



# Reliability Information Management

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# Reliability Information Management

## BEST PRACTICES

### RIM Program

- Single Database
- Actionable Info
- Program Value
- Basic Reliability Metrics

### Asset Health

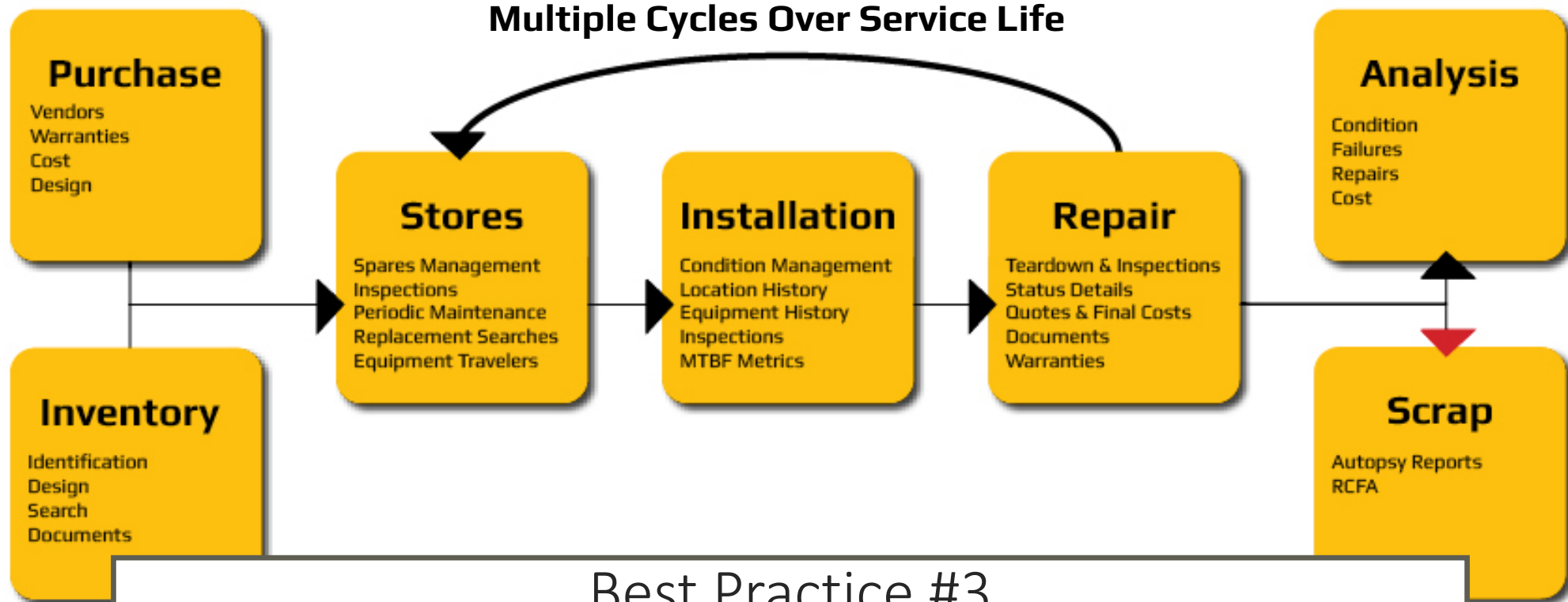
- Condition Based Inspections
- Integrated Dashboard
- Basic Care
- Asset Health Metrics

### Work Management

- Reds Meetings
- RCFA Corrective Actions
- Work Management Metrics

### Life Optimization

- Repair Vendor Interface
- Failure Analysis
- Bad Actor List
- Equipment Metrics



Best Practice #3

# Track BOTH Location & Equipment Reliability

As each unique asset moves through its lifecycle,  
Reliability Information is generated for that Asset Component  
AND for the Functional Service Locations it may occupy.

# Why is Tracking Location vs Equipment a Reliability Information Management Best Practice?



## **LOCATION –**

ONE FUNCTIONAL LOCATION MAY BE OCCUPIED BY MANY DIFFERENT ASSET COMPONENTS OVER TIME

IS THAT LOCATION A CREATING RELIABILITY ISSUES REGARDLESS OF WHICH COMPONENT IS IN SERVICE?

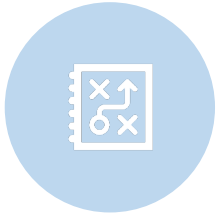


## **EQUIPMENT –**

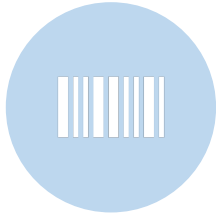
ONE ASSET COMPONENT MAY MIGRATE TO SEVERAL DIFFERENT FUNCTIONAL LOCATIONS OVER TIME

IS THAT ASSET COMPONENT A 'BAD ACTOR' TAKING ITS PROBLEM FROM LOCATION TO LOCATION? WITHOUT ACCESSIBLE INFORMATION FROM BOTH INFORMATION SOURCES YOU'RE TRYING TO REACH YOUR RELIABILITY GOALS HALF BLIND

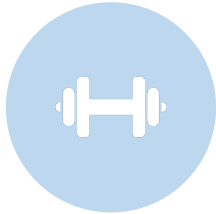
# Equipment-Based Reliability Information



CRITICAL /  
REPAIRABLE  
EQUIPMENT  
INVENTORY



NAMEPLATE AND  
DESIGN  
INFORMATION



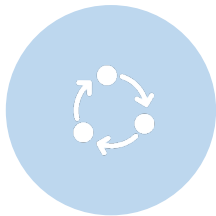
CRITICAL SPARES  
MANAGEMENT -- FIT  
TO RUN



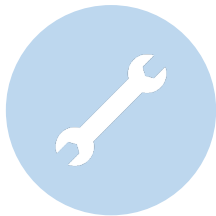
EQUIPMENT  
DOCUMENTS



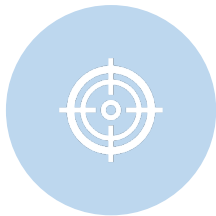
WARRANTY



EQUIPMENT  
LIFECYCLE HISTORY

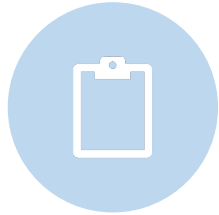


REPAIR AND FAILURE  
INFORMATION

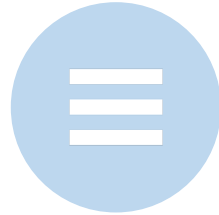


VENDOR  
EVALUATION

# Location-Based Reliability Information



WALK AROUND  
INSPECTION  
FINDINGS



CONDITION  
MONITORING  
RESULTS



INSPECTION &  
MONITORING  
SCHEDULE



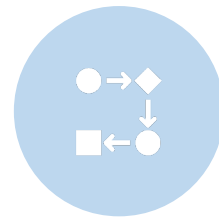
CURRENT  
INTEGRATED  
CONDITION STATUS



FAULT TYPES BY  
LOCATION



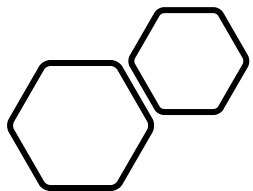
RELIABILITY COST  
BENEFIT ANALYSIS



LOCATION MTBF

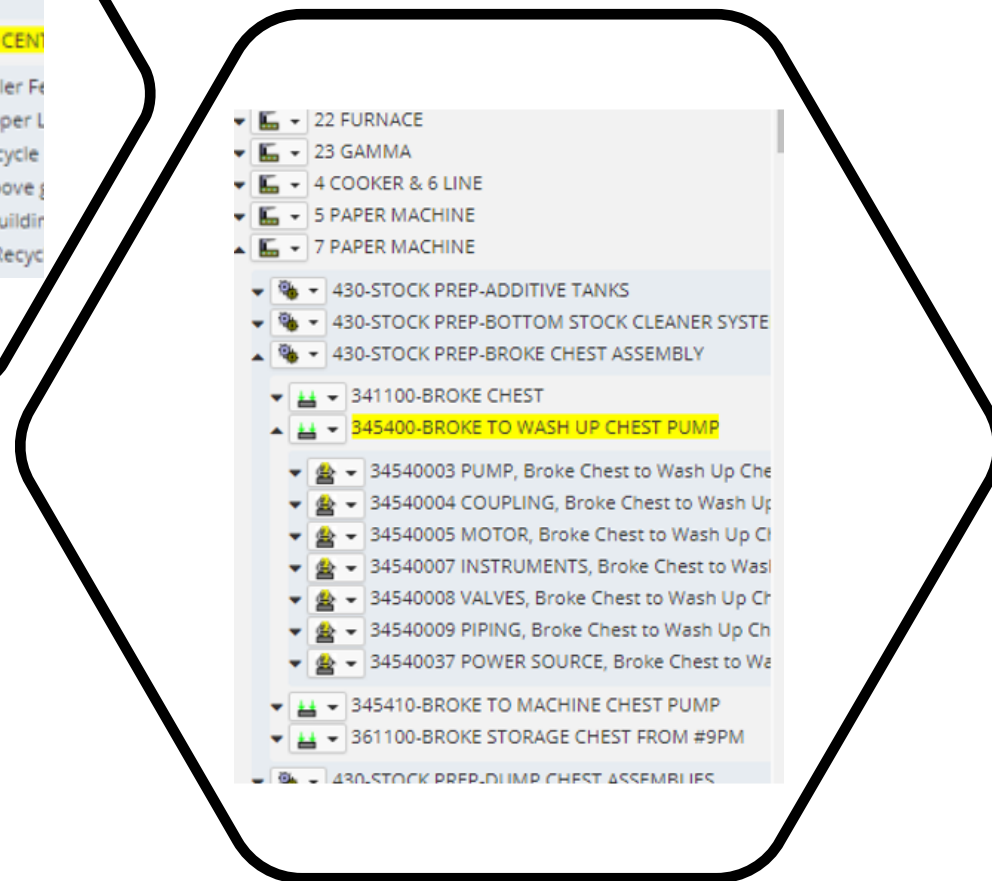
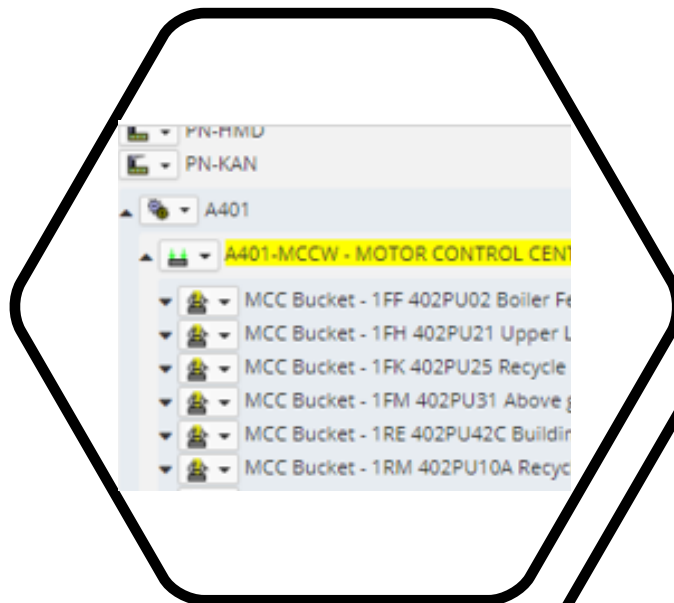


ASSET HEALTH



# Functional Location Tree

- Location reliability management starts at the component level
- Practically all condition monitoring technologies can be effective without knowing much detail about the individual asset serving a location



# Here's an Example of Location & Equipment History Working Together – Part 1

Integrated Condition Status Report												
User: John Reliable, Date: May 19, 2020, Time: 13:49:23												
			Severity	Criticality	Unit	Function	Asset	Component	Technology	Most Recent Severity	Days Awaiting Checkoff	Work Order Status
1			1	0	104 Hotline	Cranes	7120019	NBRIDGE	• Visual Inspection	1	87	0 of 1
2			1	0	162 Carbon Plant	BAKE	WASTE	FANS2	• Electrical - Online	1	98	0 of 1
3			1	0	101 Cooling Tower	Tower	CLDWELL	MOTOR1	• Infrared • Vibration - Route	1	46	1 of 2
4			2	0	170 Compressor Room	AIR	2CENTAC	Air leaks	• Visual Inspection	2	44	0 of 1
5			2	0	170 Compressor	AIR	2CENTAC	Compressor	• Oil Analysis - Screening	2	68	0 of 1



# Part 2

- Multiple condition monitoring technologies find problems on same functional location
- Integrated view of report details give quick overview of both cause & primary effect
- How was decision to replace with shielded bearings reached?

Integrated Condition Status Report

User: John Reliable, Date: May 19, 2020, Time: 13:49:23

			Severity	Criticality	Unit	Function	Asset	Component	Technology	Most Recent Severity	Days Awaiting Checkoff	
1			1	0	104 Hotline	Cranes	7120019	NBRIDGE	• Visual Inspection	1	87	0
2			1	0	162 Carbon Plant	BAKE	WASTE	FANS2	• Electrical - On	1	98	0
3			1	0	101 Cooling Tower	Tower	CLDWELL	MOTOR1	• Infrared • Vibration - Route	1	46	1
4			2	0	170 Compressor Room	AIR	2CENTAC	Air leaks	• Visual Inspection	2	44	0
5			2	0	170 Compressor Room	AIR	2CENTAC	Compressor	• Oil Analysis - Screening	2	68	0
6			2	0	161 EPA Cranes	Unit 1	Primary Transport Crane	Gearbox	• Oil Analysis - Lab • Infrared - Special Test	2	75	0

Condition Case Details

User: John Reliable, Date: May 19, 2020, Time: 14:15:53

Location: 101 Cooling Tower >> Tower >> CLDWELL >> MOTOR1

Location Risk Ranking: 4 of 16  
Equipment: 1450

Actions	Severity	Case Risk Ranking	Entered On	Technology	Faults	Entered By	Case ID
		2 of 10	Mar 10, 2020	Vibration - Route	• Drive end bearing failure	James Tech	1

Details

Recommendations: Repair or Replace Motor  
Comments: Drive end bearing showing advanced degradation, motor should be repaired at earliest opportunity - and monthly cleaning should be done.  
Work Order Number: Assign CMMS  
Status Comment: • Still waiting on special shielded bearings - expected in by early June (John Reliable, May 5, 2020)

Condition Entry Linked Documents

Status

Checkoff Status:

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Condition Case Details

User: John Reliable, Date: May 19, 2020, Time: 14:15:53

Location: 101 Cooling Tower >> Tower >> CLDWELL >> MOTOR1

Location Risk Ranking: 4 of 16  
Equipment: 1450

Actions	Severity	Case Risk Ranking	Entered On	Technology	Faults	Entered By	Case ID
		5 of 10	Feb 24, 2020	Infrared	• Dirty	Mike Manager	2

Details

Recommendations: Clean cooling fin and fan end  
Comments: Motor is operating in excess of 300 F. Motor cooling fins and fan end are clogged with debris from product preventing proper cooling  
Work Order Number: 02-14056  
Status Comment:

Condition Entry Linked Documents

Status

Checkoff Status:

Comment: Fan end was cleaned March 23, 2020

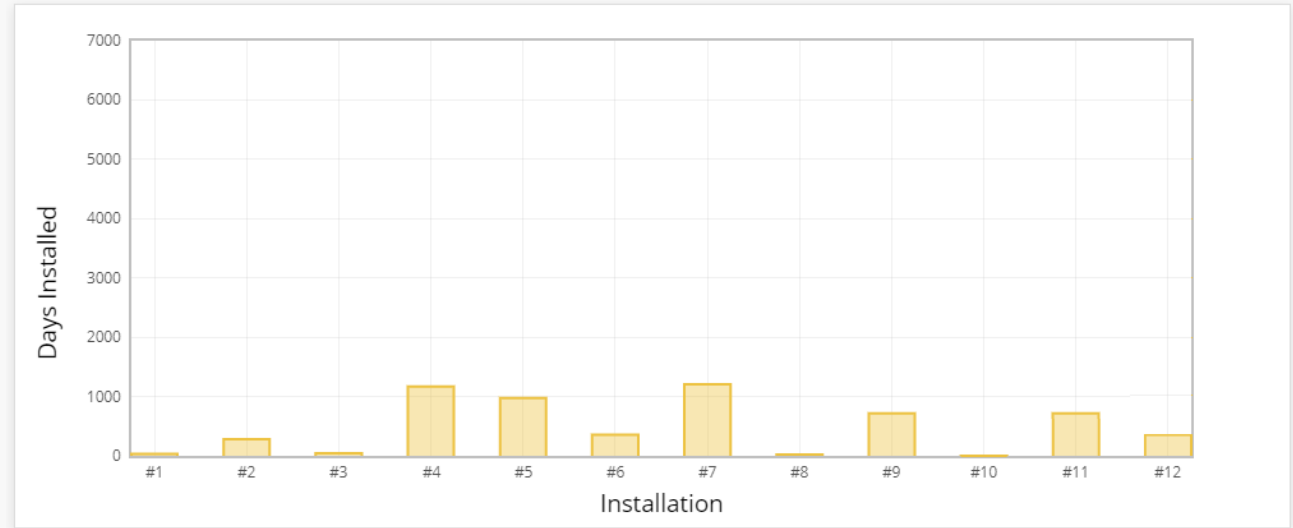
# Part 3

- The Functional Location history shows short MTBF due to repetitive bearing problems
- Information shows that several different motor ID's served in this location over time, yet suffered bearing problems

## Location History Report

101 Cooling Tower » Tower » CLDWELL » MOTOR1

Days Installed



### Installation History

	Plant Tag	Start	End	Days	Type	Remarks
▼	1452	Jun 07, 2019	Still Installed	(346)	Install 12	
▼	1450	Jun 01, 2017	Jun 07, 2019	736	Install 11	
▼	55	May 31, 2017	Jun 01, 2017	1	Install 10	ⓘ Removal: WOULD NOT COME UP TO SPEED
▼	1450	Jun 16, 2015	May 31, 2017	715	Install 9	ⓘ Removal: BEARING PROBLEMS
▼	55	May 23, 2015	Jun 16, 2015	24	Install 8	ⓘ Removal: BEARING PROBLEM - 600 AMPS WHEN LOADED
▼	1450	Jan 31, 2012	May 23, 2015	1207	Install 7	ⓘ Removal: BEARINGS
▼	1450	Mar 01, 2011	Jan 31, 2012	336	Install 6	ⓘ Removal: ICE PROBLEMS ON TOWER - WINDING GROUNDED
▼	3004	Jun 16, 2008	Mar 01, 2011	977	Install 5	
▼	1450	Apr 12, 2005	Jun 16, 2008	1168	Install 4	ⓘ Removal: ROUTINE CHANGE
▼	1758	Mar 01, 2005	Apr 12, 2005	42	Install 3	
▼	3591	May 23, 2004	Mar 01, 2005	281	Install 2	
▼	1449	Apr 18, 2004	May 23, 2004	35	Install 1	

# Part 4

- Underlying Equipment Lifecycle history reveals water contamination root cause for the bearing failures
- In this example, the location & equipment histories were in separate Excel sources for many years
- Once combined in a single database with combined location/equipment historical tracking the underlying root cause was far more obvious.

Installation History						
	Plant Tag	Start	End	Days	Type	Remarks
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▼	55	May 23, 2015	Jun 16, 2015	24	Install 8	☞ Removal: BEARING PROBLEM - 600 AMPS WHEN LOADED

Repair Findings (based on the repair following this installation)				
Fault Type	Fault Group	Status	Level	Comment
Over Lubrication	RepairTrack Defaults	Found, Not Fixed	Root Cause	seal torn by over greasing; water led to bearing failure
Drive end bearing failure	Mechanical	Fixed	Primary Failure	found water in grease
Bad Seal	RepairTrack Defaults	Fixed	Resulting Effect	
Grounding problem	Electrical - AC	Fixed	Resulting Effect	

▼	1450	Jan 31, 2012	May 23, 2015	1207	Install 7	☞ Removal: BEARINGS
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Repair Findings (based on the repair following this installation)			
Fault Type	Fault Group	Status	Level
Lubricant contains water	Mechanical	Fixed	Root Cause
Vibration/Bearings by NDT	Mechanical	Fixed	Secondary Cause
Worn shaft	Mechanical	Fixed	Secondary Cause
Moisture/wet	Other	Found, Not Fixed	Contributing Factor
Drive end bearing failure	Mechanical	Fixed	Resulting Effect