

REINHOLD ENVIRONMENTAL Ltd.



2011 NO_x-Combustion Round Table & Expo Presentation

February 7-8, 2011, in Birmingham, AL / Hosted by Southern Company

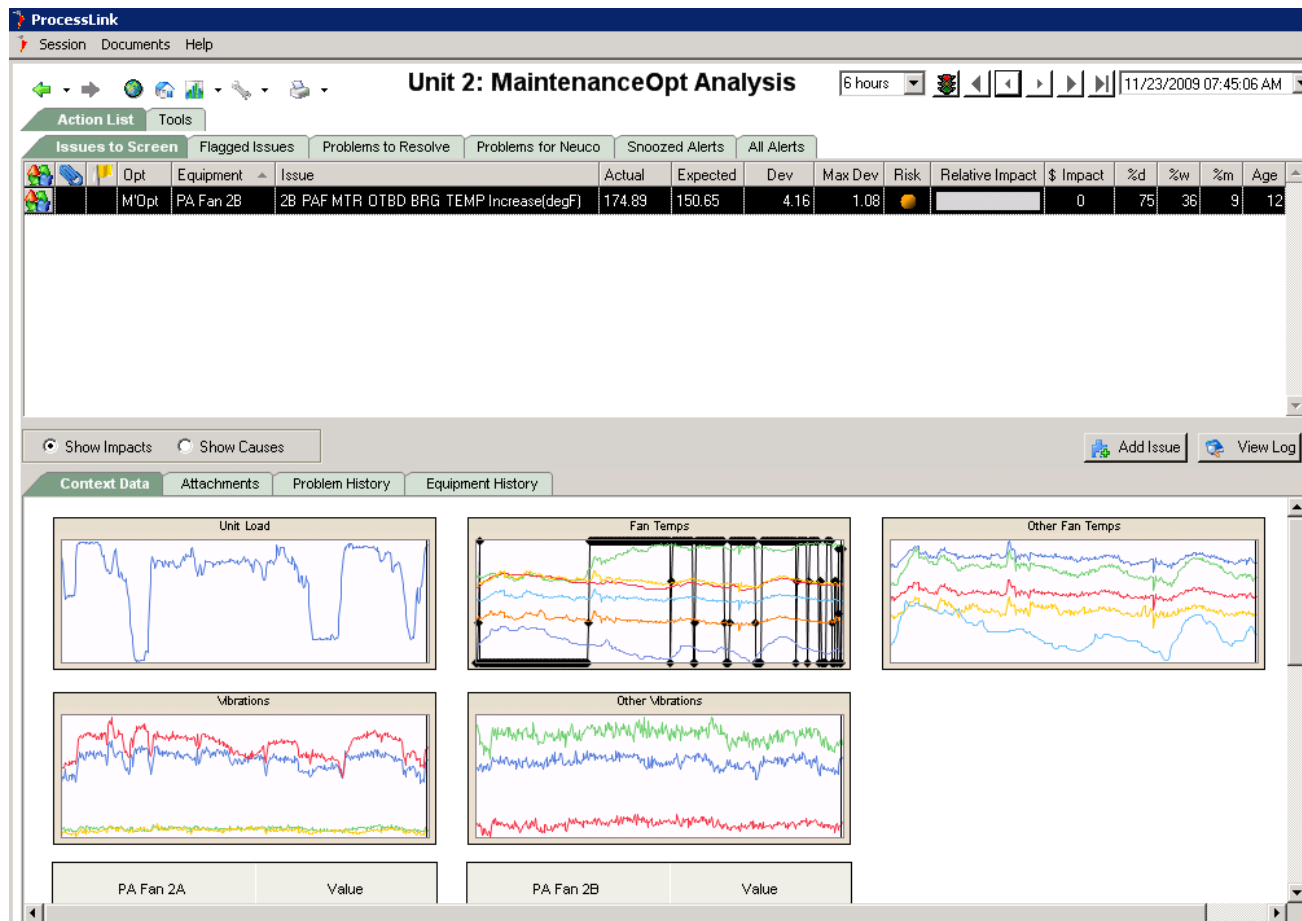
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Example 1: Low Oil

- **Unit:** NRG Limestone Unit 2, 913 MW
- **Users:** Maintenance Supervisor and Performance Engineer.
- **Usage:** Both work 4/10 shift Monday to Thursday. They check MaintenanceOpt each morning when they are at site.
- **Incident:** Low oil on a primary air fan bearing system was found on Monday during routine login to MaintenanceOpt.
- **Fix:** Oil was added to the bearing system several hours after the problem was identified. The temperature returned to normal.

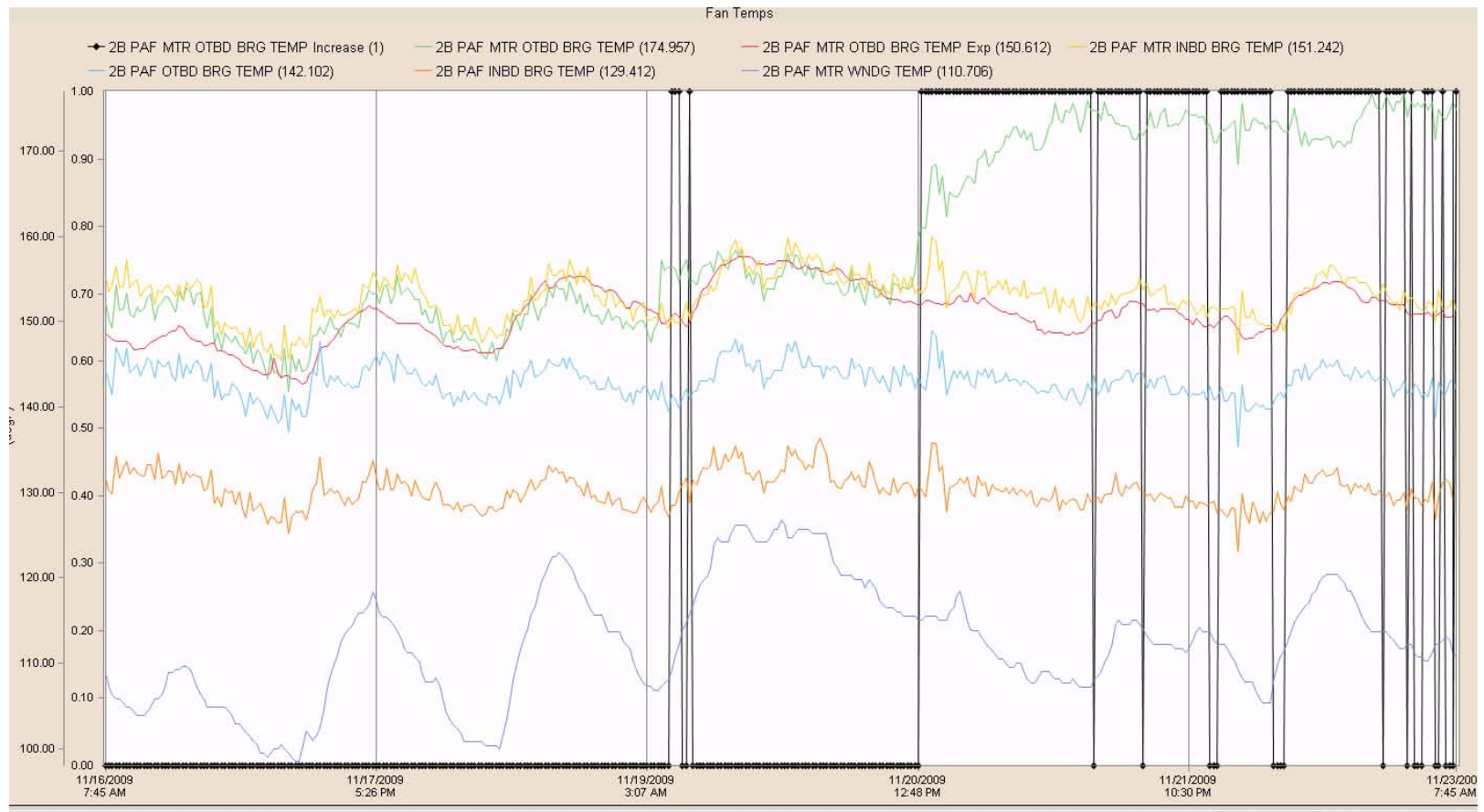
Problem Alerted by MaintenanceOpt

- In a routine login to MaintenanceOpt, the users find an alert for a bearing on a primary air fan. The bearing is at 174 degrees while it is expected to be at 150 degrees.



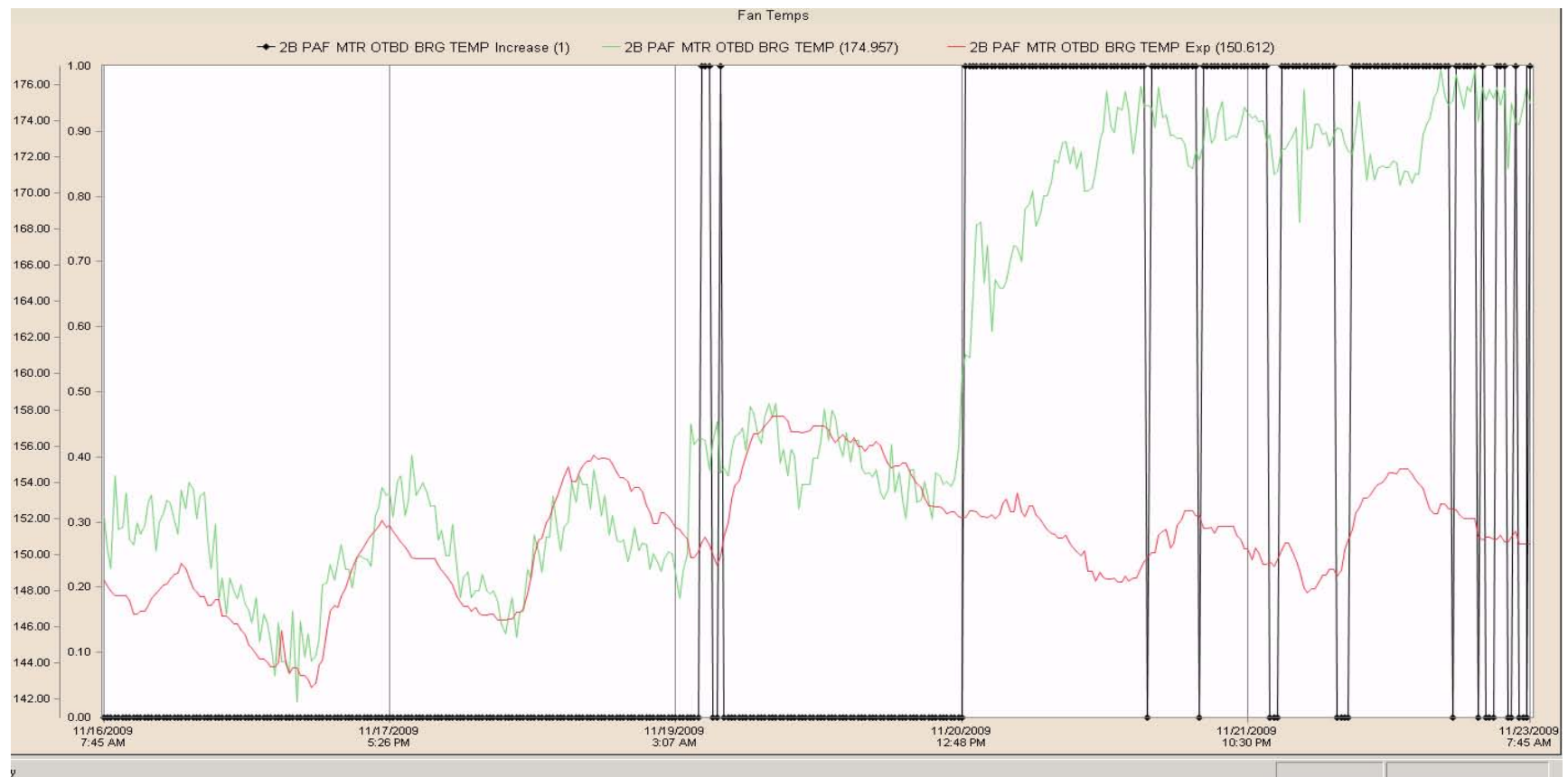
Checking Alert

- Chart shows the actual temperatures for all bearings on this fan. Also shows expected value for the bearing of interest. Only the temperature of bearing associated with the alert looks abnormal.



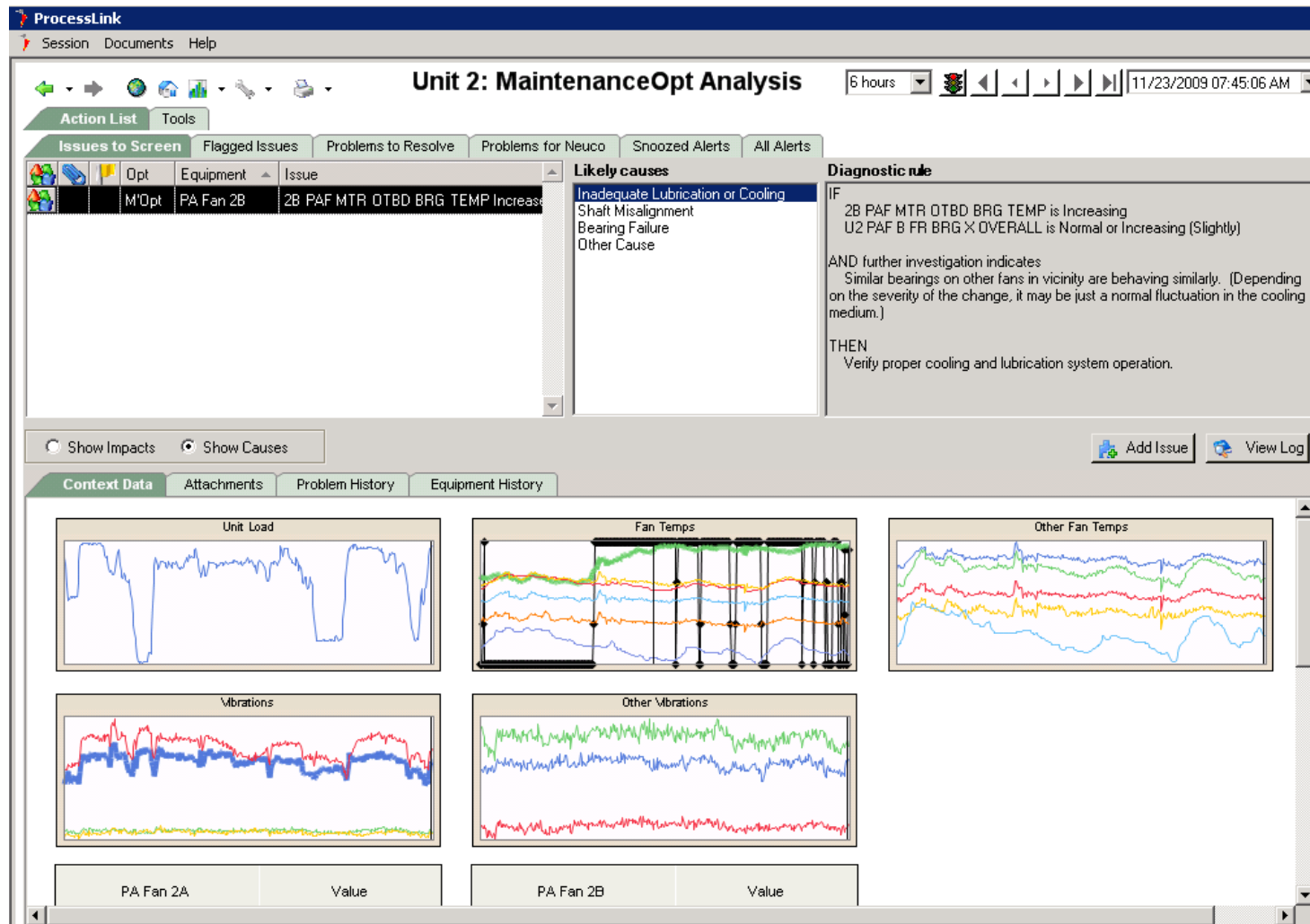
Actual vs. Expected

- Actual and expected (neural network) value of applicable bearing temperature shown. Incident starts Friday afternoon at around 1pm with no maintenance personnel on site. Value stayed under the points DCS alarm trigger value. This view is from Monday morning during a routine check.



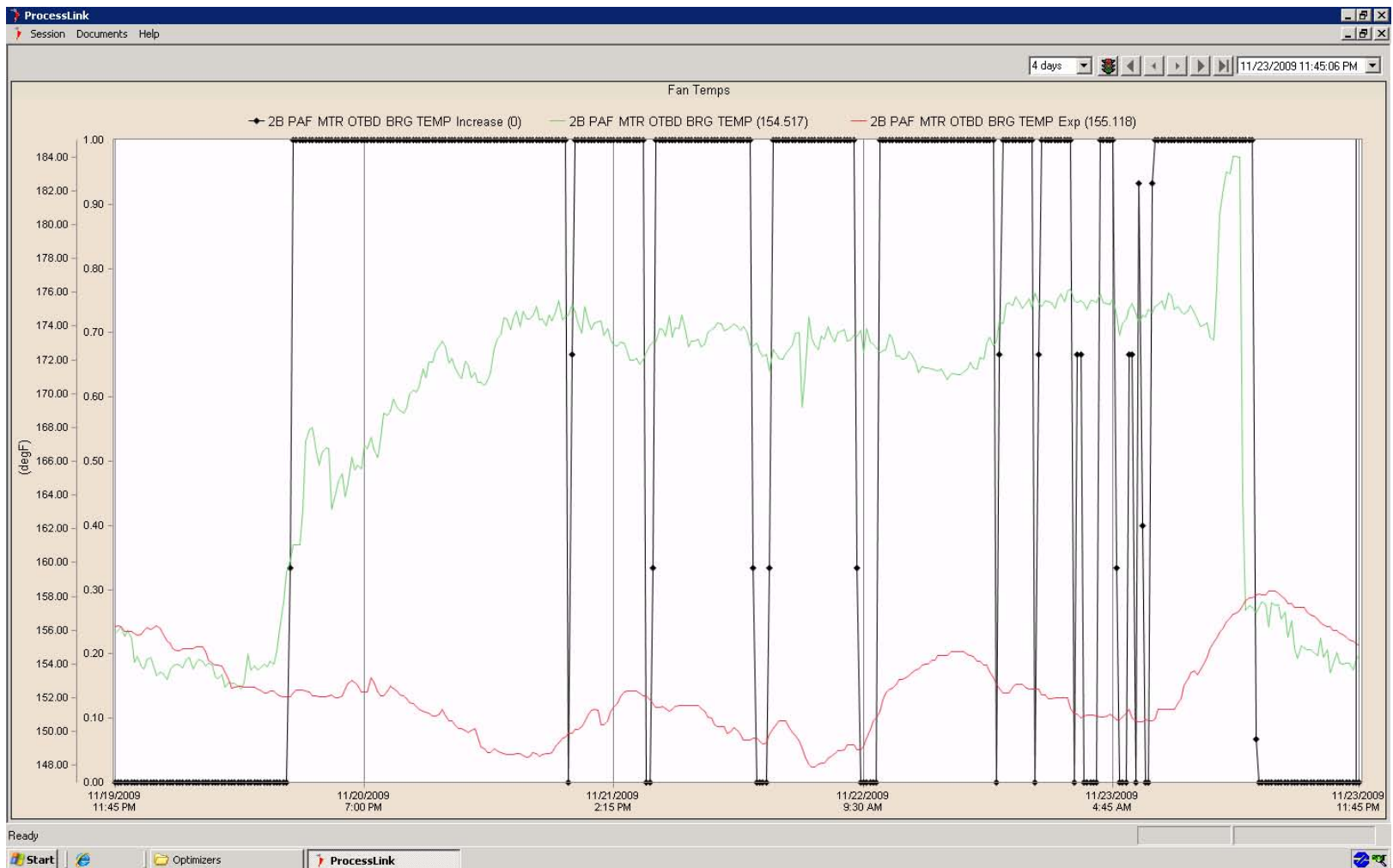
Diagnosing the Problem

- One likely cause is inadequate lubrication or cooling. Rule clauses are highlighted below. Temperature is increasing but vibrations are normal.



Fixing the Problem

- Customer fixes the low oil problem within hours of finding it. Temperature returns to normal.



Closing the Alert

- The alert is closed and a comment is posted in MaintenanceOpt's database.

The screenshot shows the ProcessLink software interface. The title bar reads "ProcessLink" and the menu bar includes "Session Documents Help". The main window title is "Unit 2: MaintenanceOpt Analysis". The interface features a toolbar with navigation icons and a date/time display showing "11/23/2009 03:45:07 PM". Below the toolbar, there are tabs for "Action List" and "Tools". The main display area has several tabs: "Issues to Screen", "Flagged Issues", "Problems to Resolve", "Problems for Neuco", "Snoozed Alerts", and "All Alerts". The "Issues to Screen" tab is active, showing a table with columns: "Opt", "Equipment", "Issue", "Actual", "Expected", "Dev", "Max Dev", "Risk", "Relative Impact", "\$ Impact", "%d", "%w", "%m", and "Age". Below the table, there are radio buttons for "Show Impacts" and "Show Causes", and buttons for "Add Issue" and "View Log". The "Problem History" tab is selected, showing a table with columns: "Description", "Triggered", "Escalated", "Diagnosed", "RootCause", "Closed", and "Resolved". The table contains two rows of data. Below the table, there is a "Detail History" section with a table with columns: "Time", "Event", "User", and "Details". The table shows a single entry for "11/23/2009 3:40 PM" with the event "Closed" and user "JHudspeth". The details text reads: "Oil level was low. Oil was added and temperatures came down into normal range." Below the table, there is a text area containing the same text: "Oil level was low. Oil was added and temperatures came down into normal range."

User
Comment

Example 2: FWH 21B DCA Degradation

- **Unit:** Limestone Unit #2, 900 MWs
- **Usage:** The following problem was identified by an automatic email alert
- **Incident:** The FWH 21B DCA was running about 30 degrees higher than the expected value on Jan.3rd. This issue was sent to customers by an automatic email on the same day, and followed by another email from NeuCo Customer Support. Based on the warnings, the client found it was a controller or drip valve issue on this heater.

Initial Email Alert

- FWH 21B DCA problem is sent by an automatic email

From: NeuCo Customer Support [<mailto:support@neuco.net>]
Sent: Monday, January 03, 2011 3:53 PM
To: Limestone Alerts; [REDACTED]
Subject: U2 MOpt Alerts: FWH 21B DCA Degradation, GEN-BRG 10 METAL TEMP Increase

The following alerts have been generated from the 'U2 MaintOpt Triggering Service' service.

[FWH 21B DCA Degradation](#)
[GEN-BRG 10 METAL TEMP Increase](#)

FWH 21B DCA Degradation

Actual: 39.07 deltaF
Expected: 9.37 deltaF
Deviation Index: 29.70
Trigger Percent during Last Day: 7 %
Trigger Percent during Last Week: 1 %



Issue Highlighted on Home Page

- FWH 21B DCA problem is shown on the MaintenanceOpt Home page

Unit 2: MaintenanceOpt Home 1/5/2011 12:32 PM

ActionList

Equipment	Issue/Action	Dev	Max Dev	Ri	Relative Impact	%d	%w	%m
Turbine B...	GEN-BRG 10 METAL TEMP Increase(degF)	3.68	15.95	●		97	27	6
Turbine B...	MT BRG 8X VIR NOT 1X Increase(mils)	2.16	2.45	●		97	27	6
FwH 21B	FwH 21B DCA Degradation(deltaF)	6.72	41.84	●		73	24	6

Optimization Benchmark

Alerts over Past

Equipment	Flg

Optimization Analysis

Current Alerts

Equipment	Trg	Flg	Diag
Turbine Bearing	2		
Air Heaters	1		
CNDP 2C	1		
FwH 22B	1		
FwH 21B	1		

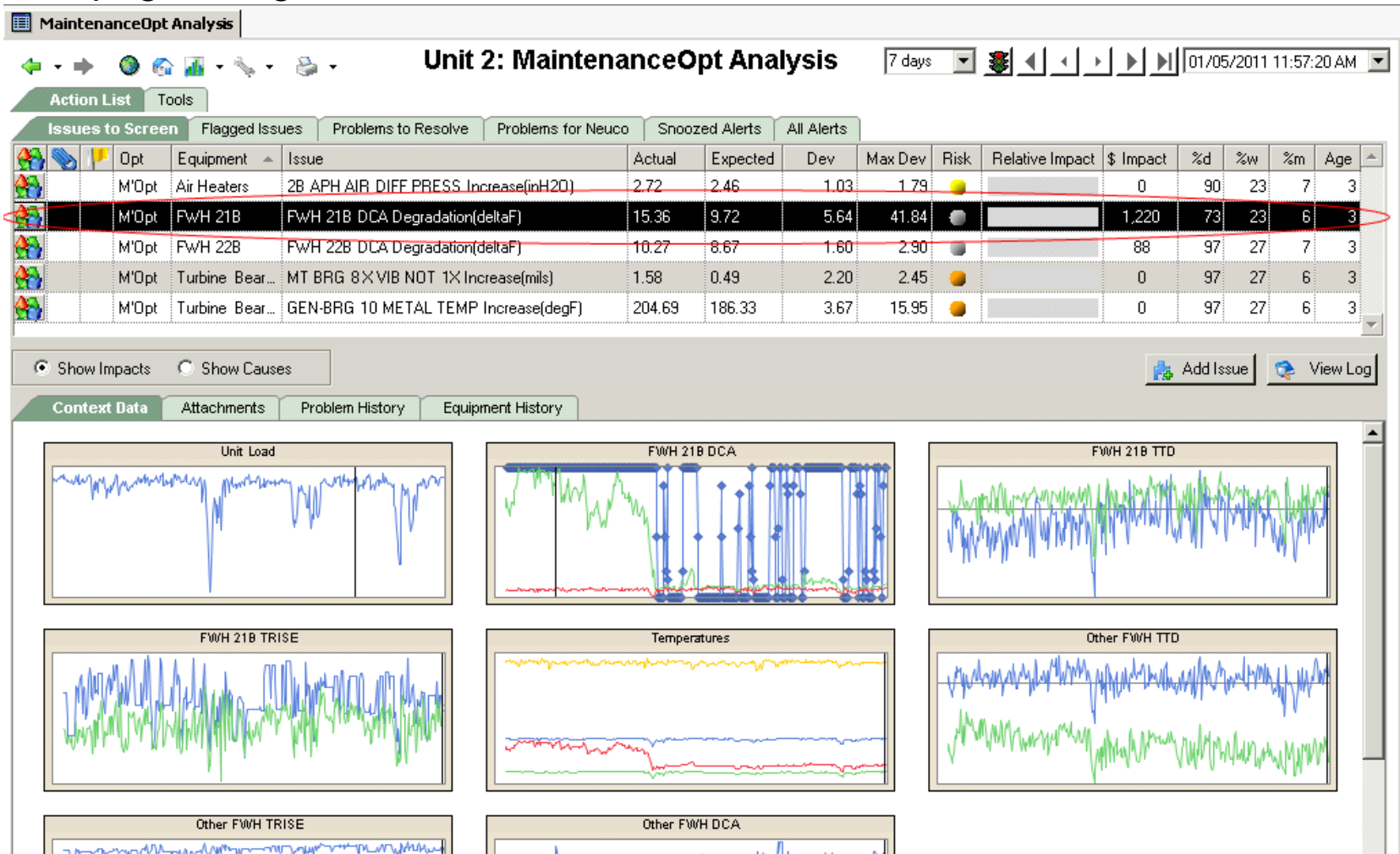
Instrumentation Issues

Sensor ID	Sensor Name	Units	Raw Value
2HD0811	2J PULV MOTOR AMPS	A	-0.06
2BBSHDPD...	B SH DP DIFF	degF	-459.67
2BBSHFINA...	B SH FIN AVG	degF	-459.67
2BBSHFIN...	B SH FIN DIFF	degF	-459.67
2BBSHLTA...	B SH LT AVG	degF	-459.67
2BBSHLTD...	B SH LT OUT DEG F	degF	-459.67

— Actual NUHR — NetM/W Act GrossM/W

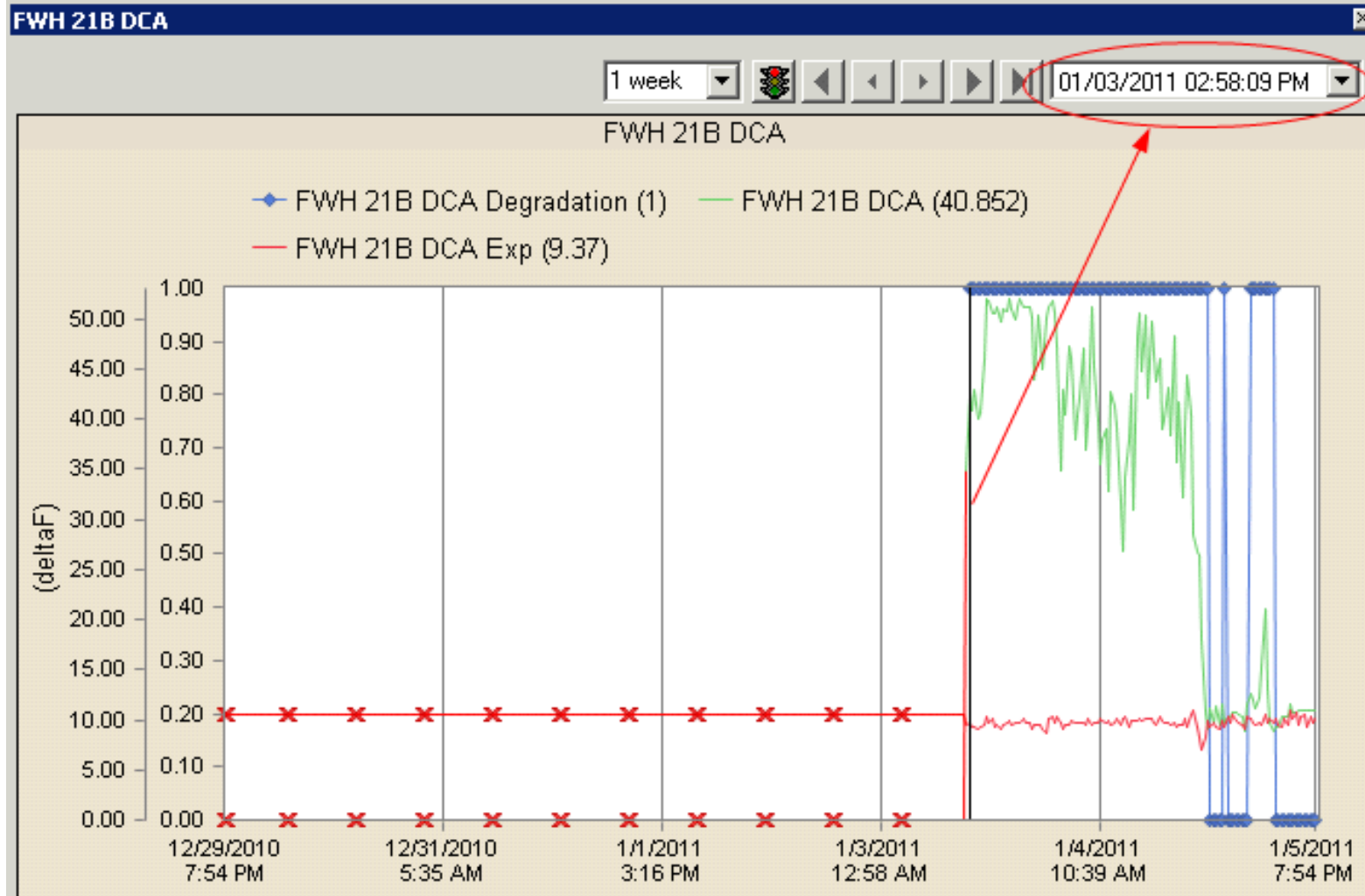
Issues to Screen

The FWH 21B DCA alert is also shown on the MaintenanceOpt Issues to Screen page along with the context data



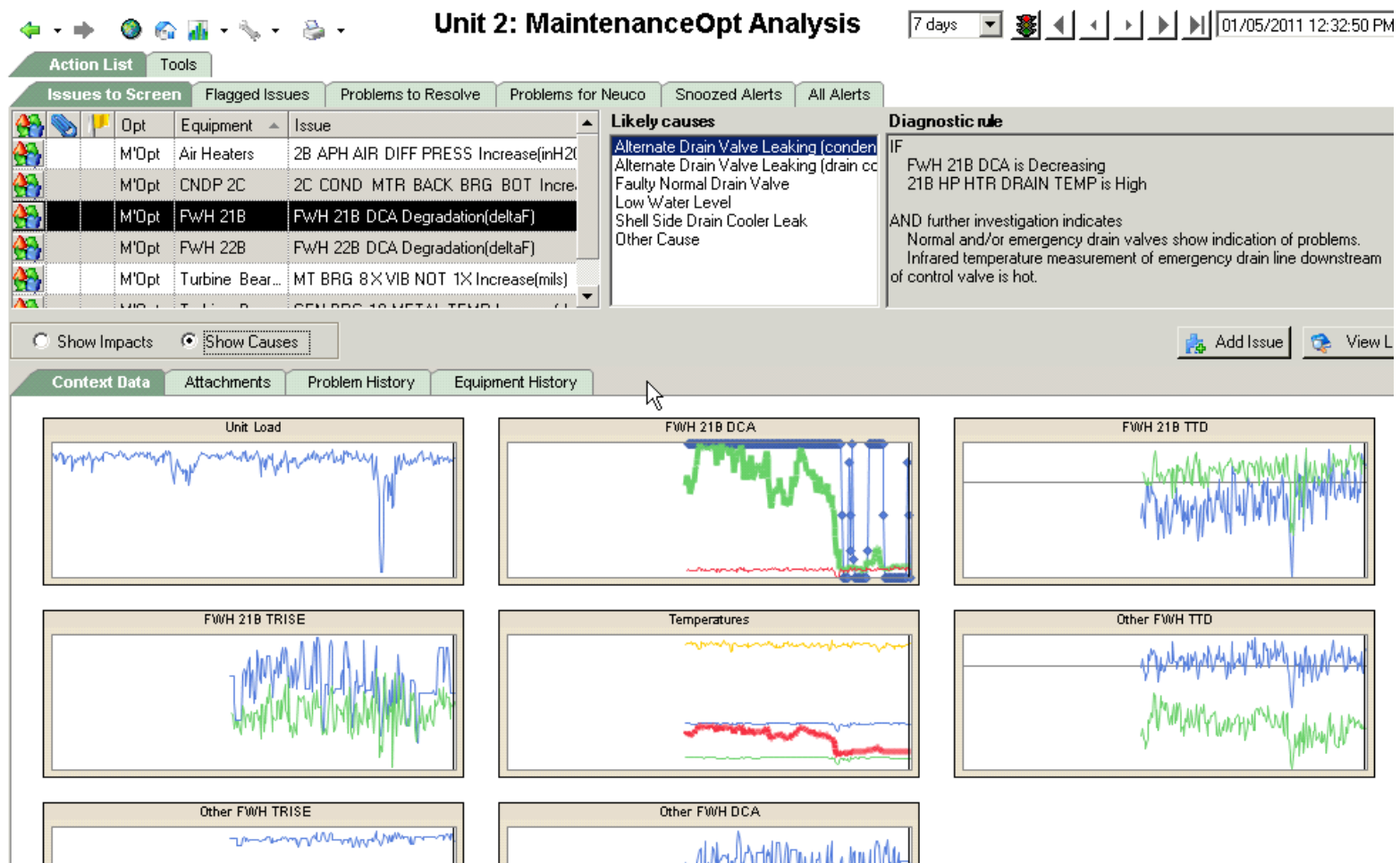
Alert Data

Reviewing the alert data, the problem happened on Jan.3rd. There was an obvious change of the actual DCA data.



Diagnosing the Problem

- By clicking show causes, we are able to investigate the potential causes of the problem. The rule for Alternate Drain Valve Leaking is shown below. Variables associated with this rule are highlighted.



Customer Support Sends Warning

John and Terry,

Yesterday, you received an automatic email alert on the Generator Bearing Metal Temperature and the FWH 21B DCA triggers.

Review of the FWH 21B DCA shows that the drain temperature has significantly increased causing a significant increase in DCA from an expected value of 9 degrees to an actual value of 39 degrees. This problem may be caused by a low level in the feedwater heater. It is definitely worth investigating this item if you have not already done so.

I also reviewed the Generator Bearing 10 temperature. It has an expected value of 185 is operating at 266 degrees. The cooling oil temperature appears to be normal along with vibrations. This may be caused by an instrument error but is also worth checking if you have not already done so.

Please let us know what you find related to these items.

Steve

Verifying the Problem

- The customers found it to be a controller or drip valve issue on the heater

From: [REDACTED]

Sent: Wednesday, January 05, 2011 8:30 AM

To: [REDACTED]

Subject: 21B Heater Hi DCA

Good news. It appears to be a controller or drip valve issue on this heater. With the DCA coming back down this makes the chance of internal damage small.

Questions?

To get a copy of the presentation or
full Final Report contact Ray at
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or 601-267-3573