Performance Metrics: KPIs

defining objectives and measuring performance

Program KPIs

- Health and safety
- Regulatory compliance
- Schedule compliance
- Financial & cost savings
- Project progression
- Peer reviews
- System performance
- Optimization

Site-specific KPIs

- Operating as designed
- Mass removed / treated
- Uptime
- Carbon footprint
- Inspections

Select remedy performance KPIs that provide a quantitative measure of remedy performance toward remedial goals.

KPI Selection

- If met, site will reach remedial goals in the predicted time
- Evaluate the rate at which the site is remediated
- Benchmarked against established standards
- Specific to a site, system, and a remedy
- Defined prompt action plan for deficiencies

Uptime

- Good first look
- Identify problematic systems or trends
- Always tracked but minimal diagnostic value

Mass Recovery

- Track as total mass, rate, or \$/lb
- Value dependent on initial mass estimate
- Tracking by well or area useful

Supplemental KPIs

- Specific to a given technology and site
- Targeted to evaluate rate at which system is achieving remedial goal or evaluate key operational parameters
- Monitor changes in regulations and site use

SVE Examples

- Pore volume exchange rate at maximum ROI
- O₂ and CO₂ concentrations
- Vadose zone temperature changes
- Respiration test data

LNAPL Recovery Examples

- Actual vs. predicted recovery rates
- Recovery per unit area
- Changes in transmissivity at recovery and monitoring wells
- Apparent thickness (often regulatory closure criteria)

Key Takeaways

- Build “fit for purpose” OM&M program
 - > Safety, cost, change management, and KPIs
- Use independent “fresh eyes” reviews to share best practices, highlight innovation, and continuous learning opportunities
- Select useful OM&M data to collect
- Optimization is change
- Standardize performance tracking, but allow flexibility in site-level implementation

A GOAL
WITHOUT A
PLAN IS JUST
A DREAM.

-dave ramsey

Thank you.

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