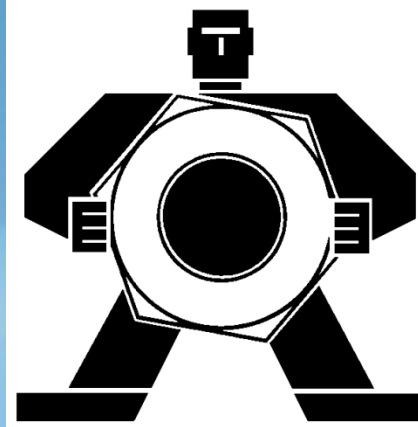


# RCM *Extension*

for  
MAXIMO



helps drive  
safety, reliability  
and productivity  
improvements  
for all industries.



## Cohesive Information Solutions Inc.

*Presented by  
Lance Morris and John Reeve*

**July 29, 2011**



# Presenters

## Lance Morris

Principal and cofounder of Cohesive  
Work Management Practice Lead and  
Solution Architect

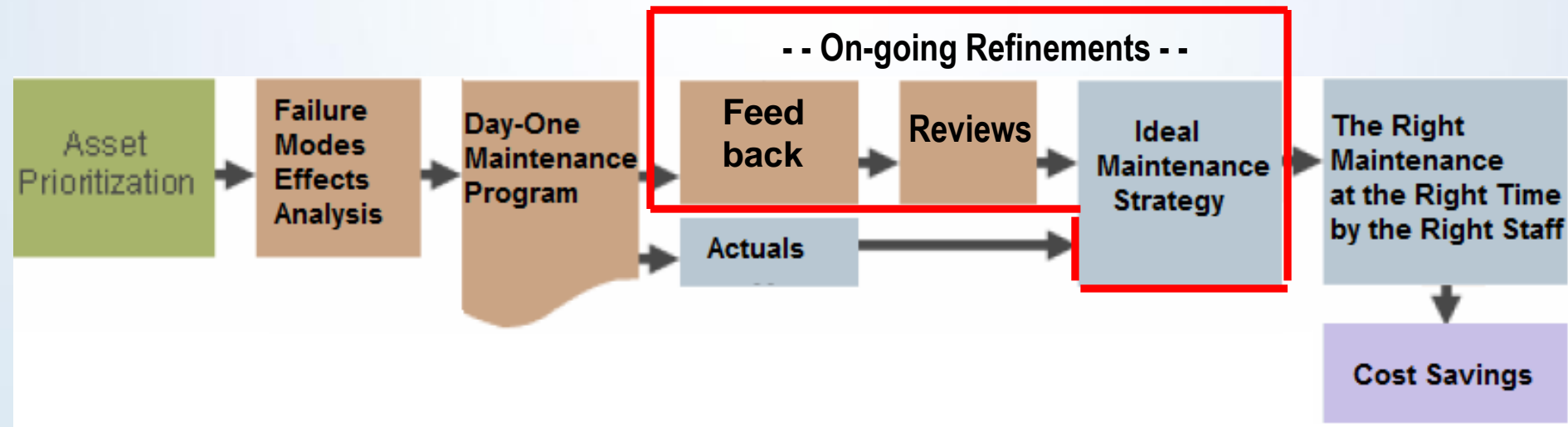
## John Reeve

Practice Leader Advanced Maintenance and  
Scheduling Processes

# Webinar Objectives

## Demonstrate how to use Maximo to:

- 1) Identify what equipment is important and why?
- 2) Identify how it fails and the resulting consequences?
- 3) Identify what will be done to prevent or mitigate the risk
- 4) Illustrate how to capture and automatically disposition feedback on the effectiveness of those actions.



# Reliability Centered Maintenance

- ❖ What is it? ..... Asset performance optimization
- ❖ Do I need it? ..... Supports continuous improvement
- ❖ Once I have it in place, is that it? improvement

The first step toward reliability centered maintenance is to capture, categorize and review asset information. But, how do you focus scarce resources on those items that would cause the most disruption if they were to fail to achieve highest ROI?

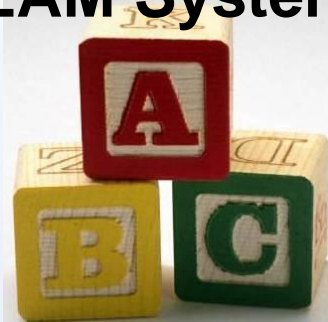
- ❖ Simply stated, the RCM Extension supports:
  - ✓ Doing the right activities
  - ✓ To the right assets
  - ✓ At the right time

# Questions to Consider

## Concerns:

- ❑ How do you know you are performing the **right PMs**? and at the right **frequency**?
- ❑ What if the maintenance personnel have knowledge regarding asset performance but it is **not being properly captured**?
- ❑ What if the data being captured is all **textual** format?
- ❑ What if you are **missing foundation** data, e.g. locations, assets, failure/problem codes?
- ❑ What if your assets are not ranked in terms of **criticality**?

EAM System



# Questions to Consider (part 2)

- ❏ Some have said, “For years and years, we have had a lot of good data. But it was **in the heads** of our most senior staff, and, many of them plan to retire soon.”
- ❏ For some organizations, the Maximo system has verbose descriptions stored inside the work order. This text might contain problem assessments, suggestions to prevent future problems, and even design changes. **Unfortunately, there is no way to quickly slice-and-dice this data categorically.**
- ❏ It is a **common misunderstanding** by maintenance organization that by typing text-only descriptive for problem/cause/remedy that this data alone provides adequate medium for failure analysis.

# Defining What is Important and Why

## Key Information to Capture:

- ❏ It is important that we capture “actionable data” in addition to descriptive.
- ❏ We should understand the design function of the Operating Location (what is it supposed to do)?
- ❏ How critical is the Operating Location to the process?
- ❏ How does it fail and what are the consequences of each failure?
- ❏ And what other considerations might affect the performance of the equipment?



# How to Mitigate Failure Risk

## Maximo Considerations:

- ❑ Most failure risks can be mitigated by Preventive or Predictive Maintenance as scheduled by Maximo
  - - **but what confidence level do you have in your PM/PdM program?**
- ❑ What is the *basis* for the strategy and frequency?
- ❑ Which risks are the PM intended to address?
- ❑ How does the PM specifically address the failure mode? Where is this stored in Maximo?





# Establish Maintenance Strategies

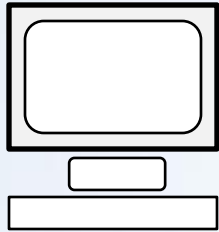
- Determine **asset/system priority** (store in Maximo)
- Determine **operating context** for the asset being analyzed (cooling water system is to maintain water from 40°F to 45°F).
- Define the asset's **functions** (maintain water temperature and contain water in the tank).
- Assess possible failures (water too hot, or, too cold).
- Identify possible **failure modes** or root causes (heat exchanger fouled, valve closed, pump bearing fatigued).
- Determine the most probable **failure effects** for each failure mode (inefficient heat exchanger results in higher utility cost, extra cooling tower sections in operation, eventual inability to deliver quality parts).
- Then propose an **appropriate maintenance task** for each failure mode.

**FMEA**

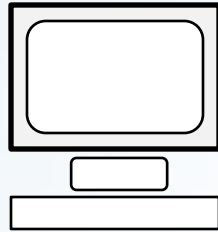
*This is all possible, but you have the power within Maximo with some education, to **immediately enhance your failure analysis process and asset performance.***

# Cohesive RCM Extension

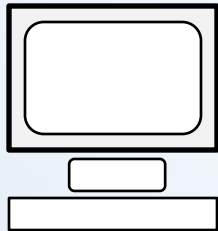
There are no new screens, but **alterations** to existing Maximo screens have been made, such as adding new tabs.



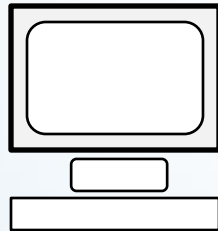
Locations,  
RCM FMEA



Locations,  
RCM  
Streamline

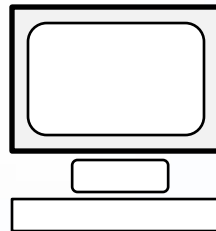


Work Order  
main,  
RCM tab,  
CM work type



Work Order  
main,  
RCM tab,  
PM work type

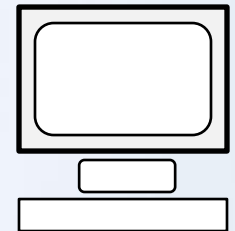
***Standard Tools used:***  
*Application Designer, Database  
Configuration, Domains, Escalations,  
Notifications, Workflow*



Master PM



PM main,  
RCM tab



PM main,  
Work Orders  
tab

***No customization to Maximo is  
required which means this solution is  
easily upgradable.***

# Cohesive RCM Extension

- - Locations, RCM tab - -

**Cohesive Locations** | Bulletins: (6) | Go To | Reports | Start Center | Profile | Sign Out | Help | IBM

Find: [ ] | Select Action [ ]

List | Location | Assets | History | RCM Streamline | **RCM FMEA** | Safety | Meters | Specifications

Location: **BR430** | Condensate Return Pump- Centrifugal/100GPM/ | Site: **BEDFORD**  
Design Function: Provide Condensate to the boiler feed pumps from the condenser. | Failure Class: **PUMPS**  
Criticality: **1** | Critical | Environment: **INDOOR**  
Duty Cycle: **CONTINUOUS**

**Design function defined for this Location/asset**

**FMEA** | Filter | 1 - 2 of 2 | Download

Failure Modes and Effects Analysis

Problem	Description	Functional Failure?
LEAK	Leaking	<input type="checkbox"/>
LOWPRES	Low Pressure	<input type="checkbox"/>

**Details**

Problem: **LEAK** | Leaking | Consequences [ ]

Functional Failure?   
Personnel Safety?   
Economic Impact to Production [ ]  
Environmental?   
Economic Impact to Repair [ ]

**New Row**

**PM Maintenance Strategy** | Filter | 1 - 1 of 1 | Download

PM	PM Description	Strategy Description	Last Completion Date
PM-PUMP	Condensate Return Pump Quarterly Service	[ ]	10/14/96

# Cohesive RCM Extension

-- PM RCM tab --

The screenshot displays the 'RCM' tab in the software interface. The main area shows details for a PM (Preventive Maintenance) task:

- PM:** SIPMP
- Location:** 1SI-PMP-A
- Failure Class:** PUMPS
- Organization:** EAGLENA
- Site:** ARUBA
- Status:** ACTIVE

The PM Basis and Frequency Basis are both set to 'Tech Specs'. A tooltip for 'Safety Injection Pump 1A' shows the location description: 'Location Description Safety Injection Pump 1A'.

Below the details is a table of failure modes:

Failure Mode	Description
LEAK	Observe Pump under running conditions
LOWPRES	Verifies outlet pressure and flow
LOWVOL	Verifies outlet pressure and flow
STOPPED	Bearing Temperature and Vibration

Brief description of how the PM is supposed to prevent the failure

Problem codes from Failure Code hierarchy

# Cohesive RCM Extension

- - Locations RCM tab - -

The screenshot displays the 'Cohesive Locations' interface, specifically the 'RCM FMEA' tab. The top navigation bar includes 'List', 'Location', 'Assets', 'History', 'RCM Streamline', 'RCM FMEA', 'Safety', 'Meters', and 'Specifications'. The main content area shows details for location 'BR430' (Condensate Return Pump- Centrifugal/100GPM) at site 'BEDFORD'. A callout box with an arrow pointing to the 'FMEA' section states: 'User site needs to create FMEA data relationships to the Location record'. Below this, a table lists FMEA failure modes: 'LEAK' (Leaking) and 'LOWPRES' (Low Pressure). A 'Details' section for the 'LEAK' failure mode shows various impact checkboxes (Functional Failure?, Personnel Safety?, Environmental?, Economic Impact to Production?, Economic Impact to Repair?) and a 'Consequences' text area. Another callout box with an arrow pointing to the 'PM Maintenance Strategy' table states: 'All PMs now show up for the specified FMEA Failure mode.' The PM table lists 'PM-PUMP' (Condensate Return Pump Quarterly Service) with a last completion date of '10/14/96'.

Location: BR430  
Design Function: Provide Condensate to the boiler feed pumps from the condenser.  
Site: BEDFORD  
Failure Class: PUMPS  
Criticality: 1 Critical  
Environment: INDOOR  
Duty Cycle: CONTINUOUS

**User site needs to create FMEA data relationships to the Location record**

Problem	Description	Functional Failure?
LEAK	Leaking	<input type="checkbox"/>
LOWPRES	Low Pressure	<input type="checkbox"/>

**Details**

Problem: LEAK (Leaking)  
Functional Failure?   
Personnel Safety?   
Environmental?   
Economic Impact to Production?   
Economic Impact to Repair?   
Consequences: [Empty text area]

**All PMs now show up for the specified FMEA Failure mode.**

PM	PM Description	Strategy Description	Last Completion Date
PM-PUMP	Condensate Return Pump Quarterly Service	[Empty field]	10/14/96

# A Streamlined Approach

## Design Considerations:

Failure Modes  
Effects Analysis

- Not all customers will want to do a detailed **FMEA** on each critical or important Location

Function	Failure mode	Effects	S (severity rating)	Cause(s)	O (occurrence rating)	Current controls	D (detection rating)	CRIT (critical characteristic)	RPN (risk priority number)	Recommended actions	Responsibility and target completion date	Action taken
Fill tub	High level sensor never trips	Liquid spills on customer floor	8	level sensor failed level sensor disconnected	2	Fill timeout based on time to fill to low level sensor	5	N	80	Perform cost analysis of adding additional sensor halfway between low and high level sensors	Jane Doe 10-Oct-2010	

Determine all failure modes based on the functional requirements and their effects. Examples of failure modes are: Electrical short-circuiting, corrosion or deformation.

- But how do we capture meaningful data at an equipment type level as a starting point?

# Cohesive RCM Extension

- - RCM version of Master PM's - -

**Cohesive Master PM** Bulletins: (6) Go To Reports Start Center Profile Sign Out Help

Find:  Select Action

List **Master PM** Frequency Seasonal Dates Job Plan Sequence

Master PM   Failure Class  Pump Failures Attachments

Criticality  Critical

Environment

Duty Cycle

Item

Item Set

Create Associated PMs for Item's Location?

Create Associated PMs for Item's Asset?

**Work Order Information** Lead Time

Work Type

Work Order Status\*

Work Order Priority\*

Interruptible?

Lead Time (Days)

Lead Time Active?

**Failure Modes Addressed** Filter Download 1 - 1 of 1

Problem	Description
<input type="text" value="LEAK"/>	<input type="text"/>

New Row

# Cohesive RCM Extension

- - Locations Streamlined RCM tab - -

**Cohesive Locations**    Bulletins: (6)    Go To    Reports    Start Center    Profile    Sign Out    Help    IBM

Find:    Select Action

List    Location    Assets    History    **RCM Streamline**    RCM FMEA    Safety    Meters    Specifications

Location: BR430    Condensate Return Pump- Centrifugal/100GPM/    Site: BEDFORD

Design Function: Provide Condensate to the boiler feed pums from the condenser.

Failure Class: PUMPS    Criticality: 1 Critical    Environment: INDOOR    Duty Cycle: CONTINUOUS

**When Failure Class, criticality, environment & duty cycle are populated, then the Master PMs will display.**

**Recommended PMs**    Filter    1 - 4 of 4    Download

Master PM	Description	Frequency	Frequency Units
1002	Pump Visual Leak Inspection	2	MONTHS
1003	Pump Vibration Readings and Analysis	3	MONTHS
1006	Pump Seal Replacement	2	YEARS
1007	Pump Overhaul	4	YEARS

**Implementing PMs**    Filter    1 - 1 of 1    Download

PM	Master PM	Description	Frequency	Frequency Units
PM-PUMP		Condensate Return Pump Quarterly Service	90	DAYS



**Currently assigned PMs**



# Cohesive RCM Extension

## Capture data to monitor and optimize the process

- ❏ Work order feedback: the goal is to capture the thoughts and wisdom of the maintenance personnel, plus create actionable data for review and analysis.
- ❏ It is also important for the people providing feedback to have buy-in to this process and see that their comments are actually being read – and processed.
- ❏ This work feedback process supports continuous improvement.

# Cohesive RCM Extension

❏ Work order feedback can be applied to corrective or preventive maintenance.

❏ Trades feedback examples:

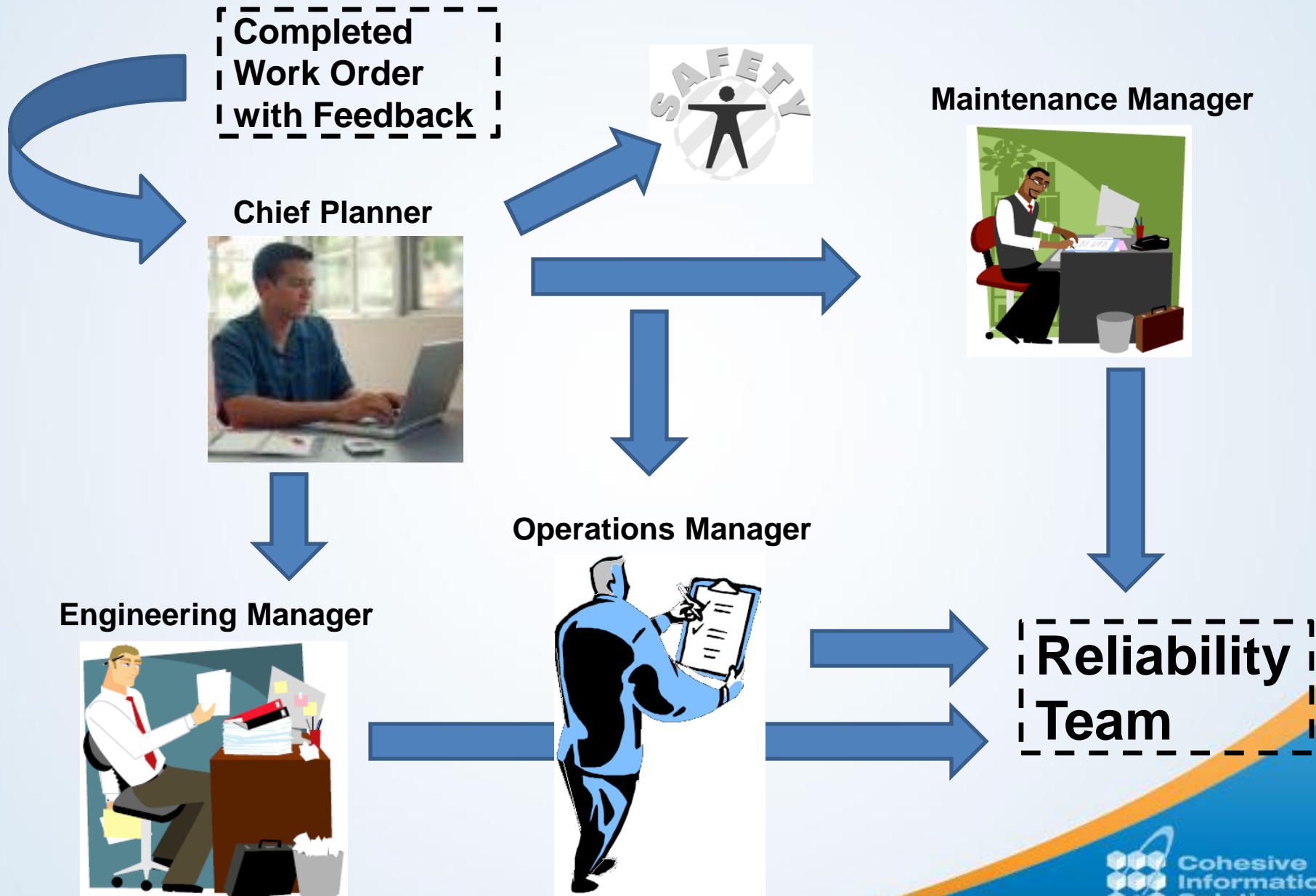
- PM: validation of correct **overall strategy**
- PM: validation of correct **frequency**
- CM/PM: asset (loc) condition **trending**
- CM/PM: design issue concern/**suggestion**
- CM/PM: **safety**/environmental issue
- CM: **maintainability** issue
- CM: need new failure/problem **code value**
- CM: need new **asset number**
- CM: **tips** for reducing future **breakdowns**

**Note:** typical work order updates only include actual labor (and sometimes materials).

❏ Trades feedback can also refer to planning accuracy

- CM/PM: validation of correct **estimates**
- CM/PM: validation of **task steps** for this strategy

# Routing of Feedback – Multiple Directions



# Process is equally as important as the software

- ❏ Once comments are captured, then routing of information begins.
- ❏ Each plant/facility can setup routing unique to their organization e.g. escalations/notifications.
- ❏ Reliability team maintains list & assigns actions.



# Cohesive RCM Extension

-- WO RCM tab for CM --

## CM

RCM

Feedback

Failure Codes

Corrective

PM

Function

Provide High Pressure cooling water makeup to the reactor in the event of a breach or loss of coolant event of a severity that maintains pressure in the reactor vessel.

Did Location Fail to fulfill its Function?

Was the Failure Preventable?

What could have been done to prevent failure

The best strategy for maintenance is to keep analyzing results and make periodic adjustments in light of the experience gained.

# Cohesive RCM Extension

- - WO RCM tab for PM - -

RCM Feedback Failure Codes

Corrective PM

## PM

PM Basis Tech Specs

Frequency Basis Tech Specs

PM As Found Condition

PM Effective?

Frequency Adequate

What can be done to enhance PM

Failure Modes tied to SIPMP Filter 1 - 4 of 4 Download ?

Problem	Description
LEAK	Observe Pump under running conditions
LOWPRES	Verifies outlet pressure and flow
LOWVOL	Verifies outlet pressure and flow
STOPPED	Bearing Temperature and Vibration

During this time of PM inspection, if a future (proactive) repair is needed, this is the best time to record it.

The best strategy for maintenance is to keep analyzing results and make periodic adjustments in light of the experience gained.

# Cohesive RCM Extension

- - PM Work Orders tab - -

Navigation tabs: List, **PM**, Planning, Scheduling, RCM, Seasonal Dates, Job Plan Sequence, PM Hierarchy, **Work Orders**

PM: SIPMP    Safety Injection Pump Quarterly IST    Location: 1SI-PMP-A    Safety Injection Pump 1A    Attachments    Status: ACTIVE

Open Work Orders: Filter > 1 - 1 of 1

Work Order	PM/Surv Grace Entry Date	PM/Surv Drop Dead Date	Scheduled Start	Target Start	Actual Finish	Status
C1038				5/21/07 12:00 AM		WSCH

Filter > 1 - 2 of 2

Work Order	PM/Surv Grace Entry Date	PM/Surv Drop Dead Date	Scheduled Start	Actual Start	PM As Found Condition	Description
C1010				4/12/07 2:32 PM	7	Satisfactory
C1011				4/12/07 2:33 PM	6	Within Tolerance - Adjustment Needed

PM As Found Condition: 7    Satisfactory

Actual Work Performed: [Empty text area]

# Cohesive RCM Extension

## Using Maximo to Build/Optimize the Process

- ❏ **Escalations** along with **Workflow/Notifications** help automate the review process and leverage the data.
- ❏ This feedback can be used to help build missing foundation data and fill in the blanks.
- ❏ Escalations/Workflow can be used to act on and track responses to feedback.
- ❏ Escalations can also be used to mine the data for anomalies which need follow up and provide Notifications.



# Maximo Start Center

Welcome, Maximo

Bulletins: (0)

Go To

Reports

Start Center

Profile

Sign Out

Help



Update Start Center

## Quick Insert

New Asset

New Item

## Authorized Assets

Assets

Receiving

Item Master

Inventory

Locations

## Deployed Assets

You do not have access to the selected actions.

## Bulletin Board

Filter

Subject	Message	Post Date	Expiration Date	Viewed
				N

There are currently no bulletin board messages to view.

## Stocked IT Assets

ITEMNUM	ASSETNUM	DESCRIPTION	LOCATION
D700	A8011	Standard Desktop Computer	HWSTOCK
D600	7500	Standard Laptop Computer	HWSTOCK
D600	7400	Standard Laptop Computer	HWSTOCK
D600	7300	Standard Laptop Computer	HWSTOCK
D600	7505	Standard Laptop Computer	HWSTOCK

## Inbox / Assignments (13)

Next Assignment Due: 4/28/2009 12:00:00 AM

Refresh

Description	Due Date	Start Date	Route
Review WO 1019 for failure mode not previously analyzed	6/18/07 2:00 PM	6/18/07 2:00 PM	Y
WO 1161 has suggestions to improve PM PM-PUMP	6/18/07 2:00 PM	6/18/07 2:00 PM	Y
Review WO 40093, maintenance strategy did not prevent LOWVOL as expected	6/18/07 2:00 PM	6/18/07 2:00 PM	Y
Review WO 31150 for failure mode not previously analyzed	6/18/07 2:00 PM	6/18/07 2:00 PM	Y
WO 1162 has suggestions to improve PM PM-PUMP	6/18/07 2:00 PM	6/18/07 2:00 PM	Y
WO 1163 has suggestions to improve PM PM-PUMP	6/18/07 2:00 PM	6/18/07 2:00 PM	Y
WO 3001 is a CM work order for Location BR200 which does not have a criticality assigned	6/18/07 3:00 PM	6/18/07 3:00 PM	Y
WO 1025 is a CM work order for Location BPM3100 which does not have a criticality assigned	6/18/07 3:00 PM	6/18/07 3:00 PM	Y
WO 1213 has suggestions to improve PM	4/19/09 10:06 AM	4/19/09 10:06 AM	Y
WO 1214 has suggestions to improve PM	4/20/09 7:24 AM	4/20/09 7:24 AM	Y

**Inbox  
Messages  
from  
Workflow**



# Maximo Start Center

## Inbox - examples

Inbox / Assignments (13)			
Next Assignment Due: 4/28/2009 12:00:00 AM			<a href="#">Refresh</a>
Description	Due Date	Start Date	Route
Review WO 1019 for failure mode not previously analyzed	6/18/07 2:00 PM	6/18/07 2:00 PM	
WO 1161 has suggestions to improve PM PM-PUMP	6/18/07 2:00 PM	6/18/07 2:00 PM	
Review WO 40093, maintenance strategy did not prevent LOWVOL as expected	6/18/07 2:00 PM	6/18/07 2:00 PM	
Review WO 31150 for failure mode not previously analyzed	6/18/07 2:00 PM	6/18/07 2:00 PM	
WO 1162 has suggestions to improve PM PM-PUMP	6/18/07 2:00 PM	6/18/07 2:00 PM	
WO 1163 has suggestions to improve PM PM-PUMP	6/18/07 2:00 PM	6/18/07 2:00 PM	
WO 3001 is a CM work order for Location BR200 which does not have a criticality assigned	6/18/07 3:00 PM	6/18/07 3:00 PM	
WO 1025 is a CM work order for Location BPM3100 which does not have a criticality assigned	6/18/07 3:00 PM	6/18/07 3:00 PM	
WO 1213 has suggestions to improve PM	4/19/09 10:06 AM	4/19/09 10:06 AM	
WO 1214 has suggestions to improve PM	4/20/09 7:21 AM	4/20/09 7:21 AM	
WO 1215 has suggestions to improve PM ML-PUMP	4/20/09 6:01 PM	4/20/09 6:01 PM	
WO 1216 has suggestions to improve PM ML-PUMP	4/21/09 9:27 AM	4/21/09 9:27 AM	
WO 1218 has suggestions to improve PM ML-PUMP	4/28/09 11:27 AM	4/28/09 11:27 AM	

1 to 13 of 13

# Maximo Communication Template

By setting up a pre-built communication template you can leverage this media to assist the working level in easy update to the system informing management that foundation data is missing.


List   Communication Template   Recipients   Attachment Folders

Template: 1017   Failure/Problem code is missing from hierarchy   Created By: WILSON   Status: ACTIVE

• Applies To: WORKORDER   Date: 2/3/05 9:55 PM   Attachments

\* Accessible From: ALL

Comm Log Entry?

 This generic template can then be referenced on the existing Work Order Comm Log for rapid update.

## Template Details

To: CHIEFPLANNER

cc:

bcc:

• Send From: maxadmin@us.ibm.com

Reply To:

Subject: WO# :WONUM needs FC-PC hierarchy addition

Font   Size   Format None

Message: This is a request for planning staff to (1) review/accept suggested Problem Code (which is missing from hierarchy), (2) add to hierarchy, and (3) add this Problem code to existing work order - - before Close status.

# RCM-WO Feedback coupled with Failure Analysis provides the best results

Simple Pareto analysis can provide significant improvements

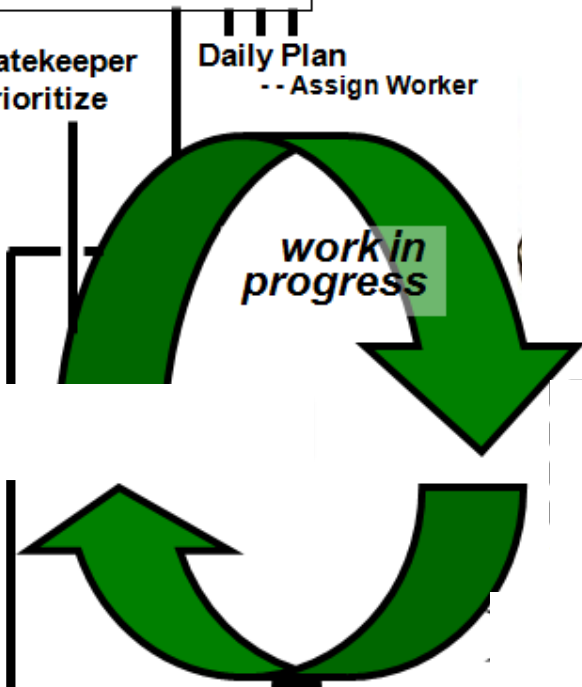
**Weekly Schedule**

Gatekeeper  
Prioritize

Daily Plan  
-- Assign Worker

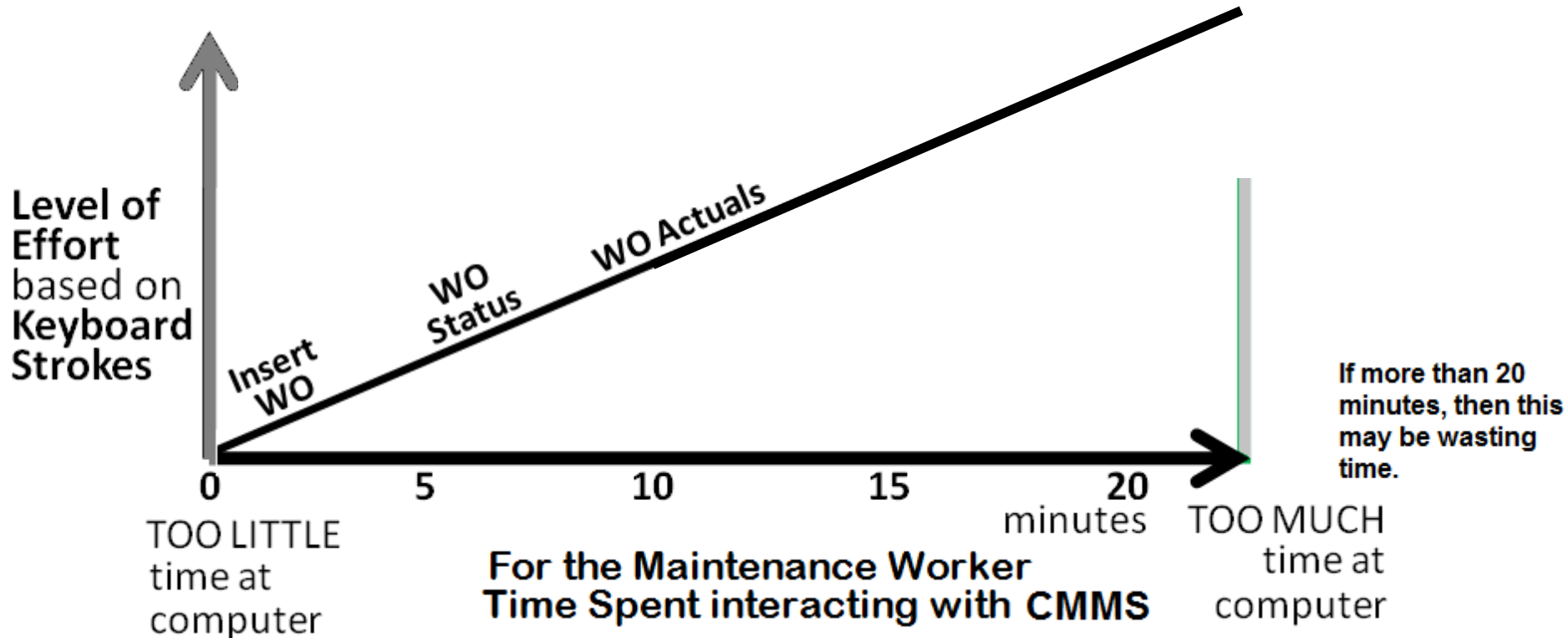
*work in progress*

**Job Planning**



# Additional time by trades adds substantial value

Time per Shift

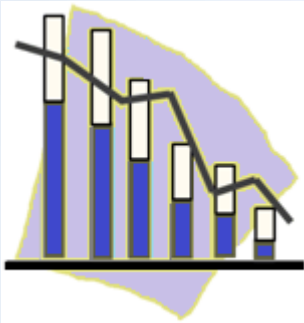


# RCM Extension - in Summary

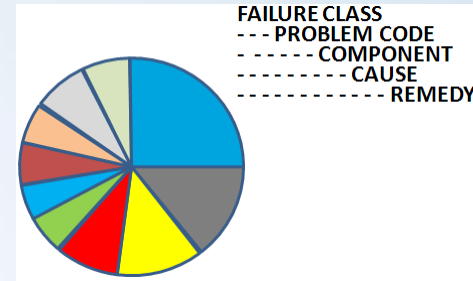
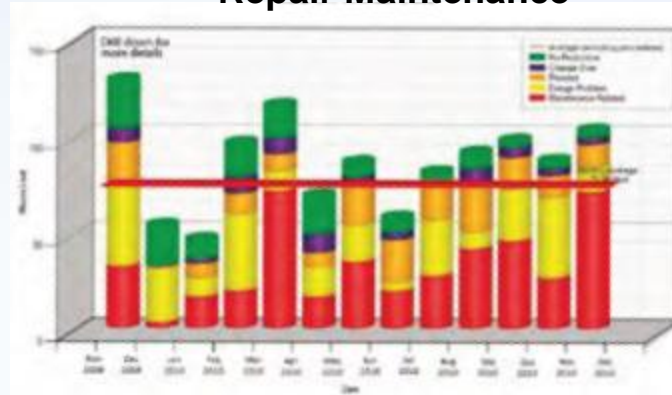
- ❏ Cohesive Solutions helps organizations improve **equipment reliability** through the use of technology, process and leading practices.
- ❏ The RCM Extension assists the Maintenance/Engineering staff by **storing** feedback, creating actionable data, setting up automated reviews.
- ❏ This analysis supports continuous improvement through enhanced PM/PdM strategies which in turn helps staff work on the right asset at the right time.

# Proactive Reports

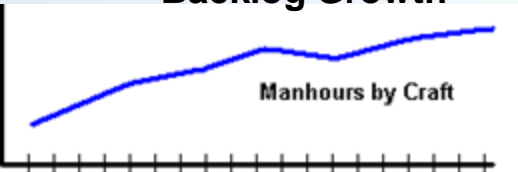
Asset/Location Condition Trending



Cost by System relating to Repair Maintenance



Backlog Growth



Missing Foundation Data

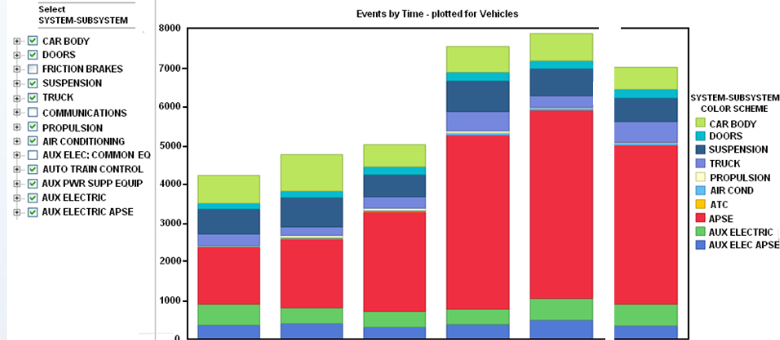


Safety / Environmental Issues over time

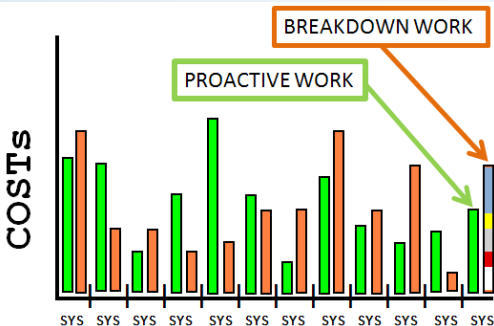


Failure Analysis by System / Subsystem

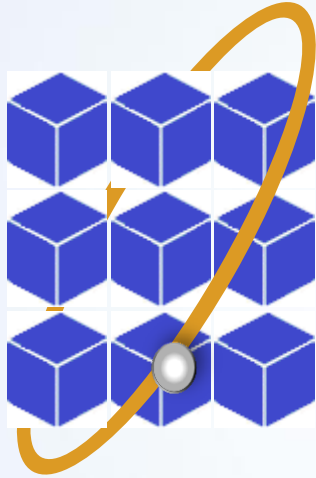
Vehicles: ALL | Dates: From: 01/11/2006 00:00:00 | Subcategories: Show:    
 A2 | B2 | C1 | C2 | To: 08/11/2006 23:59:59



Planning Feedback



**Your Input, Our Knowledge,  
Industry Best Practice**



**Cohesive  
Information  
Solutions** Inc.





# For more information on the Cohesive RCM Extension for Maximo

[http://www.cohesivesolutions.com/images/pdf/cis\\_workorderfeedback\\_09.pdf](http://www.cohesivesolutions.com/images/pdf/cis_workorderfeedback_09.pdf)

or contact us directly at [sales@cohesivesolutions.com](mailto:sales@cohesivesolutions.com)

or 678-233-1280