	Air	Systems					Orgar 3100	nization:	
	▼ <u>Filter</u>	<mark>></mark> ر		¥	÷ 1	- 10 of 3	34 →	<u>ж</u>	1
	llure Code		Description						
	IR BAGS	0,	Air bag issues					Ē	
	AIR SUPPLY	0,	Problems with a	air supply	or air sup	ply c 📄		Ē	
	ALIGNMENT	0	Alignment Issu	es				Ē	
,	BEARING	Q,	Bearing probler	ms				Ē	
	BELT	0	Problems with (conveyor l	belts			Ē	
	BLOCKED	0,	Equipment bloc	ked				Ē	
	BLOWER	0	Blower isues					Ē	
	BREAKER	0	Circuit breaker	problems				Ē	
	BROKEN	0	Broken Parts					Ē	
	CHAIN	0	Problems with o	chains				Ē	
New	Row	V Filtor			باد	4.4	2 - 6 - 2		
auses to	OF AIR BAGS	• <u>Filter</u>	, v. 10		•	~ 1 -	3 01 3	~	
	Failure Code		Description						
>	LEAK	O,	Leaks						
>	WEAR	Q,	Worn parts						
>	DAMAGED	Q,	Physically da	maged					
New	Row								
Remedie	s for LEAK	Filter	> 0. 78		J.	€ 1 - 2	2 of 2		

Identify and Apply Failure Coding

Atta

Help Control Defects In







Michael Guns, Jr., CRL, CEFP, CMRP

Senior Maximo/EAM Consultant JFC & Associates



- Master Electrician's license for Delaware in 2002 and Maryland in 2006.
- Certified Reliability Leader certification in 2019
- Certified Educational Facilities Professional in 2020
- Certified Maintenance & Reliability Professional in 2021
- Previously held NABCEP certification for Solar Installation from 2009-2013
- 14 years functional Maximo experience



Learning Objectives

	Identify	Identify standard high level failure modes
	Create	Create an awareness of what failures are and how to work toward eliminating them
	Develop	Develop situational asset management awareness of why something may fail
	Align	Align your business processes to better facilitate elimination of defects found in your asset portfolio



Inability of an asset to preform it's designed function







EXAMPLES OF FAILURES

			(7)
ELECTRICAL	VENTILATION	WATER	FUEL
•			
LOCK	UNDERGROUND	HEAT	FIRE

	IBM Maximo Application Suite			Take a	tour
Q Fa ŵ	ailure Codes				
ত ু ব	Find navigation item	Failure Classes (1 - 20 of	23)	5 7 S	⊻ ,۲
Av	vailable Queries 🗸 🗸	Failure Class	Description	Organization	
් co	ommon Actions				
₩ (+	New Failure Code	PUMPS	Pump Failures	EAGLENA	다
	Create Report	PKG	Packaging Line Failures	EAGLENA	L‡
L≃ Mo	ore Actions	BLDGS	Facility Maintenance & HVAC	EAGLENA	L‡
A ⊕	ttachment Library/Folders 🗸	BOILERS	Boiler Failures	EAGLENA	다
	un reports	BURNERS	Gas Fired Burner Failures	EAGLENA	L†
÷	&	PIPES	Pipe Failures	EAGLENA	L†
		CONVEYOR	CONVEYOR LINE FAILURES	EAGLENA	L‡
		PROD	PRODUCTION FAILURES	EAGLENA	L‡
G	ි ප ප	MOLD	MOLDING EQUIPMENT	EAGLENA	다
۵ س		TUMBLE	TUMBLE EQUIPMENT	EAGLENA	L‡
₩ ¢			MECHASSY	MECHANICAL ASSEMBLY	EAGLENA
<u>ଚ</u> ିଚି		SPRAY	SPRAY EQUIPMENT	EAGLENA	다
\$		CLEAN	CLEAN EQUIPMENT	EAGLENA	다
E)		HARDWARE	Hardware Failures	EAGLENA	다
		VPN	Virtual Private Network (VPN) Difficulties	EAGLENA	L‡
		PRINTER	Printer Issues	EAGLENA	L‡
		NETWORK	Network Issues	EAGLENA	L‡
		BUILDING	Building	EAGLENA	C‡



PROBLEM

WHAT MAKES THE FAILURE HAPPEN?

When identifying what makes the failure happen think of the simplest form of the cause. This should be something easily identifiable as the PROBLEM

NO POWER LIGHTS OUT LEAK/BREACH FLOOD ALARM HAZARD





WHAT MADE THE PROBLEM OCCUR?

Now what elements made the problem happen. Again, concise descriptions get to the root cause.





WHAT WAS DONE TO CORRECT THE FAILURE?

FINALLY, THE FIX!!





SAMPLE FAILURE CODING

Disp	atcher	Mechanic/Technician				
Failure Class	Problem Code	Cause Code	Remedy Code			
ELECTRIC (EL)	No Power(NO_PO)	Tripped Breaker(TRIP_BR)	Replace(RPLC)			
AIR (AIR)	Lights Out(LI_OUT)	Shorted/Broken Wire(SHORT)	Repair(RPR)			
VENT (VENT)	LEAK/BREACH (LK_BR)	Equipment Malfunction(EQ_MAL)	Reset(RST)			
WATER (WTR)	FLOOD (FLD)	Bad Device(BD_DEV)	Rework(RWK)			
FUEL (FUEL)	ALARM (ALRM)	Bad Lamps(BD_LMP)	SUPPORT(SUP)			
LOCK (LK)	TEMPERATURE (TEMP)	Bad Ballast(BD_BALL)	FOLLOWUP (FL_UP)			
DEVICE (DEV)	NOISE/VIBRATION (NS_VIB)	User Error(US_ERR)	ADJUSTED (ADJ)			
STRUCTURE (STR)	ODOR (OD)	No Problem Found (NPF)	EXERCISED/LUBRICATED (EX_LUB)			
UNDERGROUND (UG)	FLOW/PRESSURE (FLW_PR)	Oil (OIL)	CLEANED (CLND)			
HEAT (HEAT)	EQUIPMENT INOPERABLE (INOP)	Antifreeze (AF)	NO ACTION TAKEN (NO_ACT)			
VALVES (VLV)	HAZARD (HAZ)	Damage (DAM)	WARRANTY/CONTRACT (W_C)			
VESSELS (VES)	SUSPECTED MOLD (MLD)	ASSEMBLY/SETUP (AS_SET)	SECURED/CONTAINED (SEC_CON)			
FIRE (FIRE)	MISSING (MISS)	INSTALLATION (INSTL)				
FURNISHINGS (FURN)		IMPROPER STORAGE (IM_STOR)				
DISTRIBUTION (DIST)		IMPROPER PACKAGING (IM_PACK)				
STEAM (STM)		IMPROPER TRANSPORT (IM_TRAN)				
LADDERS (LAD)		IMPROPER MAINTENANCE (IM_MNT)				
VEHICLE (VEH)		IMPROPER OPERATION (IM_OP)				
		IMPROPER START UP (IM_ST_UP)				
		IMPROPER BURN IN (IM_BRN)				
		IMPROPER COMMISSIONING (IM_COM)				
		INADEQUATE DESIGN (IN_DES)				
		SUBSTANDARD MANUFACTURING (SUB_MAN)				



CREATE THE HIERARCHY



	Manage				Take	a tour					
Failure Codes						_					
	5.11										
← List View <	Failure Coo	des									
Q Find navigation item	Failure Class					Organization		Atta	chments		
Available Queries 🗸 🗸	BOILERS	Bo	oiler Failures			EAGLENA	_		View a	ttachmer	ts
Common Actions	Problems	(1 - 1 of 1)					æ			JL.	×
New Failure Code		Eniluse Code		Description			0		0	2	
Save Failure Code		Failure Code	0	Description		-					
Clear Changes	× ·	STOPPED	<u> </u>	Stopped		=					
Create Report	1 - 1 of 1									-	•
More Actions											
Attachment Library/Folders 🗸	Causes for	STOPPED (1 - 3 o	f 3)				۲		8	$\overline{\gamma}$	×*
Duplicate Failure Code		Failure Code		Description							
Delete Failure Code	~	LOWVOL	Q	Low Volume						Ū	
Add to Bookmarks	~	LOWPRES	Q	Low Pressure		Ξ				Ū	
Run Reports	~	BREAKTRP	Q	Breaker Tripped		Ē				Ū	
	1-3 of 3									-	
	1 0010										
	Remedies f	for LOWVOL (1 - 1	of 1)				۲		V	土	بر
		Failure Code		Description							
	~	INCWATER	Q	Increased Water Level		Ξ				Ū	
	1-1 of 1									_	
	1-1011										

Once your failures are identified lay out into a hierarchy then apply to a work order, asset, location or inventory



OBJECTIVE OF FAILURE CODING

Administration Report Admin Y						
Vorkflow Configuration	PM vs CM Work - All Work Orders (%)					
orkflow Designer	Last Run: 8/3/04 3:05 PM					Upda
Nos	50 se	Status	KPI	Actual	Target	Variar
ures .	30 70	4	PM Performance (%)	12.73	95	-82
ctions	20 80					
ommunication Templates	10 90					
/orkflow Administration	0 100		×			
scalations			B			
	Redford Work Orders V Eilter)	G ↓ [7]				
	Bediou work orders	. <u> </u>				
Reporting	X (By Priority)			Priority	Count	Recent (%)
				Priority	Count	Percent (76)
eport Administration				1	20	4.26
eport Administration				1 2	20 94	4.26 20
eport Administration PI Manager	100 -			1 2 3	20 94 60	4.26 20 12.77
eport Administration PI Manager	100 -			1 2 3 4	20 94 60 137	4.26 20 12.77 29.15
eport Administration PI Manager	100 -			1 2 3 4 5	20 94 60 137 58	4.26 20 12.77 29.15 12.34
eport Administration PI Manager	100 - 50 -			1 2 3 4 5 6	20 94 60 137 58 9	4.26 20 12.77 29.15 12.34 1.91
eport Administration PI Manager	50 -			1 2 3 4 5 6 7	20 94 60 137 58 9 25	4.26 20 12.77 29.15 12.34 1.91 5.32
eport Administration PI Manager	100 - 50 -			1 2 3 4 5 6 7 8	20 94 60 137 58 9 25 7	4.26 20 12.77 29.15 12.34 1.91 5.32 1.49
eport Administration IPI Manager	50 -			1 2 3 4 5 6 7 8 9	20 94 60 137 58 9 25 7 24	4.26 20 12.77 29.15 12.34 1.97 5.32 1.49 5.11
teport Administration (PI Manager				1 2 3 4 5 6 7 8 9 Undefined	20 94 60 137 58 9 25 7 24 36	4.26 20 12.77 29.15 12.34 1.91 5.32 1.49 5.11 7.66
Report Administration (PI Manager			- Undefe	1 2 3 4 5 6 7 8 9 Undefined	20 94 60 137 58 9 25 7 24 36	4.24 2(12.77 29.11 12.34 1.97 5.33 1.44 5.11 7.66

EFFECTIVENESS

UP

DOWN

DOWNTIME



UNDERSTANDING FAILURE PATTERNS

How A Failure Occurs

IBM Maximo Application Suite Reliability Strategies				BATHTUB PATTERN A = 3-4%	WEAR OUT PATTERN B = 1-17%	FATIGUE PATTERN C = 3-5%
trategy library / Strategy				Process Contract Cont	Leader	Montes
Asset Asset type	Asset configuration		Get strategy \rightarrow	Time INITIAL BREAK-IN PERIOD PATTERN D = 6-11%	RANDOM PATTERN E = 14-42%	INFANT MORTALITY
Air Handling Unit X Air Handling Unit	X HVAC - Air Handling Equipm	ent	×	ANDO	and the second se	
Overview Failure modes Mitigation activities					Time	Time ───→
✓ Actuator, Electric				Reprinted with permission from NeterpressUSA Inc. db/a Reliability with consets of NeterpressUSA Inc. Re relia	ityweb.com. Copyright © 2016. All rights reserved. No part of this graphic may be n Subility" and Reliabilityweb.com" are trademarks and registered trademarks of Ner abilityweb.com • maintenance.org • reliabilityleadership.com	eproduced or transmitted in any form or by any means without the prior express neupressUSA Inc. in the U.S. and several other countries.
 Actuator, ElectroHydraulic 					, , , ,	
 Actuator, Pneumatic 	IBM Maximo Application Suite Reliat	ility Strategies		<mark>®</mark> 0 8 :		
 Actuator, Refrigerant 	Strategy library / Strategy					
	Asset	Asset type	Asset configuration			
Agastat Type Timer Switches	Air Handling Unit	X Air Handling Unit	X HVAC - Air Handling Equipment	× Get strategy →		
✓ Belts or sheaves	Overview Failure modes	Mitigation activities				
✓ Condensate Traps	Operating context (j)					
✓ Condenser Coil	Preview activities in all contexts					
 Controllers, Sensors, and Transmitters 	Criticality Duty cycle Critical High Minor Low	Service condition Severe Mild 				
✓ Damper Bearings	Activities	Frequency				
 Damper Blade to Control Shaft Connection 	System Testing - Functional Tests	зм				
✓ Damper Linkage	Vibration Analysis	ЗМ				
	Fan Bearing Temperature Monitoring	ЗМ			/	
	Calibration	lY				
	Performance Monitoring	lY				
	Thermography	2Y				
	Filter Clean and Inspection	6M				
	System Engineer Walkdown	1Y				

FAILURE PATTERNS

aining 8-23%

MU@ Vegas

FAILURE ANALYSIS











4

ROOT CAUSE ANALYSIS















TOOLS

5 WHYS ANALYSIS CAUSE MAPPING PARETO ANALYSIS FAULT TREE MAS Health



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Reliabilityweb.com, et al. "Uptime Elements Body of Knowledge". Reliabilityweb.com (2017-2019)

https://www.facilities.udel.edu

https://www.jfc-associates.com



THANK YOU!



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