RAPH SUPPORT BEARING FAILURE ANALYSIS REPORT-UNIT 1

Report /Failure analysis report / UNIT I-1/1/2018 **Dt. 21.05.2018**

Committee members:

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OCCURRENCE: Unit I RAPH A2 drive got failed22:11 hrs on 01.05.2018due to "Fluid coupling O-ring failure"

Load: 309 **MW** with Mills (B, C, E, G, H). and CMC mode.

OBSERVATIONS FROM ALARM PAGES:

22:41:26 Hrs : RAPH A1 On Command

22:41:30 Hrs : RAPH A2 Off command

22:45:43 Hrs : RAPH A2 On Command

22:45:50 Hrs : RAPH A1 off Command

ANALYSIS:

Unit was in service with a load of 309 MW. RAPH A with A2 drive was in service. Suddenly at 22.11 hrs flue gas outlet started increasing with decrease in mill outlet temperature, secondary air outlet, and primary air outlet in RAPH-1A. Rotor stoppage alarm not appeared in DCS. The deviation in the above parameter was noted by board operators and on local inspection it was found that RAPH A2 motor alone running with no transmission. RAPH A1 drive was started by 22:41 hrs and found no transmission as of fusible plug in fluid coupling failed. Support bearing and guide bearing temperature of RAPH 1A was maintained around 57.7°C and 50.6°C respectively. Since both drive got failed board operator decided to close the air and flue gasside dampers. But dampers could not be closed from DCS and flue gas inlet damper-2 was closed by electrical maintenance from local by 23:00hrsand flue gas inlet damper-1 was closed manually by 23:40hrs. RAPH was tried to rotate manually and observed it was not free to rotate. All the air dampers were closed from local parallelly. Since closing of flue gas dampers got delayed, it resulted in uneven expansion of modules. Later RAPH was allowed to cool. But even after cooling RAPH could not be rotated freely. It was decided to inspect the guide and support bearings. It was found guide bearing was normal&inner race of support bearing, flue gas side cold end circumferential seal of 24 nos got damaged. Then support bearing was replaced and RAPH-A was started after replacement of bearing on 11.05.2018 by 13:52 hrs.

CONCLUSION:

1. RAPH A2 drive fluid coupling drive got failed due to drive shaft O-ring failure. Due to that fluid coupling oil level got dropped resulted in transmission failure.

2. On reduction of RAPH rotor speed annunciation not came as it was in disabled condition. Since commissioning of RAPH A, the speed sensor got damaged twice in RAPH 1A alone. Frequent rotor stoppage was persisting due to misalignment of existing sensing plates hence it was kept in disabled condition. RAPH stoppage alarm appeared in SOE (Sequence of events page).

3. Board operator immediately after assessing the deviation in parameter at 22:20 hrs should have tried to start the reserve one, which might have saved the RAPH.

4. If all the air and flue gas dampers are closed immediately from DCS, the severity of the damage to RAPH could be minimised.

RECOMMENDATIONS:

Sl.No	Recommendation	Scope	Remarks
1.	RAPH rotor stoppage alarm should not be bypassed.	C&I	Immediate
2.	RAPH motor current reading should be made available at DCS.	C&I and EM	Current reading made ready at DCS on 13.05.2018.
3.	Board operator immediately after assessing the deviation in parameter at 22:20 hrs should have tried to start the reserve one, which might have saved the RAPH.	Operation	Frequent monitoring is advised.
4.	If RAPH motor failed and reserve motor could not be taken in to service immediately & on sensing the raise in flue gas temperature at RAPH outlet at 22:40 hrs. Rotor should not be rotated at local. Rather it should be allowed to cool for free rotation and to be checked at local.	Operation	To be followed.

5.	If RAPH flue gas outlet temperature crossing above 150 ° C flue temperature high annunciation may be provided for alerting board engineers.	C&I	To be implemented immediately.
6.	RAPH motor shall be changed once in a week after checking the oil level of reserve fluid coupling.	BM& Operation	To be followed.
7.	Periodical inspection of oil leak in fluid coupling to be ensured.	BM	To be followed.
8.	Periodical operation of all air and flue gas dampers from DCS by 10% inching operation to ensure the healthiness. It is to be done at partial load.	EM & Operation	To be followed.
9.	Lighting in the RAPH to be improved in bearing and drive area for the ease of inspection.	EM	To be implemented immediately.
10.	SOE display to kept regularly in one OWS monitor.	Operation	To be implemented immediately.

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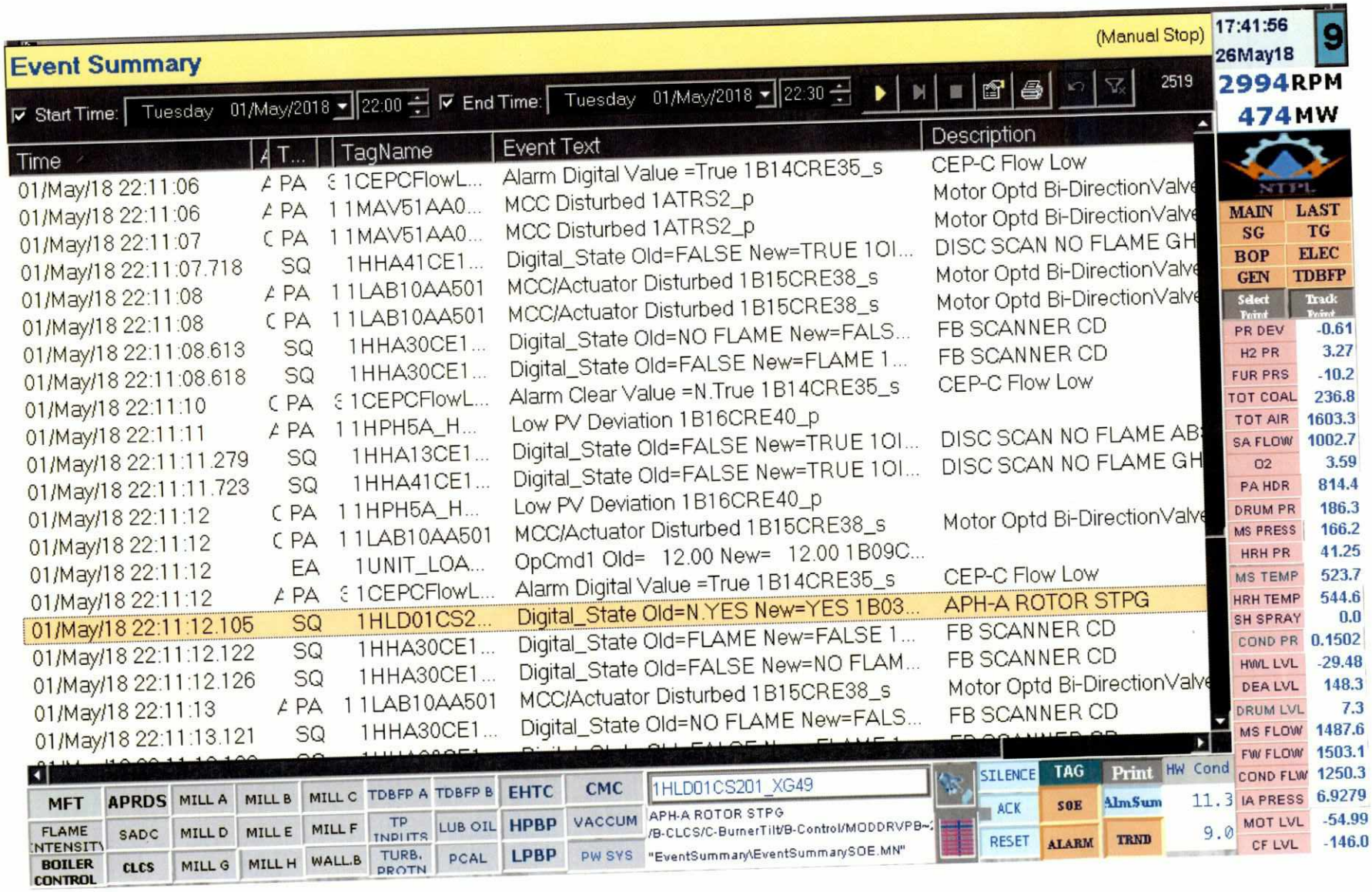
28/5/18

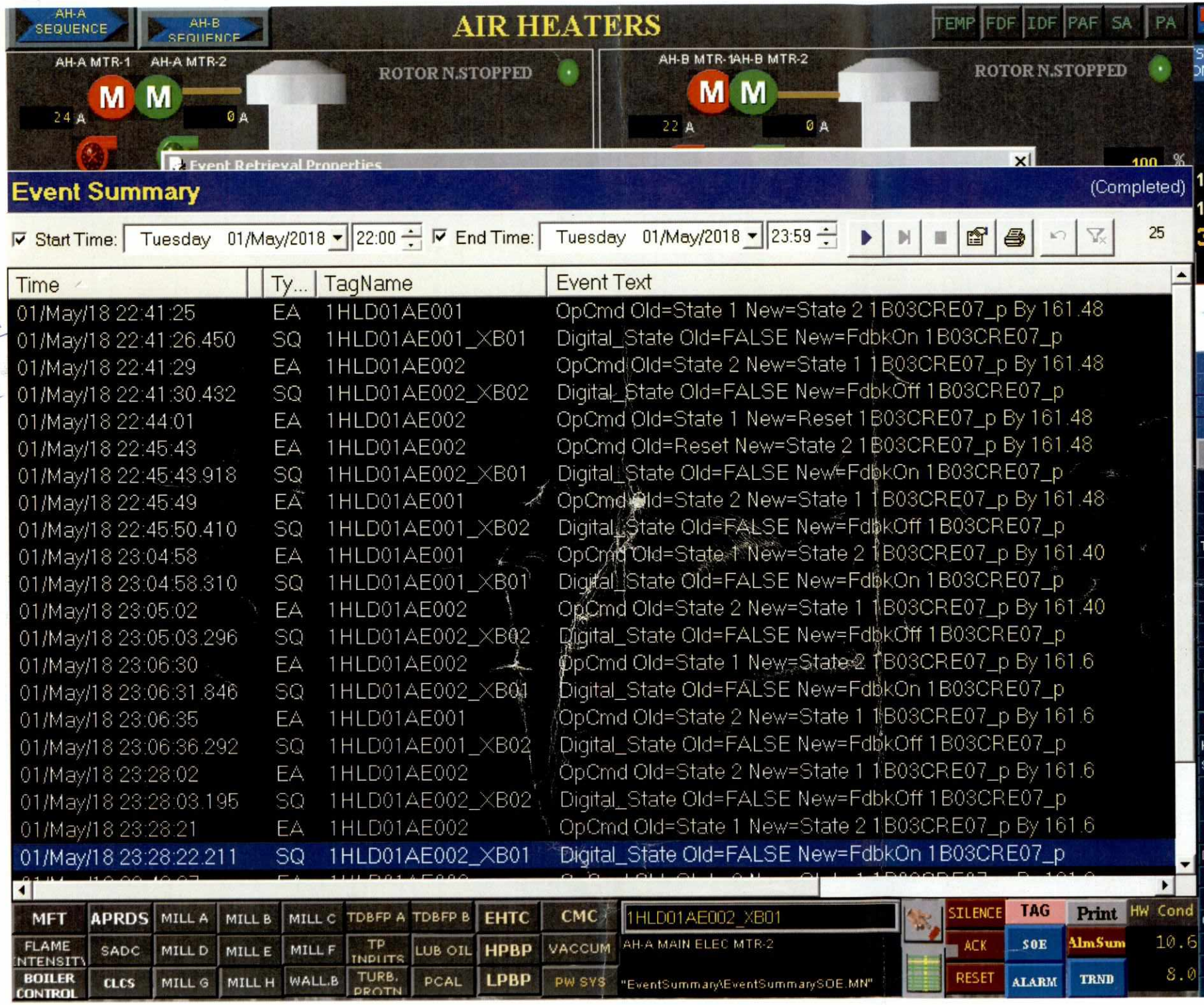
Submitted to CEO/NTPL

DGM/O&C

UNIT 1

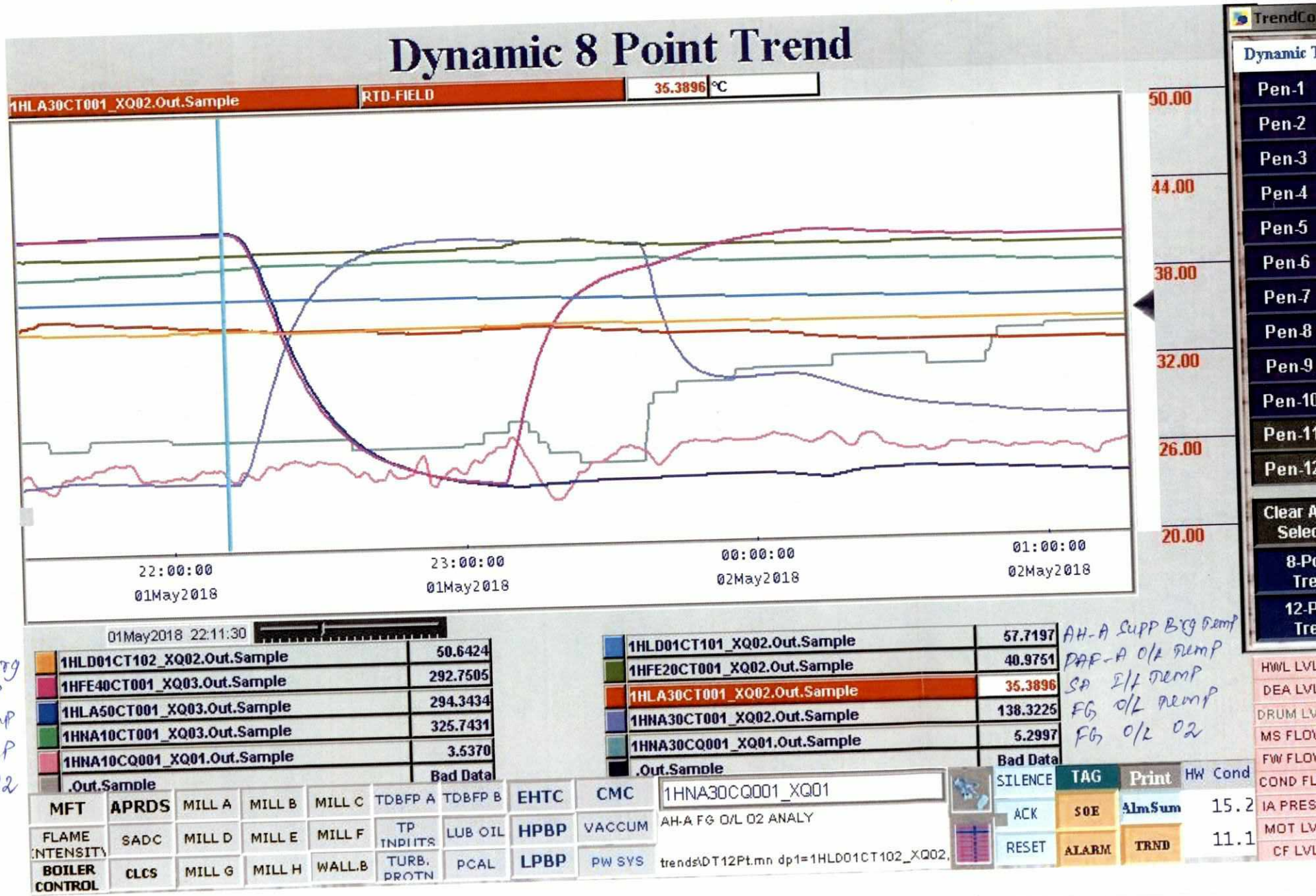
7/5/18 22" Hgs RAPHIA STOPPED




AH-A SEQUENCE
AH-B SEQUENCE
AIR HEATERS
TEMP
FDF
IDF
PAF
SA
PA
AH-A MTR-1
AH-A MTR-2
ROTOR N.STOPPED
AH-B MTR-1AH-B MTR-2
ROTOR N.STOPPED
Event Retrieval Properties
Event Summary
(Completed)
Start Time: Tuesday 01/May/2018 22:00
End Time: Tuesday 01/May/2018 23:59
25
Time
Ty...
TagName
Event Text
01/May/18 22:41:25 EA 1HLD01AE001 OpCmd Old=State 1 New=State 2 1B03CRE07_p By 161.48
01/May/18 22:41:26.450 SQ 1HLD01AE001_XB01 Digital_State Old=FALSE New=FdbkOn 1B03CRE07_p
01/May/18 22:41:29 EA 1HLD01AE002 OpCmd Old=State 2 New=State 1 1B03CRE07_p By 161.48
01/May/18 22:41:30.432 SQ 1HLD01AE002_XB02 Digital_State Old=FALSE New=FdbkOff 1B03CRE07_p
01/May/18 22:44:01 EA 1HLD01AE002 OpCmd Old=State 1 New=Reset 1B03CRE07_p By 161.48
01/May/18 22:45:43 EA 1HLD01AE002 OpCmd Old=Reset New=State 2 1B03CRE07_p By 161.48
01/May/18 22:45:43.918 SQ 1HLD01AE002_XB01 Digital_State Old=FALSE New=FdbkOn 1B03CRE07_p
01/May/18 22:45:49 EA 1HLD01AE001 OpCmd Old=State 2 New=State 1 1B03CRE07_p By 161.48
01/May/18 22:45:50.410 SQ 1HLD01AE001_XB02 Digital_State Old=FALSE New=FdbkOff 1B03CRE07_p
01/May/18 23:04:58 EA 1HLD01AE001 OpCmd Old=State 1 New=State 2 1B03CRE07_p By 161.40
01/May/18 23:04:58.310 SQ 1HLD01AE001_XB01 Digital_State Old=FALSE New=FdbkOn 1B03CRE07_p
01/May/18 23:05:02 EA 1HLD01AE002 OpCmd Old=State 2 New=State 1 1B03CRE07_p By 161.40
01/May/18 23:05:03.296 SQ 1HLD01AE002_XB02 Digital_State Old=FALSE New=FdbkOff 1B03CRE07_p
01/May/18 23:06:30 EA 1HLD01AE002 OpCmd Old=State 1 New=State 2 1B03CRE07_p By 161.6
01/May/18 23:06:31.846 SQ 1HLD01AE002_XB01 Digital_State Old=FALSE New=FdbkOn 1B03CRE07_p
01/May/18 23:06:35 EA 1HLD01AE001 OpCmd Old=State 2 New=State 1 1B03CRE07_p By 161.6
01/May/18 23:06:36.292 SQ 1HLD01AE001_XB02 Digital_State Old=FALSE New=FdbkOff 1B03CRE07_p
01/May/18 23:28:02 EA 1HLD01AE002 OpCmd Old=State 2 New=State 1 1B03CRE07_p By 161.6
01/May/18 23:28:03.195 SQ 1HLD01AE002_XB02 Digital_State Old=FALSE New=FdbkOff 1B03CRE07_p
01/May/18 23:28:21 EA 1HLD01AE002 OpCmd Old=State 1 New=State 2 1B03CRE07_p By 161.6
01/May/18 23:28:22.211 SQ 1HLD01AE002_XB01 Digital_State Old=FALSE New=FdbkOn 1B03CRE07_p
MFT
APRDS
MILL A
MILL B
MILL C
TDBFP A
TDBFP B
EHTC
CMC
FLAME INTENSITY
SADC
MILL D
MILL E
MILL F
TP INDUITS
LUB OIL
HPBP
VACCUM
BOILER CONTROL
CLCS
MILL G
MILL H
WALL B
TURB. PROTN
PCAL
LPBP
PW SYS
1HLD01AE002_XB01
AH-A MAIN ELEC MTR-2
"EventSummary\EventSummarySOE.MN"
SILENCE
TAG
Print
HW Cond
ACK
SOE
AlmSum
10.6
RESET
ALARM
TRND
8.0
MAIN
SG
BOP
GEN
Select Point
PR DEV
H2 PR
FUR PRS
TOT COAL
TOT AIR
SA FLOW
O2
PA HDR
DRUM PR
MS PRESS
HRH PR
MS TEMP
HRH TEMP
SH SPRAY
COND PR
HWL LVL
DEA LVL
DRUM LVL
MS FLOW
FW FLOW
COND FLW
IA PRESS
MOT LVL
CF LVL

1/5/2018 22" Hrs

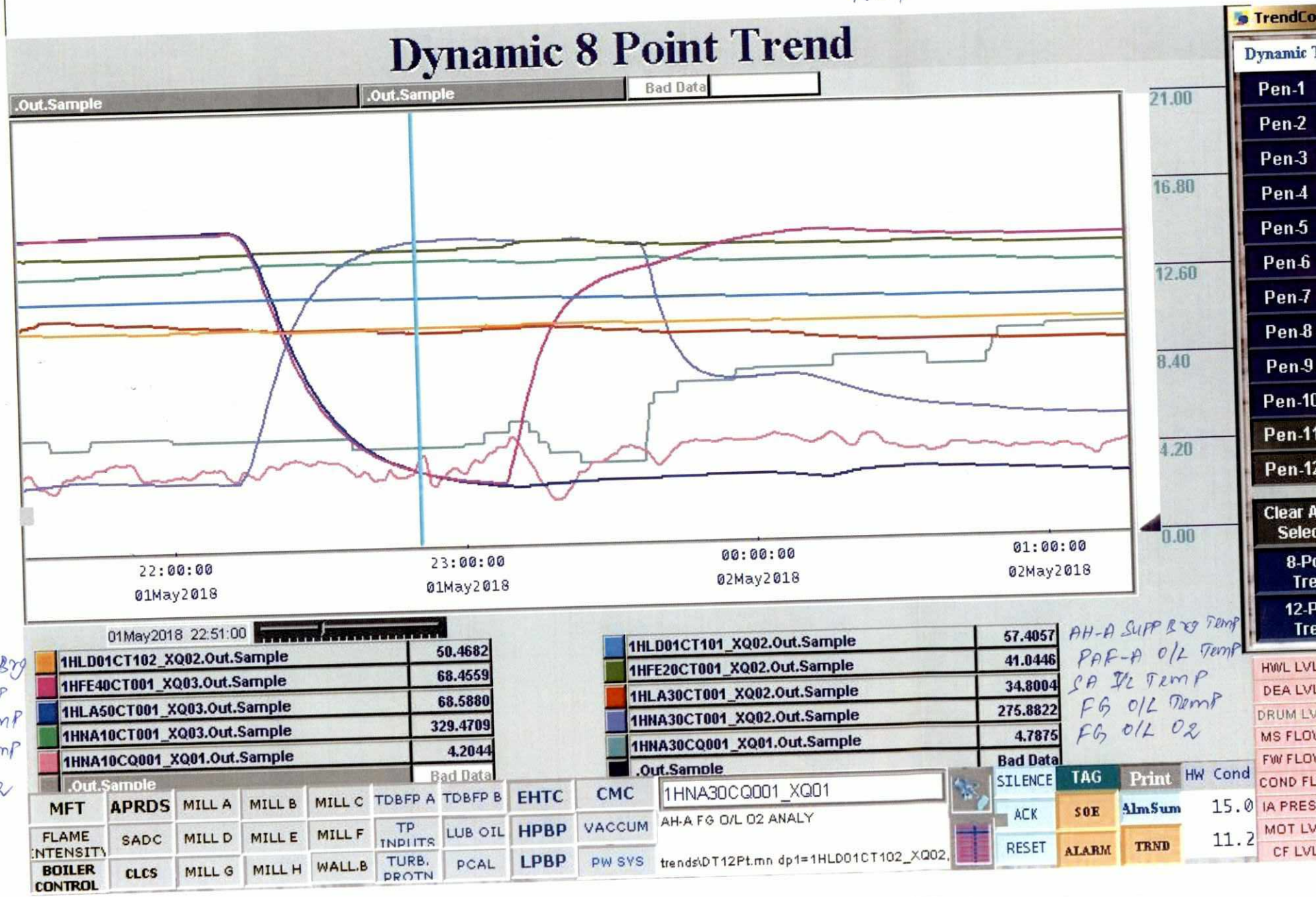
RAPH # 1A



AH-A Guide Brg
PA O/L Temp
SA O/L Temp
FG E/L Temp
Eco O/L O2

1/5/2018

RAPH # 1A

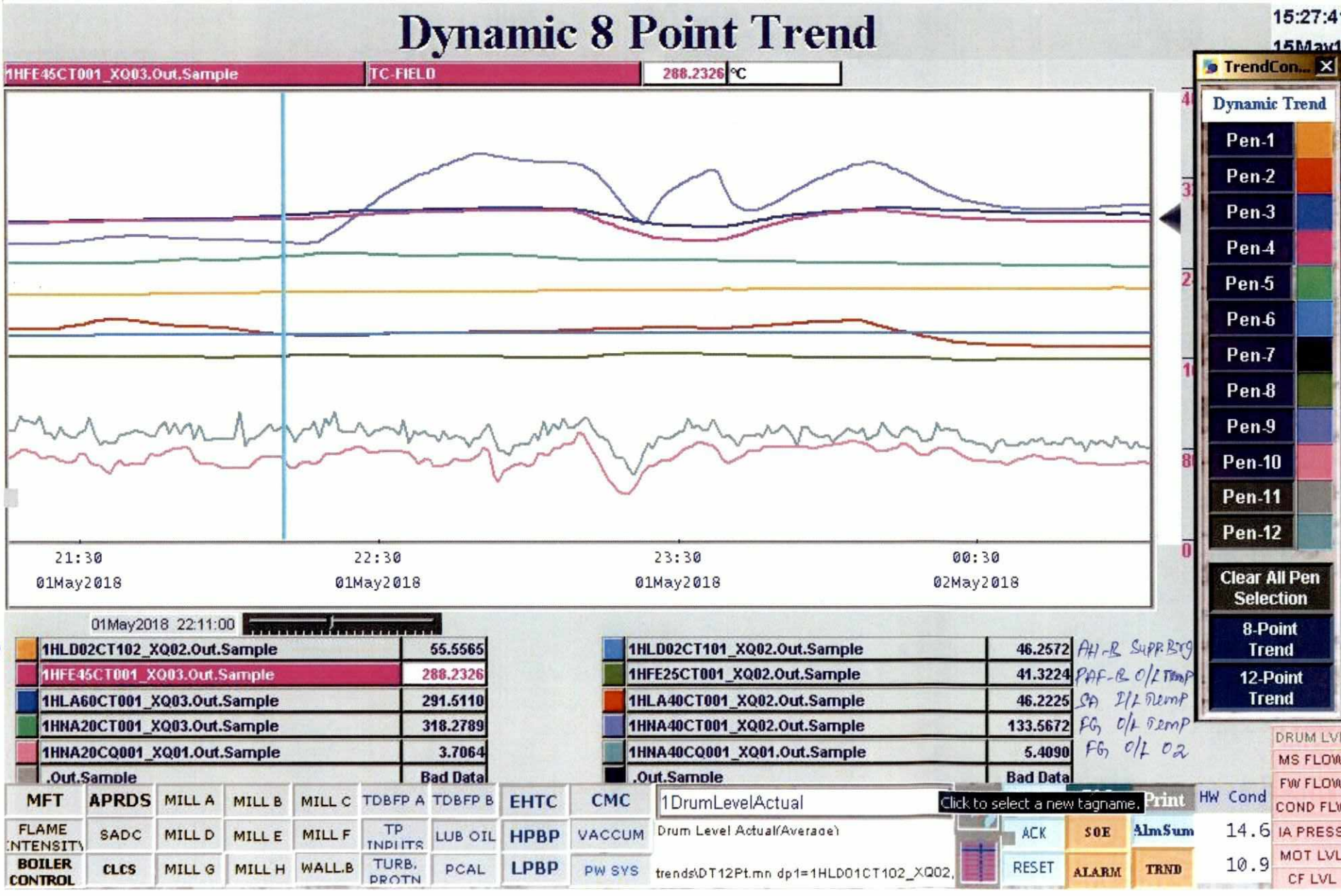


AH-A Guide Brg
PA O/L Temp
SA O/L Temp
FG I/L Temp
Eco O/L O2

AH-A Supp Brg Temp
PAF-A O/L Temp
SA I/L Temp
FG O/L Temp
FG O/L O2

1/5/2018

RAPH # 1B

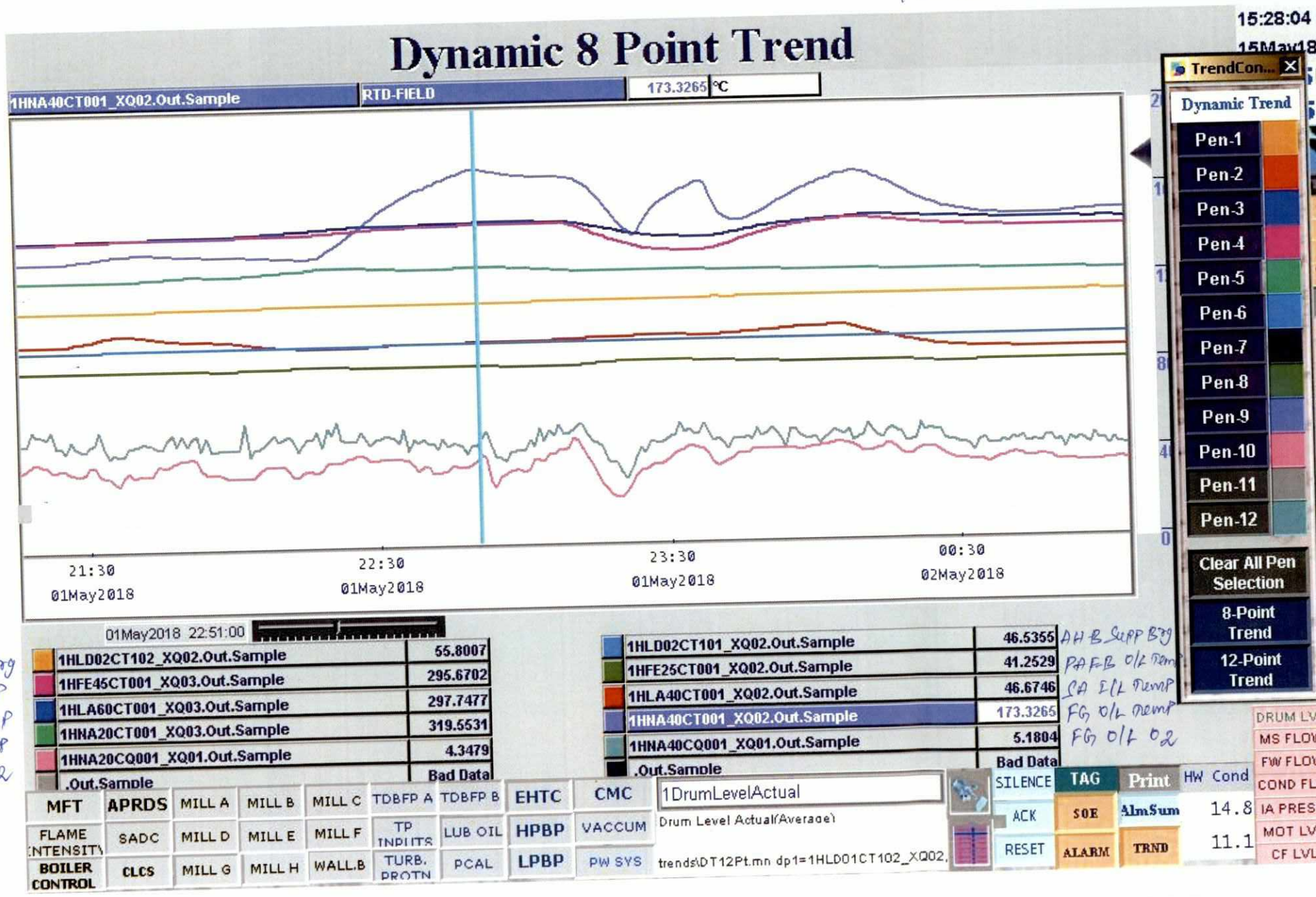


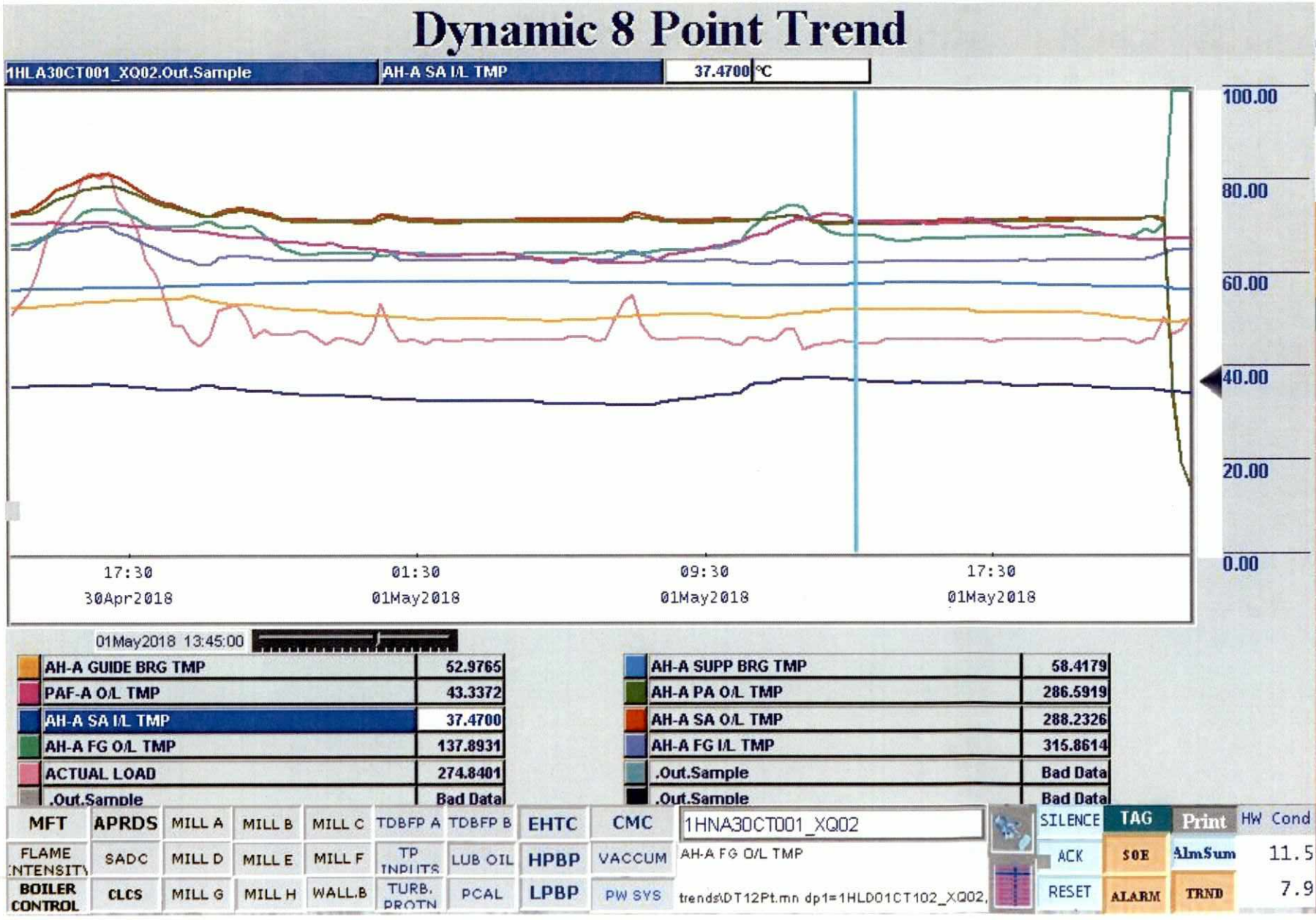
AH-B Guide Brg
PA O/L Temp
SA O/L Temp
FG I/L Temp
Eco O/L O2

AH-B Supp Brg
PAF-B O/L Temp
SA I/L Temp
FG O/L Temp
FG O/L O2

1/5/2018

RAPH # 1B




Dynamic 8 Point Trend
1HLA30CT001_XQ02.Out.Sample
AH-A SA I/L TMP
37.4700 °C
100.00
80.00
60.00
40.00
20.00
0.00
17:30
30Apr2018
01:30
01May2018
09:30
01May2018
17:30
01May2018
01May2018 13:45:00
AH-A GUIDE BRG TMP 52.9765
PAF-A O/L TMP 43.3372
AH-A SA I/L TMP 37.4700
AH-A FG O/L TMP 137.8931
ACTUAL LOAD 274.8401
.Out.Sample Bad Data
AH-A SUPP BRG TMP 58.4179
AH-A PA O/L TMP 286.5919
AH-A SA O/L TMP 288.2326
AH-A FG I/L TMP 315.8614
.Out.Sample Bad Data
.Out.Sample Bad Data
MFT
APRDS
MILL A
MILL B
MILL C
TDBFP A
TDBFP B
EHTC
CMC
FLAME INTENSITY
SADC
MILL D
MILL E
MILL F
TP INPUTS
LUB OIL
HPBP
VACCUM
BOILER CONTROL
CLCS
MILL G
MILL H
WALL B
TURB. PROTN
PCAL
LPBP
PW SYS
1HNA30CT001_XQ02
AH-A FG O/L TMP
trends\DT12Pt.mn dp1=1HLD01CT102_XQ02,
SILENCE
ACK
RESET
TAG
SOE
ALARM
Print
AlmSum
TRND
HW Cond
11.5
7.9
10:12:01
03May1
2997
275
UNI
MAIN
SG
BOP
GEN
Select Point
PR DEV
H2 PR
FUR PRS
TOT COAL
TOT AIR
SA FLOW
O2
PA HDR
DRUM PR
MS PRESS
HRH PR
MS TEMP
HRH TEMP
SH SPRAY
COND PR
HWL LVL
DEA LVL
DRUM LVL
MS FLOW
FW FLOW
COND FLW
IA PRESS
MOT LVL
CF LVL