CLASSICAL RCM PILOT STUDY

PILOT No. 1 and 2
Main Pumping Station Screening System
Main Pumping Station Pumping System

June 21, 2018

Presenters:
Kenrick St. Louis and Gregory Stephens

Moderator: Gian Cossa
CWEA Plant O&M Committee
SAFETY MOMENT

• Doors across the facility
  • You can’t see when somebody is going to come barging through a door
  • Be mindful if you are standing on the swinging side of the door
  • Open doors slowly as a precaution
INTRODUCTION

• What is RCM?
  • RCM – Reliability Centered Maintenance – is a comprehensive, systematic, and structured approach to develop an efficient and effective maintenance plan to minimize the probability that our assets fail.

• Why RCM?
  • RCM is labor and time intensive – but it is considered the industry’s best approach to maintenance.
RCM TEAM

DDCS RCM Sponsors
Biju George, Charles Kiely, Charles Sweeney

DDCS RCM Team
Carlos Almeida
Greg Stephens
Dwayne Jones
Calvin Smalls
Everald James
David Gisborn

CH2M
John Fortin

AMS Group
Mac Smith

CBM Consultant
Jack Nicholas

RCM Consultant
Nick Jize - JMS

DETS
Gian Cossa

Kenrick St. Louis
Quinton Jones
Sam Banks
Victor Edozie
Phil Higgins
Keith Watts
TEAM INTRODUCTION

Enthusiastic team with great participation and commitment!

- Victor Edozie – Maximo Administrator
- Calvin (CJ) Smalls – Lead Mechanic
- Everald James – Planner/Scheduler
- Keith Watts – Operations Foreman
- Charles Sweeney – Director, DDCS
- Gregory Stephens – Operations Foreman
- Nick Jize – RCM Facilitator
- Dwayne Jones – Acting Foreman, Electric Shop
- Carlos Almeida – Manager, Maintenance
- Jack Nicholas – CBM Expert
- Quinton Jones – Instrumentation Technician II
- Phil Higgins – Reliability Maintenance Supervisor
- Gian Cossa – Asset Manager, DETS
- David Gisborn – DDCS Operations
- Kenrick St. Louis – Manager, Operations
- John Fortin – CH2M
- Sam Banks – Planner/Scheduler
- Anthony “Mac” Smith – AMS Associates and “RCM Guru”
OBJECTIVES

• Establish a framework for DDCS to improve Maintenance efficiency and functional reliability of assets
  • Approach focus:
    • People
      • Training and Mentorship
      • Changing the cultural prospective
      • Increase cooperation and communication between Operations & Maintenance
    • Process
      • Reliability Centered Maintenance Approach
      • Computerized Maintenance Management System (CMMS)
      • Standard Operating Procedures (SOPs)
    • Equipment and technology
      • Condition Based Maintenance (CBM)
      • Predictive Maintenance (PdM)
      • Understand the complex interactions between assets.
  • Alignment with Blue Horizon 2020 Strategic Goals
  • Prevent the occurrence of catastrophic failures by developing and implementing a cost-effective maintenance program
• How are we using RCM?
  • A core team has been meeting to apply the RCM process to Main Pumping Station.
  • The team consists of an Electrician, Mechanic, Instrumentation tech, Operator, Planners, Consultant, Scribe, and management support.
  • We will continue to apply RCM process to other stations.
• What do we get from RCM?
  • New PMs.
  • Changes to existing PMs.
  • Assets and tasks for Condition Based Maintenance.
  • A selection of assets we determined to Run to Fail.
  • Operator inspection items.
  • A more reliable station!!
What makes up a RCM Study?

• Seven key questions:

1. What are the functions and associated desired standards of performance of the asset in its present operating context (functions)?
2. In what ways can the asset fail to fulfill its functions (functional failures)?
3. What causes each functional failure (failure modes)?
4. What happens when each failure occurs (failure effects)?
5. In what way does each failure matter (failure consequences)?
6. What should be done to predict or prevent each failure (proactive tasks and task intervals)?
7. What should be done if a suitable proactive task cannot be found (default actions e.g. run to failure)?
HOW WE DID IT

- Training – AMS Associates
- Used JMS Software
- Facilitation & Mentoring - AMS Group
1. System Selection

Main Pumping Station
Screening System for pilot #1
Pumping System for pilot #2
2. System Boundary Definition
3. System Description and Functional Block Diagram
WHAT WE DID

Classical RCM

• Selected the Classical RCM Process to conduct a pilot study
  • Classical - Mimics very closely the original Study Format conducted by United Airlines in the early '60s for the 747 airplane

• Four RCM Principles
  • Preserve system function
  • How are functions defeated (failure modes)
  • What are the priorities
  • For high critical failure modes
    • Define applicable tasks
    • Select most effective one
### 4. System Functions and Functional Failures

<table>
<thead>
<tr>
<th>Function/#</th>
<th>Function/Functional Failure Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.0</td>
<td>Remove large debris and allow flow of up to 240 MGD (Firm Capacity)</td>
</tr>
<tr>
<td>01.1</td>
<td>Debris can not be removed so can not meet 240 MGD flow rate (Firm Capacity)</td>
</tr>
<tr>
<td>02.0</td>
<td>Efficiently remove debris from the building</td>
</tr>
<tr>
<td>02.1</td>
<td>Cannot efficiently remove debris from the building</td>
</tr>
<tr>
<td>03.0</td>
<td>Provide control signal to PLC</td>
</tr>
<tr>
<td>03.1</td>
<td>No signal provided</td>
</tr>
<tr>
<td>03.2</td>
<td>False signal provided</td>
</tr>
<tr>
<td>04.0</td>
<td>Allow sewer gases to escape from the channel</td>
</tr>
<tr>
<td>04.1</td>
<td>Gases cannot escape</td>
</tr>
<tr>
<td>05.0</td>
<td>Provide capability to manage flow and isolate sections for maintenance purposes</td>
</tr>
<tr>
<td>05.1</td>
<td>Cannot isolate sections of the station</td>
</tr>
<tr>
<td>05.2</td>
<td>Cannot manage flow</td>
</tr>
</tbody>
</table>

**Screening System**
- 5 Functions
- 7 Functional Failures

**Pumping System**
- 5 Functions
- 8 Functional Failures
7. **Task Selection**

- High Priority Failure Modes were Identified in Step 6
- For those High Priority Failure Modes, select the proper preventive maintenance action
  - Applicable: Can prevent, mitigate, detect onset of, or discover (if hidden) a failure mode
  - Effective: The least costly choice among competing applicable PM task candidates
- All tasks are Time Directed (TD), Condition Directed (CD), Failure Finding (FF), or intentional Run To Fail (RTF).
### Step 7-1: Selection Process and Decision

<table>
<thead>
<tr>
<th>Comp. #</th>
<th>Comp. ID</th>
<th>Component Description</th>
<th>F.M. #</th>
<th>Failure Mode</th>
<th>F.C. #</th>
<th>Failure Cause</th>
<th>Local</th>
<th>System</th>
<th>Plant</th>
<th>Safety</th>
<th>Candidate Task Description &amp; Effective Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>222804</td>
<td>PUMP, CENTRIFUGAL, (MP-SANP-04)</td>
<td>01.01</td>
<td>Worn, clogged Impeller.</td>
<td>01.01</td>
<td>Debris or age</td>
<td>Loss of efficiency of the pump</td>
<td>loss of pumping capacity</td>
<td>Cannot meet consent decree resulting in fines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02.1</td>
<td>01</td>
<td>222804</td>
<td>PUMP, CENTRIFUGAL, (MP 01.01)</td>
<td>02.01</td>
<td>Burnt out</td>
<td>02.01</td>
<td>Age, power surge</td>
<td>N</td>
<td>-</td>
<td>Y</td>
<td>Yes</td>
</tr>
<tr>
<td>02.1</td>
<td>01</td>
<td>222804</td>
<td>PUMP, CENTRIFUGAL, (MP 01.05)</td>
<td>02.01</td>
<td>Mechanical Seal Failure</td>
<td>02.01</td>
<td>Vibration</td>
<td>N</td>
<td>-</td>
<td>Y</td>
<td>Yes</td>
</tr>
<tr>
<td>05.1</td>
<td>03</td>
<td>211747</td>
<td>PUMP, SUMP, (MP-SP-01, 02)</td>
<td>05.1</td>
<td>Pump failure</td>
<td>05.1</td>
<td>Wear</td>
<td>N</td>
<td>-</td>
<td>Y</td>
<td>Yes</td>
</tr>
<tr>
<td>05.1</td>
<td>04</td>
<td>280148</td>
<td>VALVE, SWING CHECK, (MP 04.01)</td>
<td>05.1</td>
<td>Inoperable</td>
<td>05.1</td>
<td>Wear and Debris</td>
<td>N</td>
<td>-</td>
<td>Y</td>
<td>Yes</td>
</tr>
</tbody>
</table>
SIGNIFICANT FINDINGS
# RCM Systems Analysis Profile

For The Screening and Gates System

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsystem Functions</td>
<td>5</td>
</tr>
<tr>
<td>Subsystem Functional Failures</td>
<td>7</td>
</tr>
<tr>
<td>Components in Subsystem Boundary</td>
<td>49</td>
</tr>
<tr>
<td>Failure Modes Analyzed</td>
<td>128</td>
</tr>
<tr>
<td>• Critical</td>
<td>83 (65%)</td>
</tr>
<tr>
<td>• Non Critical</td>
<td>45 (35%)</td>
</tr>
<tr>
<td>• Hidden</td>
<td>69 (54%)</td>
</tr>
<tr>
<td>PM Tasks Specified (includes 47 RTF tasks)</td>
<td>158</td>
</tr>
<tr>
<td>Active PM Tasks</td>
<td>111 (70%)</td>
</tr>
<tr>
<td>Items of Interest</td>
<td>35</td>
</tr>
</tbody>
</table>

**Note:**
The details for the above topics are located in the “RCM WorkSaver” software that was completed by the RCM Team.
## Analysis Pilot No. 1

### PM Task Types – Comparison (By Failure Mode)
For The Screening and Gates System

<table>
<thead>
<tr>
<th>Task Type</th>
<th>RCM</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Directed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-Intrusive (TD)</td>
<td>38 (24%)</td>
<td>17 (11%)</td>
</tr>
<tr>
<td>• Intrusive (TDI)</td>
<td>20 (13%)</td>
<td>63 (40%)</td>
</tr>
<tr>
<td><strong>Condition Directed (CD)</strong></td>
<td>29 (18%)</td>
<td>5 (3%)</td>
</tr>
<tr>
<td><strong>Failure Finding (FF)</strong></td>
<td>27 (17%)</td>
<td>9 (5%)</td>
</tr>
<tr>
<td><strong>Run to Failure (RTF)</strong></td>
<td>47 (30%)</td>
<td>--</td>
</tr>
<tr>
<td><strong>None</strong></td>
<td>--</td>
<td>64 (40%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158 (100%)</td>
<td>158 (100%)</td>
</tr>
<tr>
<td><strong>Total Active</strong></td>
<td>111 (70%)</td>
<td>94 (60%)</td>
</tr>
</tbody>
</table>

- RCM Tasks have significantly reduced intrusive tasks and dramatically increased Condition Directed tasks.
- All RCM PM task categories contributed to this positive development.
# Analysis Pilot No. 1

## PM Task Similarity Comparison (By Failure Mode)
For The Screening and Gates System

<table>
<thead>
<tr>
<th>I</th>
<th>RCM Task = Current Task</th>
<th>11 (7%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>RCM Task = Modified Current Task</td>
<td>35 (22%)*</td>
</tr>
<tr>
<td>III</td>
<td>RCM Specifies Task, No Current Task Exists</td>
<td>39 (25%)*</td>
</tr>
<tr>
<td>IV</td>
<td>RCM Specifies Task, Current Specifies Different Task</td>
<td>25 (16%)*</td>
</tr>
<tr>
<td>V</td>
<td>RCM Specifies RTF, Current Task Exists</td>
<td>19 (12%)*</td>
</tr>
<tr>
<td>VI</td>
<td>RCM Specifies RTF, No Current Task Exists</td>
<td>28 (18%)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>158 (100%)</td>
</tr>
</tbody>
</table>

- A quarter (25%) of the study failure modes have no PM task currently (III).
- Another 22% of current task are significantly modified with some modifications documenting current tribal knowledge.
- RCM changes or modifies 75% of current program (*)
# ANALYSIS PILOT NO. 2

<table>
<thead>
<tr>
<th>RCM Systems Analysis Profile For The Pumping System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsystem Functions</td>
</tr>
<tr>
<td>Subsystem Functional Failures</td>
</tr>
<tr>
<td>Components in Subsystem Boundary</td>
</tr>
<tr>
<td>Failure Modes Analyzed</td>
</tr>
<tr>
<td>• Critical</td>
</tr>
<tr>
<td>• Non Critical</td>
</tr>
<tr>
<td>• Hidden</td>
</tr>
<tr>
<td>PM Tasks Specified (includes RTF)</td>
</tr>
<tr>
<td>Active PM Tasks</td>
</tr>
<tr>
<td>Items of Interest</td>
</tr>
</tbody>
</table>

**Note:**
The details for the above topics are located in the “RCM WorkSaver” software that was completed by the RCM Team.
### ANALYSIS PILOT NO. 2

<table>
<thead>
<tr>
<th>Task Type</th>
<th>RCM</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Directed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-Intrusive (TD)</td>
<td>34 (30%)</td>
<td>18 (17%)</td>
</tr>
<tr>
<td>• Intrusive (TDI)</td>
<td>18 (17%)</td>
<td>24 (22%)</td>
</tr>
<tr>
<td><strong>Condition Directed (CD)</strong></td>
<td>32 (29%)</td>
<td>4 (3%)</td>
</tr>
<tr>
<td><strong>Failure Finding (FF)</strong></td>
<td>12 (12%)</td>
<td>3 (3%)</td>
</tr>
<tr>
<td><strong>Run to Failure (RTF)</strong></td>
<td>13 (12%)</td>
<td>--</td>
</tr>
<tr>
<td><strong>None</strong></td>
<td>--</td>
<td>60 (55%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>109 (100%)</td>
<td>109 (100%)</td>
</tr>
<tr>
<td><strong>Total Active</strong></td>
<td>96 (88%)</td>
<td>49 (45%)</td>
</tr>
</tbody>
</table>

- RCM Active PM tasks almost **doubled** over current active PM tasks.
- RCM has a dramatic increase in Condition Directed Tasks over existing tasks.
## Analysis Pilot No. 2

### PM Task Similarity Comparison (By Failure Mode) For The Pumping System

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>RCM Task = Current Task</td>
<td>5</td>
<td>(4%)</td>
</tr>
<tr>
<td>II</td>
<td>RCM Task = Modified Current Task</td>
<td>24</td>
<td>(22%)*</td>
</tr>
<tr>
<td>III</td>
<td>RCM Specifies Task, No Current Task Exists</td>
<td>53</td>
<td>(49%)*</td>
</tr>
<tr>
<td>IV</td>
<td>RCM Specifies Task, Current Specifies Different Task</td>
<td>14</td>
<td>(13%)*</td>
</tr>
<tr>
<td>V</td>
<td>RCM Specifies RTF, Current Task Exists</td>
<td>6</td>
<td>(6%)*</td>
</tr>
<tr>
<td>VI</td>
<td>RCM Specifies RTF, No Current Task Exists</td>
<td>7</td>
<td>(6%)</td>
</tr>
</tbody>
</table>

**Total**: 109 (100%)

- About half (49%) of the study failure modes have no PM task currently (III).
- Another 22% of current task are significantly modified with some modifications documenting current tribal knowledge.
- RCM changes or modifies 90% of current program (*)
STUDY FINDINGS

• Both of the subsystems in pilot #1 and #2 reflect the need for two very important beneficial actions
  • Upgrade the selected PM tasks in the existing program to eliminate tribal knowledge as the basic procedure “modus operandi”
  • Add PM tasks to a large number of components that currently have no coverage to prevent possible failure modes
• Both of the Subsystems in Pilot #1 and #2 also suggest the need to progressively replace the large percent of the Time Directed Intrusive (TDI) PM tasks with the non-intrusive PM Technology available with use of the Predictive Maintenance Methodology (PdM)
Lessons Learned

Construction Views of the Pump Division, Showing the Pumps in Position and Piers to Support the Cylinders.
LESSONS LEARNED

• Consistent membership in the team proved to be very beneficial
• Highlighted the need for continual asset verification
• Just because you have a PM program does not mean it is effective
• Value of having a team made up of maintenance and operations
• Visits and encouragement from management was a motivator for the team
• Highlighted the critical need for documentation of SOPs (capturing tribal knowledge)
• Better knowledge of our systems and how equipment can fail
LESSONS LEARNED

• Work management process disconnect between what is expected and what is happening
• This is a real opportunity to improve the Maintenance program – we now see that we can influence change and are more optimistic about it – we view the cup as half full…
• Importance of taking time out from day to day responsibilities to focus on the study and improvement
• RCM process has provided an environment for information exchange between technicians that does not consistently occur
LESSONS LEARNED

• Specific Examples:
  • Sluice Gate G
  • Operating Sequence for lead and lag equipment (80/20) – potential savings of 60% on pump maintenance.

  Operate on a 12 week cycle
  • #1 pump is lead for 10 weeks
  • #2 pump is lead for 1 week
  • #3 pump is lead for 1 week
  • #4 pump tested and ran for approx. 1 hour every 3 months.
TASK TEAMS CREATED TO SUSTAIN MOMENTUM

Draft charters for the Steering Committee and Reliability Assurance Team
Steering Committee Charter
DDCS Operational and Reliability Excellence

Vision
To achieve world class Operational and Reliability Excellence

Mission
Provide strong leadership and personal commitment for the successful execution of Operations and Maintenance to deliver superior water and wastewater services at an excellent value.

Supporting Blue Horizon 2020 Strategic Plan objectives:
1. Achieve distribution system optimization to enhance water quality
2. Ensure compliance with sewer and water systems permits and regulations
3. Optimize the ratio of preventive versus corrective maintenance
4. Develop, Measure and evaluate specific indices of efficiency
5. Achieve top quartile asset management performance against benchmarks
6. Increase adoption of sustainability processes and programs
7. Increase adoption of innovative processes and programs

Key Activities:
- Establish strategic goals for Reliability Assurance, Asset Condition Monitoring, and Planning & Scheduling focus areas.
- Allocate resources for Operational and Reliability Excellence initiative.
- Sponsor and empower task teams.
- Attend task team meetings as applicable.
- Attend Steering Committee progress meetings.
- Review and provide timely feedback on progress, reports, and recommendations.
- Actively lead change to ensure acceptance of objectives, goals, and solutions.
- Develop and implement a framework to monitor and widely communicate progress, benefits, and results.
- Provide updates to Executive Sponsors
- Collaborate with industry leaders on best practices, and encourage innovation.

Executive Sponsors
Biju George
Charles Kiely
Charles Sweeney
Members
Carlos Almeida
Kenrick St. Louis
Samant Garg

Acknowledgement:
Reliability Assurance Team Charter

Vision
To achieve world class Operational and Reliability excellence through the application of state of the art Reliability Practices

Mission
Provide a core team of committed members to learn, practice, train, and implement world class Operational and Reliability Excellence.

Reliability Assurance Team Objectives:

1. Build on pilot RCM Analysis and ensure it’s implementation
2. Establish, document, and implement reliability best practices, procedures, measures, and continuous improvements.
3. Share knowledge with applicable staff to ensure business efficiency and continuity
4. Ensure that existing assets and new assets are protected by a proactive reliability assurance program to maintain high equipment and infrastructure reliability.
5. Acting in a steering capacity, specify and prioritize work team activities, assign resources, lead/ sponsor work teams, decide on policy recommendations from work teams, and monitor progress of work teams.

Team Leader
Kenrick St. Louis

Members
Sam Banks
Everald James
Dwayne Jones
Calvin Smalls
Quinton Jones
Gregory Stephens
Victor Edozie

Engineering rep (design) TBD

Key Activities:
• Select locations and conduct RCM Analysis.
• Implement new job plans, PMs, ACM tasks developed through RCM Analysis.
• Meet to track goals and objectives.
• Identify requirements for, and conduct, Root Cause Failure Analysis.
• Provide updates to the steering committee.
• Provide recommendations to training.
• Operate as the liaisons to appropriate branches.

Acknowledgement:
# One Year Plan Created

<table>
<thead>
<tr>
<th>TENET</th>
<th>DUE DATE (By end of)</th>
<th>ITEM OWNER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>Due by</td>
<td>Owner</td>
</tr>
<tr>
<td>RCM Champion – roles &amp; responsibilities</td>
<td>2017</td>
<td>Group select champion</td>
</tr>
<tr>
<td>ACM Champion</td>
<td>2017</td>
<td>Group select champion</td>
</tr>
<tr>
<td>RCM Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document “Process”</td>
<td>2018</td>
<td></td>
</tr>
<tr>
<td>PM Jon Plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM/PdM Strategies</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>CBM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBM Strategy Development</td>
<td>2018 1&lt;sup&gt;st&lt;/sup&gt; Quarter</td>
<td>Carlos</td>
</tr>
<tr>
<td>IOI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracking checklist</td>
<td>2017</td>
<td>David Gisborn/ Kenrick</td>
</tr>
<tr>
<td>Planning / Scheduling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading/ Understanding job plans</td>
<td></td>
<td>Ken</td>
</tr>
<tr>
<td>Maximo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work flow process (cradle to grave)</td>
<td>Ongoing (tweaks)</td>
<td>Victor</td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills assessment (up front)</td>
<td>December 2017</td>
<td>Carlos</td>
</tr>
<tr>
<td>Self or external?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metrics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Reliable and accurate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benchmarks / KPIs (Define)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Quarter 2018</td>
<td>RCM Team</td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Articles</td>
<td>2018</td>
<td>Anyone! (Gian Cossa to facilitate)</td>
</tr>
<tr>
<td>Supply Chain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor/ Contractor parts “lock in”</td>
<td>December 2017</td>
<td>Sam Banks / Everald James (ensure procurement co-op)</td>
</tr>
</tbody>
</table>
THE LIVING PROGRAM AND SUSTAINMENT

• RCM is a living program
  • RCM decisions should be revisited every 2-5 years
  • We will look to see if processes or technology has changed, as well as if our program is effective

• Develop and implement a 5 year masterplan
  • Created by task teams and reviewed annually
MEASURING PROGRESS
KEY PERFORMANCE INDICATORS

• WO types
  • PM  Preventive Maintenance Work Orders
  • CM_PM  WOs resulting from a PM tasks
  • CM_PdM  WOs resulting from a PdM tasks
  • CM_CS  WOs resulting from SCADA
  • CM_IN  WOs resulting from Operations routes
  • CM_RE  Unscheduled reactive work
  • PROJ  Project/Engineering Support
  • CM_STRM  WOs resulting from storm damage or response
    (recommendation)

• Recommended KPIs
  • % Reactive (by count) = CM_RE/(PM + CM_RE)
  • % Effective PMs (by count) = CM_PM/(PM + CM_PM)
  • % PdM effectiveness (by count) = CM_PdM/(PM* + CM_PdM)
  • % Storm Impact (by count) = CM_STRM/(PM* + CM_STRM)

*Only PdM PMs are counted
• Operations checklist – Capturing Tribal Knowledge and based on RCM Tasks
CONCLUSIONS

• Having the team put together and focused on RCM has yielded numerous positive results
• The process has spilled over into our day to day activities in positive ways. One example is increased cooperation between our groups
• The team is committed and excited to move forward with implementation and sustainment
• The RCM results point out the significance of where positive actions will be beneficial in streamlining our maintenance program with over 90% of the program experiencing some form of change
• The process has caused a paradigm shift in the way we think, talk, and conduct maintenance
• The group has become of like minds…