





Diagnostics for O&M



GovEnergy
www.govenergy.gov



For More Information

- Would you like to know more about this session?
- Mark Levi
- General Services Administration
- 450 Golden Gate Ave. 4E (9PME)
San Francisco, CA 94102
- Mark.Levi@gsa.gov

Don't forget to fill out and drop off your session evaluations!



What Are Diagnostics

- Software that finds problems
- Third-Party or OEM
- Types:
 - From OEM with equipment (not discussed here)
 - Statistical
 - Real-Time
 - Simplest form: alarms



Types of Diagnostics

- Alarms simply provide notice that one or a few conditions occur
- “Real-time” diagnostics provide notice of a more complex set of conditions
- Statistical diagnostics provide notice of set of conditions based on trends over time
- “Real-time” may be statistical with shorter time horizon



Applications Used

- NIST VPACC (VAV box Performance Assessment Control Charts)
- FDE PACRAT (Performance and Continuous Recommissioning Analysis Tool)
- Under evaluation: NIST APAR (AHU Performance Assessment Rules)



Linking to O&M

- Use Computerized Maintenance Management System (CMMS)
- VPACC: Automatic work order generation
- PACRAT: Periodic runs and semi-automatic work order generation



PACRAT Work Order

Work Order Details - Microsoft Internet Explorer provided by General Services Administration

File Edit View Favorites Tools Help

Address http://www2.gemnetr9.com/Region9/Workorders/WO_Details.aspx

Links Acquisition APW ASHRAE Dashboard BART BEC BIM Bldg Pics CHRIS login Comprizon CPS E2 EMCS Data Std Energy Projects eRegs EUAS FAS FBO Finance FMIS Forms

GSA MLEVI:EZCMMS
GSA Region 9

Navigate Settings History Action

NUMBER 00752451 Print Filter STATUS START
DESCRIPTION PACRAT ANOMALIES:Chiller 3_Carrier TYPE Corrective Maintenance
550ton:4/1/08-6/22/08. Check Spelling PRIORITY 0
LOCATION Phillip Burton / FLR:SB / RM:CHILLER RM HAS FOLLOWUP N
EQUIPMENT R-5-3:Main Chiller #3 Carrier Evergreen Centrifugal 550 Ton PARENT

Additional Equipment Cost/Funding Labor/Remarks Materials

REPORT DATE 7/24/2008 1:17:00 PM RESPOND BY
REPORTED BY PACRAT Notify AGENCY
CONTRACTOR ENOVITY PHONE
ATTN: DISPLAY All
SCHEDULED START FUNCTION CODE HVAC
TARGET COMPLETE FUNCTION CODE N/A
ACTUAL START 7/24/2008 1:34:00 PM PROBLEM HVAC
ACTUAL COMP CA0154ZZ UD ACCESS LEVEL
CHANGE BY MWynne
CHANGE DATE 7/24/2008 1:37:00 PM

Done E:\GovEnergy Microsoft PowerPoint - [...] VPACC NIST - Google Se... Work Order Details - ... Mail - Microsoft Internet ... Internet 5:17 AM



PACRAT WO, Full Text

http://www2.gemnet9.com/Region9/temp/MLevi.pdf - Microsoft Internet Explorer provided by General Services Administration

work type: ...

Y

PACRAT ANOMALIES:Chiller 3_Carrier 550ton:4/1/08-6/22/08. 1.>>Chiller Efficiency was beyond the defined range<< --->Chiller efficiency adjusted for percent load was out of range 100% of the time. Efficiency averaged 24% above indicated baseline. 2.>>Chiller starts more frequently than desired<< --->The chiller started more frequently than desired. 1 day was found where starts were more than 6. The most starts per day was 8. The average number of starts for the days that were high was 8. 3.>>Sensor Failure<< --->The ER_P sensor was failed from 4/10/2008 11:30:00 AM to 6/20/2008 2:45:00 PM 30% of the time. It showed an average value of 52.8. 4.>>Sensor Failure<< --->The Evap_DP sensor was failed from 4/2/2008 10:45:00 AM to 6/20/2008 2:45:00 PM 99% of the time. It showed an average value of 21. 5.>>Sensor Failure<< -->The Suct_T_Calc sensor was failed from 4/10/2008 11:30:00 AM to 6/20/2008 2:45:00 PM 40% of the time. It showed an average value of 0. 6.>>Sensor Failure<< --->The Tons sensor was failed from 4/10/2008 11:30:00 AM to 6/20/2008 2:45:00 PM 42% of the time. It showed an average value of 0. 7.>>Suspect Sensor Readings<< --->The CHWS_Stpt sensor was suspect from 4/1/2008 to 6/22/2008 96% of the time. It showed an average value of 50. 8.>>Suspect Sensor Readings<< --->The CHWS_T sensor was suspect from 4/2/2008 10:45:00 AM to 6/20/2008 2:45:00 PM 79% of the time. It showed an average value of 55.4. 9.>>Suspect Sensor Readings<< --->The ER_P sensor was suspect from 4/10/2008 11:45:00 AM to 6/20/2008 2:00:00 PM 23% of the time. It showed an average value of 48.6. 10.>>Suspect Sensor Readings<< --->The Suct_T_Calc sensor was suspect from 4/2/2008 10:45:00 AM to 6/19/2008 9:00:00 AM 99% of the time. It showed an average value of 50.2

Unknown Zone

Done

Start | E:\GovEnergy | Microsoft PowerPoint - [... | VPACC NIST - Google Se... | Work Order Details - Micr... | Mail - Microsoft Internet ... | http://www2.gemnet...

5:21 AM



VPACC Work Order

Work Order Details - Microsoft Internet Explorer provided by General Services Administration

File Edit View Favorites Tools Help

Address http://www2.gemnetr9.com/Region9/Workorders/WO_Details.aspx

Links Acquisition APW ASHRAE Dashboard BART BEC BIM Bldg Pics CHRIS login Comprizon CPS E2 EMCS Data Std Energy Projects eRegs EUAS FAS FBO Finance FMIS Forms

GSA
MLEVI:EZCMMS
GSA Region 9

Navigate Settings History Action

NUMBER: 00656721 [Print] [Filter] STATUS: CLOSE [Close Icon] TYPE: Corrective Maintenance

DESCRIPTION: Alarm:Nist Alarm Code : 16016 PV:5
Unstable cold deck airflow alarm
High cold deck airflow alarm [Check Spelling] PRIORITY: 0

LOCATION: Phillip Burton / FLR:16 / RM:16W-16 [Person Icon] HAS FOLLOWUP: N [Person Icon] [Car Icon] [Truck Icon] PARENT: [Blank] [Close Icon]

EQUIPMENT: C-5-1055:Single Duct VAV Box 16W-16 [Person Icon] [Lightbulb Icon]

Additional | Equipment | Cost/Funding | Labor/Remarks | Materials

REPORT DATE: 12/5/2007 9:20:04 AM RESPOND BY: [Blank]

REPORTED BY: BAS [Notify] AGENCY: [Blank] [Person Icon] PHONE: [Blank]

CONTRACTOR: ENOVITY [Dropdown] DISPLAY: All [Dropdown]

ATTN: [Blank] FUNCTION CODE: HVAC [Dropdown]

SCHEDULED START: [Blank] FUNCTION CODE: N/A [Dropdown]

TARGET COMPLETE: [Blank] PROBLEM: N/A [Dropdown]

ACTUAL START: 12/11/2007 8:36:00 AM ACCESS LEVEL: [Dropdown]

ACTUAL COMP: 12/11/2007 8:36:00 AM CHANGE BY: AFisher [Person Icon]

CA0154ZZ [UD] CHANGE DATE: 12/11/2007 9:20:00 AM

Done | Start | E:\GovEnergy | Microsoft PowerPoint - [...] | VPACC NIST - Google Se... | Work Order Details - ... | Mail - Microsoft Internet ... | Internet | 5:26 AM



VPACC WO – Action Taken

Work Order Details - Microsoft Internet Explorer provided by General Services Administration

Address: http://www2.gemnetr9.com/Region9/Workorders/WO_Details.aspx

Links: Acquisition APW ASHRAE Dashboard BART BEC BIM Bldg Pics CHRIS login Comprizon CPS E2 EMCS Data Std Energy Projects eRegs EUAS FAS FBO Finance FMIS Forms

GSA
MLEVI:EZCMM5
GSA Region 9

Navigate Settings History Action

NUMBER: 00656721 [Print] [Filter]

DESCRIPTION: Alarm:Nist Alarm Code : 16016 PV:5
Unstable cold deck airflow alarm
High cold deck airflow alarm [Check Spelling]

LOCATION: Phillip Burton / FLR:16 / RM:16W-16

EQUIPMENT: C-5-1055:Single Duct VAV Box 16W-16

STATUS: CLOSE [Traffic Light Icon]

TYPE: Corrective Maintenance

PRIORITY: 0

HAS FOLLOWUP: N [Person Icon] [Truck Icon]

PARENT: [Link Icon]

Additional | Equipment | Cost/Funding | Labor/Remarks | Materials

NAME: Mark Levi

DATE: Jul 31 2008 05:36:51 AM

REMARKS: [Text Area] [Check Spelling]

FUNCTION CODE: HVAC [N/A]

HOURS: [Empty]

REG: 0

OT: 0

OT MULTIPLIER: 1.5

PAYRATE: 52.0000

[Add Labor] [Set Rate]

ENTER REMARKS AND/OR LABOR TIME THEN PRESS "ADD LABOR"

Startdate	LaborCode	Contractor	RegHrs	OTHrs	AccountCode	Ext	Description
12/10/2007 5:20:19 PM	SHlls0n	ENOVITY	2	0	A00		JD - SH 12/10/07: Replaced VAV card, rebalanced

Done

Start | E:\GovEnergy | Microsoft PowerPoint - [...] | VPACC NIST - Google Se... | Work Order Details - ... | Mail - Microsoft Internet ... | Internet | 5:27 AM



Issues

- May not have all sensors desired
- Data problems with BAS
- Need to maintain communications
- Need to calibrate algorithms (equipment must be able to meet tests)
- One system can impact another (avoid 100 box work orders because an AHU is down)



Would you like to know more about this session?

- Mark Levi
- General Services Administration
- 450 Golden Gate Ave. 4E (9PME)
San Francisco, CA 94102
- Mark.Levi@gsa.gov
- Don't forget to fill out and drop off your session evaluations.