Reliability Centered Maintenance (RCM) Program Update

6/29/2023

Madison Metropolitan Sewerage District

What is RCM?

Not That Way	This Way
Crews know work assignments the night before or even day of the job	Know the critical work to be done 1 week +
Tech makes educated guess on parts, tools, and materials. Makes trips to and from site to verify.	Job has a plan developed based on past work and history by Planner
Tech spends time gathering materials. Some parts are not in stock, need to order.	Materials are pre-staged and ready. Work is not scheduled till parts are delivered.
Techs are pulled of job to address emergency and other asks in the plant. Emergencies are considered normal.	Emergencies and support requests are prioritized against current work. Emergencies addressed but analyzed to prevent in future.
Tech makes notes of learnings for personal use	Tech files learnings in CMMS so others can learn and use

RCM Strategy

1. **Efficiency and Data Integrity**
   - Get more work done
   - Standardize Process - Have data to make better decisions

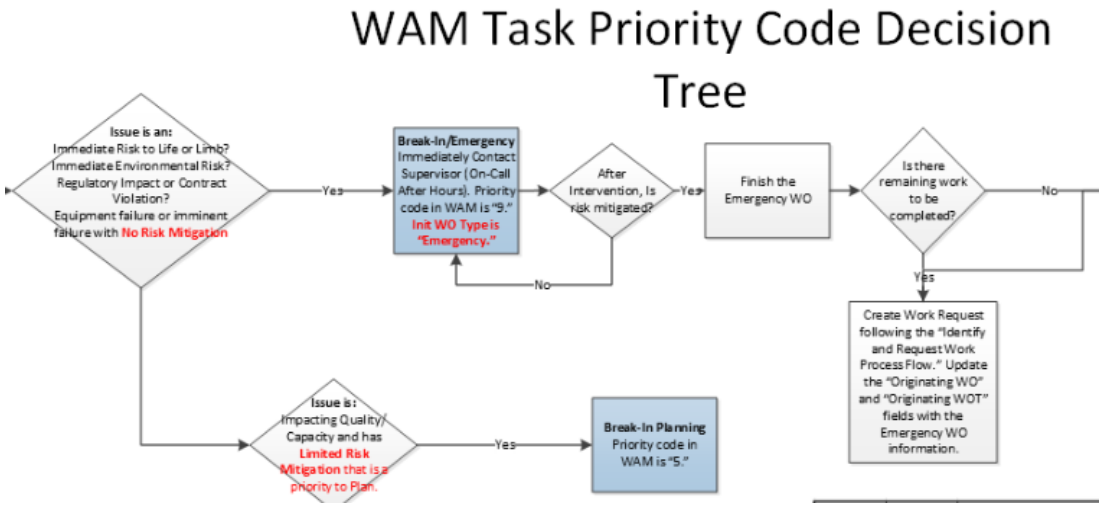
2. **Effectiveness of work to impact Strategic Focus Areas**
   - Shift more work to before catastrophic failure
   - Safer, Less Risk to Process, Less $$

Efficiency & Data Integrity: WAM Process Rollout

- User Requirements = Existing WAM functions
- Functions fail because:
  - No process
  - Lack of training
- Establishing process is key to the next system

Processes Established

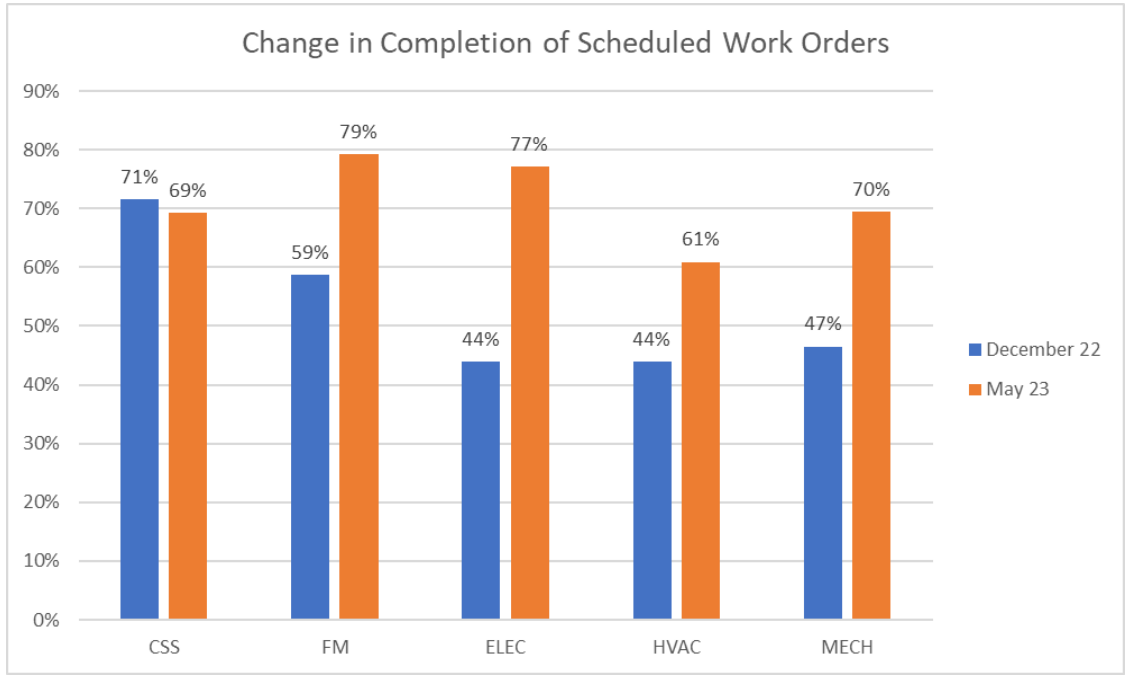
- Work Order Management (Our Maintenance Backlog)
  - Identify, Approve, Plan, Schedule, and Execute Work
- Spare Parts Management
  - Create, Modify, Obsolete, Inactivate, Quoting/Purchasing/Receiving
- Asset Management
  - Retiring Assets, Project Asset Commissioning



Efficiencies Realized – Work Management

CED/Executive Team-Level Focus Items

Status	Focus Item	2023 Deliverable(s)	Comments
◎	**RCM Improvements**	Two positions for full-time planning; implement workgroup task scheduling with key performance indicators (KPIs).	Two maintenance planner positions were filled within the Reliability Process workgroup in January.



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Efficiencies Realized - Inventory

- Reorder Point Analysis
- Economic Order Quantity
- Measure Results & Take Action

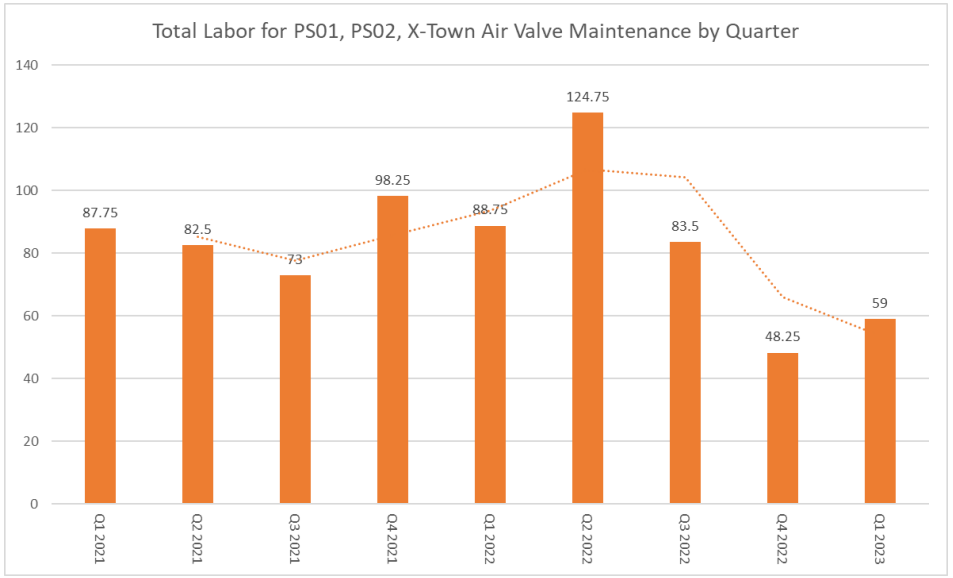
Reorder Quantifications			
Category	**Quantity of Reorders per Year**	**Annual Cost of Reorders (Parts and Labor)**	
Current Reorder Points in WAM	938	$ 405,329.44	
Agreed to ROP Changes	433	$ 365,637.44	
Difference	-505	$ (39,692.00)	*Annual Cost Avoidance. Not a true savings but a cost avoidance. This is labor value that can be spent on other activities.
Inventory Quantifications			
Inventory Quantity Change	1194	*This is a net change of the quantity in WAM. Not perfect as some items are purchased in a kit, by the foot, etc.	
Inventory Value Change	$ 125,285.80		
Years to Recuperate Inventory Value Change	3.16		

Effectiveness

- Root Cause Analysis (RCA)
- Failure Modes and Effects Analysis (FMEA)
- Predictive Maintenance (PdM)

Root Cause Analysis - Results

- 17 received training in Q2 2022
- 6 total analyses completed
  - Air Valve Grease Plugging
  - Scum Line Grease Plugging
  - Flow Meter Transducer Fouling
  - Leaking Sludge Transfer Line
  - Headworks Slide Gate Failure
  - Engine Shutdown
- 4 have shown positive impact to results!



Root Cause Analysis - Headworks Screening

Failure Modes and Effects Analysis (FMEA)

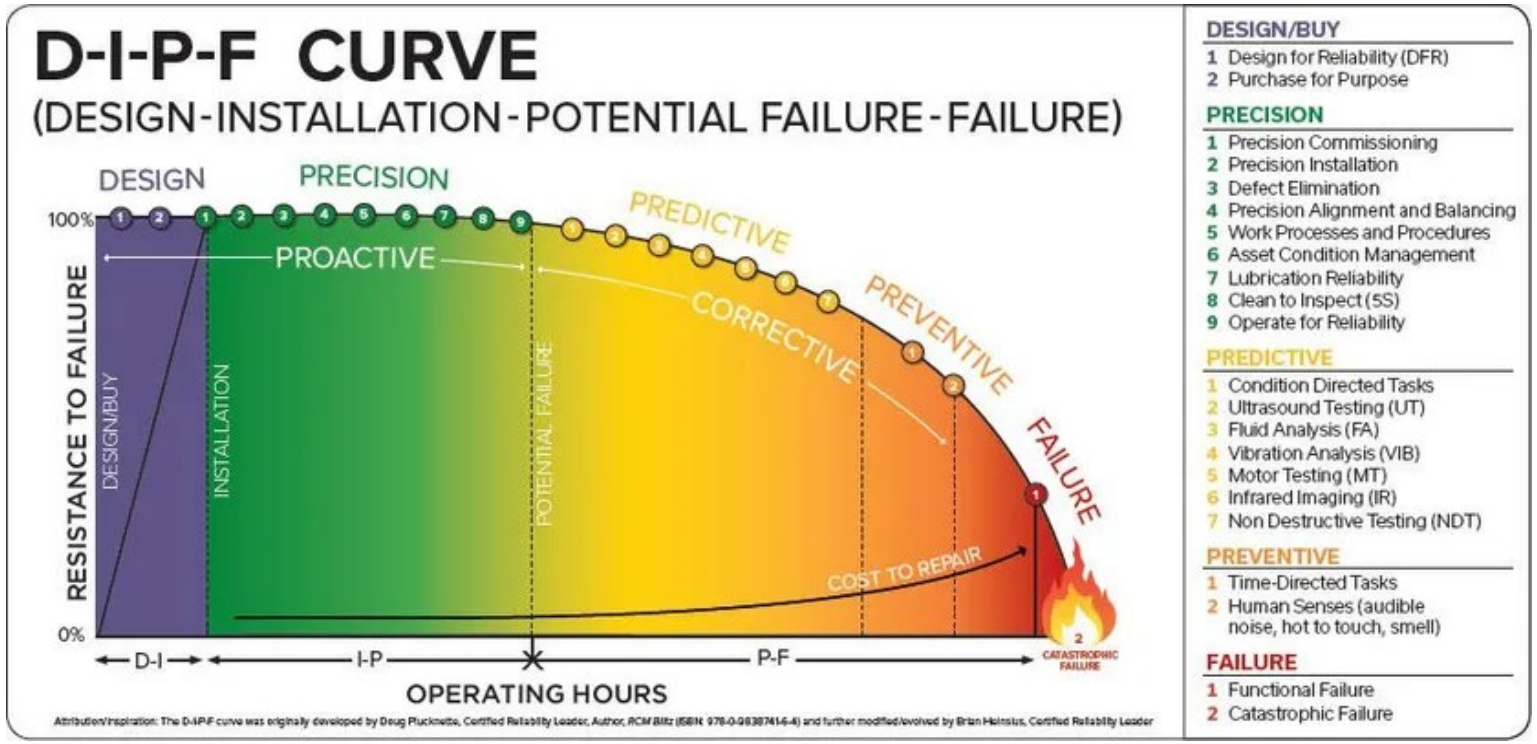
- What are our assets that fail most often, and cost most to maintain?
- What are all the ways that asset can fail?
- Can we change that?
  - Engineer out
  - Predictive Maintenance
  - Preventative Maintenance

Materials and Service Cost Savings Calculation - Critical Plant Pumps (2018-2022)		
	Current	Expected
	96	96
Mean Time Between Failure (MTBF)	2.9	4
Failures	33	24
Failure Rate	34%	25%
Average Cost per incident	$ 2,318.96	$ 2,318.96
Cost reduction due to PdM. No ancillary damage or rushed parts.	0%	20%
Average Cost per year	$ 76,765.67	$ 44,524.09
10 year savings	0	**$ 322,415.79**

Labor Savings Calculation		
	Current	Expected
	96	96
Mean Time Between Failure (MTBF)	2.9	4
Failures	33	24
Failure Rate	34%	25%
Average Labor / Event	13	13
Cost reduction due to PdM. No ancillary damage or rushed parts.	0%	20%
Average Labor / Year	430	$ 250
10 year savings in Labor	0	**1807**
10 Year savings in labor cost	0	**$ 135,558.62**

https://www.waterworld.com/wastewater/treatment/article/16191867/improving-pump-component-reliability-to-optimize-mean-time-between-failure

Predictive Maintenance (PdM)



https://reliabilityweb.com/articles/entry/the-reliability-impact-within-the-p-f-curve

What’s Next for the Program?

RCM Impacts each Performance Area

Objectives for 2023

- Continue RCA
- First FMEA started this Month – Moyno and Borger Pump Units
- Continued Process Improvement
- PdM Training and Technology

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Thank you

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