







FAMOS Mobile App 1.0



August 16, 2018 Curtiss-Wright Symposium

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[Mike Greene]

DISCIPLINE: ASSET MANAGEMENT

HIRE DATE: FEB 13, 2015

JOB TITLE: OPERATIONAL TECHNOLOGY LEAD

JOB LOCATION: NSP HEADQUARTERS

JOB DESCRIPTION: MANAGES OPERATIONS COMPUTER SYSTEMS AND THEIR INTERCONNECTIONS.

INTERESTING FACT: HATES VEGETABLES











Tomorrow's Mobile Workforce









Asset Health Manager	A CONTRACTOR OF A CONTRACTOR OF A CONTRACTOR	Sitemap: Metrics->Scorecard->1. Power Production Man	agement Report				
	Health Indicator Explorer	View 1. Power Production	Management	Report			
Common Tanks 😵	A ~Themal ~ A ~LIN ~ LIN	Asset Strategy	Actual	Previous	Target	Trend	Frequ
Send To >>	14221002 - B-CIRCULATING W	E S OPR Compliance					
😢 Help	E-CIRCULATING WATER F	OPR Compliance IS - PP	46.83 %	13.77 %	70.00 %	+	Week
	Operational_Daily_Test_0 Operational_OPR_Inspec	OPR Compliance OS - PP					
Associated Pages 😸	Operational_PDM_IR	PM Compliance					
Create Recommend	Operatorial_PDM_UE Operatorial_PDM_VIB	PM Compliance - Weekly - PP	66.50 %	70.09 %	85.00 %		Weel
Create OPR Recom	Operational_PCP_REC_B	PM Compliance - Weekly - LIN	57.00 %	70.91 %	85.00 %		Weel
Create Nor Recommun	Strategy_OPR_Comp	PM Compliance - Weekly - POA	82.50 %	80.00 %	85.00 %	+	Wee
		PM Compliance - Weekly - POT	77.00 %	66.67 %	85.00 %	+	Wee
	Work_Management_WO	PM Compliance - Weekly - TRE	86.00 %	70.37 %	85.00 %	+	Wee
		PM Compliance - Weekly - TUC	30.00 %	62.50 %	85.00 %	+	Wee
		PM Compliance - YTD - PP	70.20 %	69.00 %	85.00 %	+	Wee
		- S PDM Compliance					
		= //# Performance					
		- E S Production					
		- Actual vs Annual Budget (k\vh) - PP	1,105,087,109	853,895,544	889,542,815	+	Mont
		Actual vs Reforecast (k\vh) - PP	1,105,081	853,896	958,404	+	Mont
		Heat Rate - PP - AVG	10,304	10,652	10,980	+	Mont
		🔤 😴 GER					
		= # Maintenance					
		Description Planning Compliance					
		Total Work Hours - PP	5650	5381	4918	+	Wee
		El 3 Planned Work - PP	55.45 %	60.62 %	50.00 %	+	Wee
		<u>% Planned Work - LIN</u>	54.48 %	55.87 %	50.00 %	+	Wee
			44.87 %	55.82 %	50.00 %	+	Wee
		V Decend Week - DOT	70.01.1/				



Highest Risk

RISK MATRIX

Criticality

FAMOS Mobile 1.0

FAMOS Mobile provides convenient, remote access to FAMOS performance and reliability functionality wherever an authorized user has access to data services and connection to the hosting web server

> Collaborative effort with Nova Scotia Power providing end use perspective on priorities for the initial roll out





11111

NSPI Business Priorities







Today's Mobile Workforce







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Tomorrow's Mobile Workforce











and Hardth Manager Hall	h Indicator Funkner	6	Summary Dalmar Daronmandations											
Sset nearth Manager	-NSPI NSPI	All Indicators												
iommon Tasks 🙁 🗄	A ~Themal ~													
Print	ALV ~ LIN	Sitemap: Metrics	->Scorecard->1. Power Production Mana	agement Report										
Send To >>	14221002 - B-CIRCULATING WATER PUMP	Manu	Devier Dreduction	Management	Depart									
l) Help	Operatoral Daly_Test_Complance	VIEW	. Power Production	management	Report									
sociated Pages 🛛	Operational_OPR_Inspect CW Pump "18"			Actual	Previous	Target	Trend	Frequenc						
Create Recommend	Operational_PDM_IR Operational_PDM_UE	- # Asse	Strategy											
Create OPR Recom	- Operational_PDM_V08	e 🔨 OP	Compliance											
Create NSP Recomm	Operational_PDP_REC_Backlog Strategy_OFR_Camp	E OPR	Compliance IS - PP	46.83 %	13.77 %	70.00 %	†	Weekly						
	Strategy_PDM_Compliance	DP	Compliance OS - PP											
	Strategy_PM_Compliance	• <u>PM</u>	Compliance											
	Engineering_health_Rating	- e <u>PM (</u>	ompliance - Weekly - PP	66.50 %	70.09 %	85.00 %	+	Weekly						
		- <u>P</u>	Compliance - Weekly - LIN	57.00 %	70.91 %	85.00 %	+	Weekly						
		- <u>P1</u>	Compliance - Weekly - POA	82.50 %	80.00 %	85.00 %	1	Weekly						
		- <u>P1</u>	Compliance - Weekly - POT	77.00 %	66.67 %	85.00 %	1	Weekly						
		- <u>P1</u>	Compliance - Weekly - TRE	85.00 %	70.37 %	85.00 %	1	Weekly						
		- <u>P</u>	Compliance - Weekly - TUC	30.00 %	62.50 %	85.00 %	•	Weekly						
		- E PM C	ompliance - YTD - PP	70.20 %	69.00 %	85.00 %	1	Weekly						
			1 Compliance											
		= ## Perfe	rmance											
		e Se Pro	luction											
		- E Actu	I vs Annual Budget (k\sh) - PP	1,105,087,109	853,895,544	889,542,815	1	Monthly						
		- E Actu	I vs Reforecast (k\Vh) - PP	1,105,081	853,896	958,404	1 T	Monthly						
		• Heat	Rate - PP - AVG	10,304	10,652	10,980	+	Monthly						
		GE												
		- //s Main	enance											
		e 🔨 Pla	ning Compliance											
		e Tota	Work Hours - PP	5650	5381	4918	1	Weekly						
			Inned Work - PP	55.45 %	60.62 %	50.00 %		Weekly						
		<u> </u>	manned work - LIN	54.48 %	55.87 %	50.00 %		Weekly						
		<u> </u>	Manned Work - PUA	44.87 %	55.82 %	50.00 %		weekly						
		1 I I I I I I I	Planned Work - POT	75.21 %	75.93 %	50.00 %		Weekly						

POWER An Emera Company

WRIGHT

- Run Coal and Oil Generating Units in concert with Renewables to meet Daily Demand
- Use Technology to replace knowledge being lost due to company demographics
- Use Technology to reduce Operating costs involved in taking manual NDT readings from older non-instrumented assets
- Use Technology to enhance Predictive models that proactively alert SME of impending problems





- Native iOS application that displays real time FAMOS PMAX and PdP results for an entire fleet of assets. (Android planned for future release.)
- Includes a system-wide overview of unit thermal performance
- Provides a remote portal for investigating early warning of equipment anomalies using PdP
- Incorporates user-friendly screens and familiar mobile device actions for navigation





Mobile Network



Mobile Network Architecture



Data Access for a Mobile App







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FAMOS Mobile – Main Menu

A menu option is always available at the top of the display to furnish quick navigation between PMAX and PdP displays and user settings.



Users can save a screen as their home page so that FAMOS Mobile sessions open directly to where the user prefers to start investigations

Displays elegantly resize to the device display. Locked columns and scrolling afford the user easy access to tabular data regardless of display size or aspect ratio

points



FAMOS Mobile – PMAX Unit Performance Fleet View

A main PMAX display show all current unit generation and heat rate deviation



A graph of the most recent 24 hours of unit gross heat rate versus gross generation can be displayed for any listed unit





FAMOS Mobile – Unit Thermal Performance 24 Hour View





FAMOS Mobile – Unit Controllable Losses

Users can drill down into any selected unit to view a table of controllable losses to investigate heat rate deviations and MW impacts

	Menu PMAX Set as Home													
Units / fossil3 / Heat Ra	ate													
	Select Units to Return to Main PMAX Display					Search:								
Controllable Losses	Delta HR (Btu/kWh)î†	Unit 🎝	Actual 1	Design \downarrow 🕇	Delta 🎝	Delta HR (Btu/kWh) ม1	MW Effect (Mwe) ↓î							
Auxiliary Steam Flow		LB/HR	0	0	0	0	0							
Boiler Excess Oxygen		% wet	2.695435	2.630852	-0.07008314	1.401298E-45	N/A							
Boiler Exit Gas Temp		°F	487.0292	339.9654	146.5134	1.401298E-45	N/A							
Condenser Subcooling		°F	0.06739807	0	0.06739807	6.739808E-06	-0.0008995276							
Cont Blow Down Flow		LB/HR	0	0	0 0		N/A							
Final Feedwater Temp		°F	450.5665	451.0031	-0.8609009	1.692362	0.1005648							
Generator Hydrogen Press		psig	30.52751	30	0.5275116	0.2978382	-0.00536311							
Incomplete Combustion		%	1.401298E- 45	0.2	-0.2	-20.41602	N/A							
LP Exhaust Pressure		in.HG	1.463686	1.5	-0.03631449	0.1159897	-0.002676782							
Main Steam Pressure		psia	1815.545	1815	0.5449219	-0.550338	0.05145615							
Main Steam Temp		°F	990.8751	1000	-9.124878	6.289907	0.2471413							
Make up Water Flow		LB/HR	0	0	0	0	0							
Reheat Spray Flow		LB/HR	0	0	0	0	0							





FAMOS Mobile – Use Search to Filter

Tables can be filtered by entering text in the Search input box. The search includes all fields.

Menu				PMA	Set as Home				
Units / fossil3 / Heat Ra	ate			Enter test to					
				filter visible table			Search:	Steam	
Controllable Losses	Delta HR (Btu/kWh)	ļţ	Unit 🎵	Actual	Design 🎵	Delta ↓†	Delta HR (Btu/kWh)Ĵ↑	MW Effect (Mwe) ↓↑	
Auxiliary Steam Flow			LB/HR	0	0	0	0	0	
Main Steam Pressure			psia	1815.545	1815	0.5449219	-0.550338	0.05145615	
Main Steam Temp			°F	990.8751	1000	-9.124878	6.289907	0.2471413	
Reheat Steam Temp			°F	957.5557	1000	-42.44434	53.54893	-3.181057	

Tables can be sorted and are scrollable





FAMOS Mobile – PdP Anomaly Detection Fleet View

A main PdP display provides a fleet-wide overview of unit health through a listing of all units, their current generation, and the number of PdP models in alarm

Menu			PDP		
Units					
					Search:
	Unit 斗		Gross MW	ţţ	Models in alarm
ccgt1		0.0		1	
ccgt2		0.0		6	A least one model in alarm, rose
fossil1		3.68109		14 🖌	background
fossil3		150.44		21	
nuclear1		-34.6423		0	
nuclear2		-21.4663		0	No models in
wcity1	Selecting a hyperlink will open the PdP Unit display	0.0		6	alarm, green background



Users can delve deeper into unit health by selecting a unit and view a table of all its models and their status, including the number of alarms for each model and how many have been acknowledged, and are being actively pursued.

	PDP						
Units 🗸 fossil3							
	Return to list of units	Search:					
Model 🌡	Description 11	Category 1	Component				
3aBFPpm (1) (1)	FOSSIL 3 BFP W MOTOR A	PUMP	3 BFP W MOTOR A				
3aCEPm	FOSSIL 3 COND EXTR PUMP A	PUMP	At least one				
3aFDFNp	FOSSIL 3 FD FAN A	FAN	sensor in alarm: Rose				
3alDFNp	FOSSIL 3 ID FAN A	FAN	3 No Sensors in Alarm: Green				
3aPAFNp	FOSSIL 3 PRIMARY AIR FAN A	FAN	3 PRIMARY AIR FAN A				
3aPAHpm	FOSSIL 3 PRIMARY AIR HEATER A	FAN	3 PRIMARY AIR HEATER A				
3aPULVpm	FOSSIL 3 PULVERIZER A	PULVERIZER	3 PULVERIZER A				
3aSAHp (1) (1) [1]	3 SECONDARY AIR HEATER A	AIR HEATER	3 SEC YOARY AIR HEATER A				
3bBFPpm (1) (1) [1]	Select hyperlink to display TOR B	PUMP	3 Model inactive:				
3bCEPm	the PdP Point Summary for the selected model PUMP B	PUMP	3 CO 8				
3bFDFNp (3) (3) [3]	FOSSIL 3 FD FAN B	FAN	3 FD FAN B				
3bIDFNp (4) (4) [4]	FOSSIL 3 ID FAN B	FAN	3 ID FAN B				
3BOILR (5) (5) [5]	FOSSIL 3 BOILER PERF	BOILER	3 BOILER PERF				
3bPAFNp (1) (1) [1]	FOSSIL 3 PRIMARY AIR FAN B	FAN	3 PRIMARY AIR FAN B				
3bPAHpm (1) (1) [1]	FOSSIL 3 PRIMARY AIR HEATER B	AIR HEATER	3 PRIMARY AIR HEATER B				
3bPULVpm (2) (2) [2]	FOSSIL 3 PULVERIZER B	PULVERIZER	3 PULVERIZER B				

From the PdP Unit Display, the user can inspect individual models by selecting the appropriate model name hyperlink.





FAMOS Mobile – PdP Model Point Summary Drill Down

Menu Return to list of models PDP Set as Home Units / fossil3 ~ 3BBFPpm Open Sensor Plots Point Summary Display, Leftmost Columns Search:												Th pro	es	Poir ents	nt Su a s	umn orta	hary ble	yd ,s	isp crc	olay ollat	ole I	table	ý		
n It	Sensor 1	Description 1	Unit 🎼	DAS Value 1	Actual 1	Prediction 1	Residual 1	Variance 1	Res. High 🎼	Res. Low ↓†	Pt. Act. 1	In Ala			ai 16		1501	5 11 1		; []] alu		EI2	aiu	ny	
1,1	BDPS- 3SJ05	BFP 3A OB MTR BRG (FDPS-3SJ05)	°F	131.341	131.341	120.974	10.3666	9.76564	5.0	-10.0	Yes	,		WI	ก		CU	ren	ι, ν	alu	ies	, St	alus	ses	
	BDPS- 3SD13	FDWTR FLOW (FDPS-3SD13)	КРРН	1044.76	1044.76	1047.72	-2.96289	0.0649829	30.0	-30.0	Yes			an	a	setti	ngs								
	BDPS- 3SJ-PT- 105	FINAL FEEDWATER PRESSURE (FDPS-3SJ-PT- 105)	PSIG	0.0	2379.18	0.0	0.0	0.0	30.0	-30.0	No														
	BDPS- 3SJ20	BFP FDWTR DISCH PRES (FDPS-3SJ20)	PSIG	2385.7	2385.7	2389.39	-3.69434	0.238268	30.0	-30.0	Yes	Me	nu					PDP					Set as	Home	
	BDPS- 3SD17	FDWTR FROM DEAERATOR (FDPS-3SD17)	°F	0.0	0.0	0.0	0.0	0.(roll _0 _	<u> </u>	No	Open	Sensor Plots			Point	t Summary Disp	olay, Rightmost	Columns			Search:			
	BDPS- 3SJ02	BFP 3A IB BRG (FDPS-3SJ02)	°F	158.289	158.289	158.624	-0.334854	0.348123	ΊL	-10.0	Yes	PN ↓†	Sensor 1	Description 1	al J†	Prediction 1	Residual 灯	Variance 1	Res. High <u>↓</u> †	Res. Low ↓↑	Pt. Act. ↓↑	In Alarm ↓₹	Alarm Active 11	Var. Limit	
	BDPS- 3SJ03	BFP 3A OB BRG (FDPS- 3SJ03)	°F	128.982	128.982	128.965	0.0175171	0.0171691	\	-10.0	Yes	1,1	BDPS- 3SJ05	BFP 3A OB MTR BRG (FDPS-3SJ05)	.341	120.974	10.3666	9.76564	5.0	-10.0	Yes	Yes	Yes (R)		
													BDPS- 3SD13	FDWTR FLOW (FDPS-3SD13)	4.76	1047.72	-2.96289	0.0649829	30.0	-30.0	Yes	No	Yes (R)		
•													BDPS- 3SJ-PT- 105	FINAL FEEDWATER PRESSURE (FDPS-3SJ-PT- 105)	9.18	0.0	0.0	0.0	30.0	-30.0	No	No	Yes (R)	*	
S	utfic	cient	de	tail	IS	orovi	ded	to					BDPS- 3SJ20	BFP FDWTR DISCH PRES (FDPS-3SJ20)	5.7	2389.39	-3.69434	0.238268	30.0	-30.0	Yes	No	Yes (R)	*	
CI	inn	ort re	m		ans	alvei	e of						PDPC.	EDW/TR EROM	0	0.0	0.0	0.0	5.0	5.0	No	No	No (D)		

3SD17

BDPS-

3SJ02

BDPS-

3SJ03

DEAERATOR (FDPS-3SD17)

(FDPS-3SJ02)

BRG (FDPS-

3SJ03)

BFP 3A IB BRG 289

BFP 3A OB 982

158.624

128.965

-0.334854

0.0175171 0.0171691

0.348123

5.0 -10.0

5.0 -10.0

Yes (R)

Yes (B)

No

Yes No

Sufficient detail is provided to support remote analysis of equipment conditions requiring user intervention.





FAMOS Mobile – PdP Select Up to 8 Sensors to Plot

Up to eight sensors at a time can be charted to facilitate investigation of the underlying cause of abnormal behavior

Menu	ı					PDP				Se	t as Hom	ie	
Units	fossil3 / 3a	aBFPpm											
Open	Open Sensor Plots Push to render charts Search:												
PN ↓†	Sensor 1	Description 1	Unit 👫	DAS Value 11	Actual 1	Prediction 1	Residual 1	Variance 1	Res. High ↓1	Res. Low ↓†	Pt. Act. ↓†	In Alan	
1,1	BDPS- 3SJ05	BFP 3A OB MTR BRG (FDPS-3SJ05)	°F	131.341	131.341	120.974	10.3666	9.76564	5.0	-10.0	Yes	Y	
	BDPS- 3SD13	FDWTR FLOW (FDPS-3SD13)	КРРН	1044.76	1044.76	1047.72		Select row Selected ro changes to	with a single w backgrou blue. To	e tap. nd	p.) Yes		
	BDPS- 3SJ-PT- 105	FINAL FEEDWATER PRESSURE (FDPS-3SJ-PT- 105)	PSIG	0.0	2379.18	0.0	0.0	background	l returns to	Þ	No	٨	
	BDPS- 3SJ20	BFP FDWTR DISCH PRES (FDPS-3SJ20)	PSIG	2385.7	2385.7	2389.39	-3.69434	0.238268	30.0	-30.0	Yes	٨	
	BDPS- 3SD17	FDWTR FROM DEAERATOR (FDPS-3SD17)	°F	0.0	0.0	0.0	0.0	0.0	5.0	-5.0	No	٨	
	BDPS- 3SJ02	BFP 3A IB BRG (FDPS-3SJ02)	°F	158.289	158.289	158.624	-0.334854	0.348123	5.0	-10.0	Yes	М	
	BDPS- 3SJ03	BFP 3A OB BRG (FDPS- 3SJ03)	°F	128.982	128.982	128.965	0.0175171	0.0171691	5.0	-10.0	Yes	Ν	





FAMOS Mobile – PdP Charts



The chart background is highlighted in yellow for periods when the sensor is in alarm and individual series can be activated or deactivated to aid in review





FAMOS Mobile – PdP Chart Updating



A user can modify the start, end time and sample frequency to focus in on periods of interest . Making the desired changes and pushing the "Update Charts" poke point will render the charts for the revised time period.





Wireless Data to Enhance Asset Performance and Condition Monitoring

Wish List





What's Next?







Questions





