ENEL BRINDISI Power Station
Temperature Verification

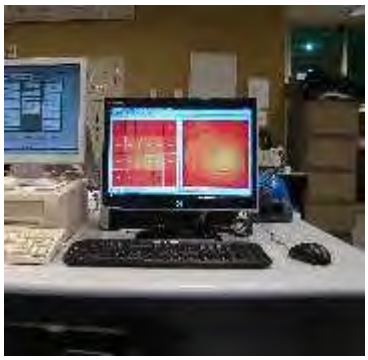
Master Distributor
Greenbank Energy Solutions Inc
185 Plumpton ave
Washington Pa 15301
724-413-4021

ENEL Brindisi – Italy

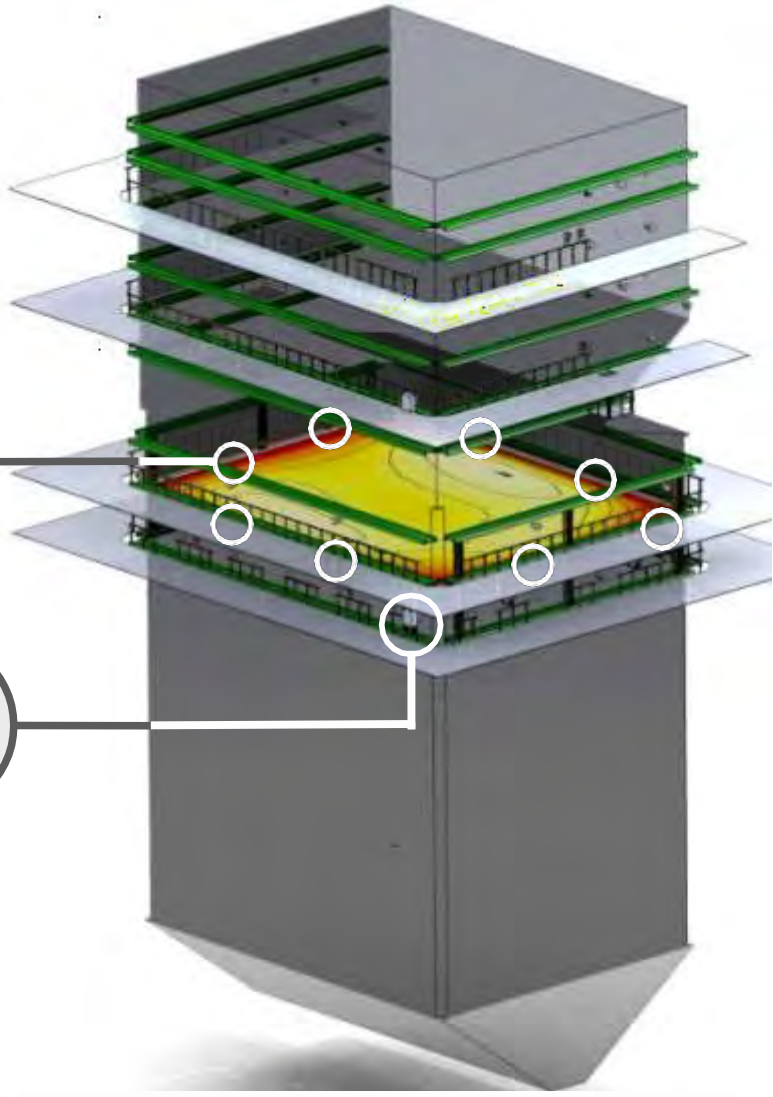
WAVEGUIDE

PREAMPLIFIER

PCU



TMSIS-4000
AT CONTROL ROOM



UNIT:	#2
FUEL:	COAL
LOAD:	660MW
TYPE OF BOILER:	NATURAL CIRCULATION
ACOUSTIC PYROMETER START DATE:	2009
CONFIGURATION	1 MAPPING SYSTEM BELOW THE NOSE AND 1 SINGLE PATH AT SUPER HEATER

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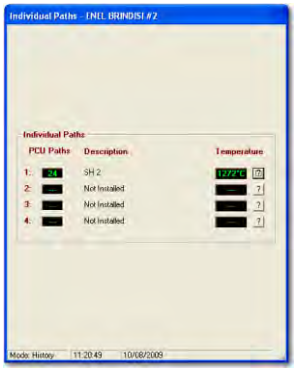
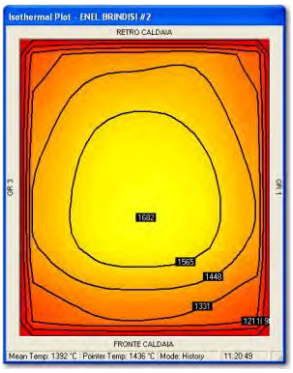
TMSIS-4000
AT CONTROL ROOM



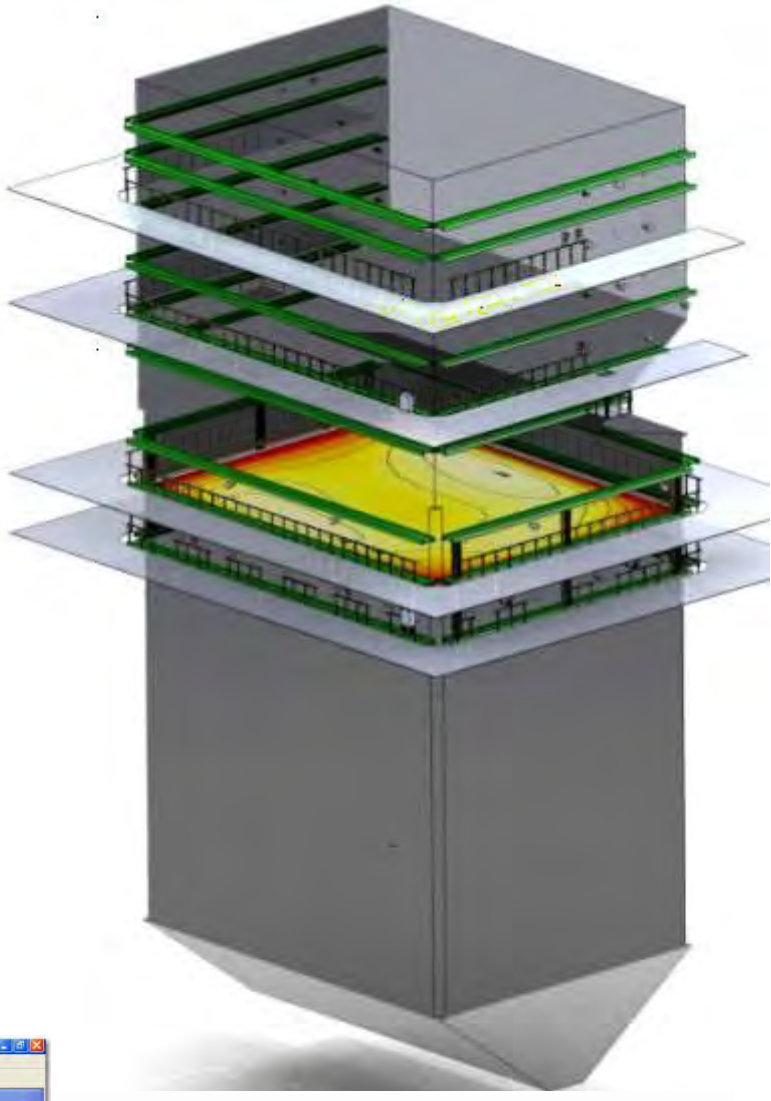
Individual Path

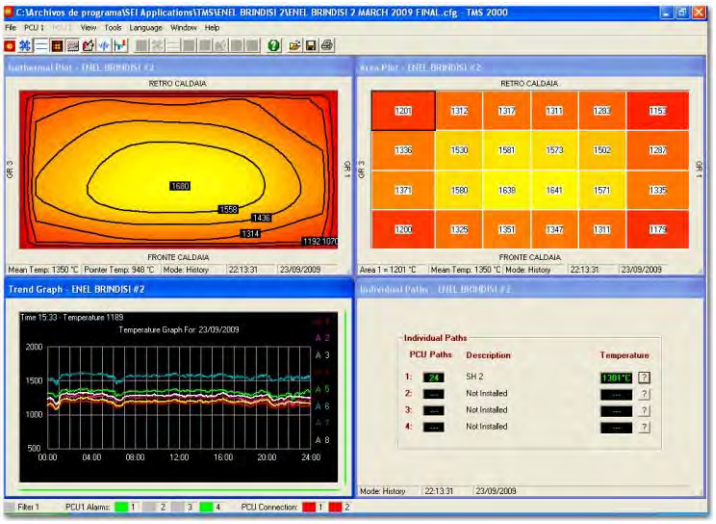
Single Path at Superheter configurated with 2 sensors to obtein a main temperature to control superheater fireside ash corrosion and fireside corrosionfatigue.



Isothermal Map

The Isothermal Map below the nose is configured with 2 sensors per walls to obtain a 2 Dimentional gas temperature measurement for Chamber Combustion Control.





TMS2000 Software

TMS2000 Software show the Isothermal map, Area Map, Trend Graph and Single path. The information on Area Map and Single Map are sent to the Control Room through OPC Output.

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1 3020TR-SSL Transceiver Unit · Wave Guide and Preamplifier

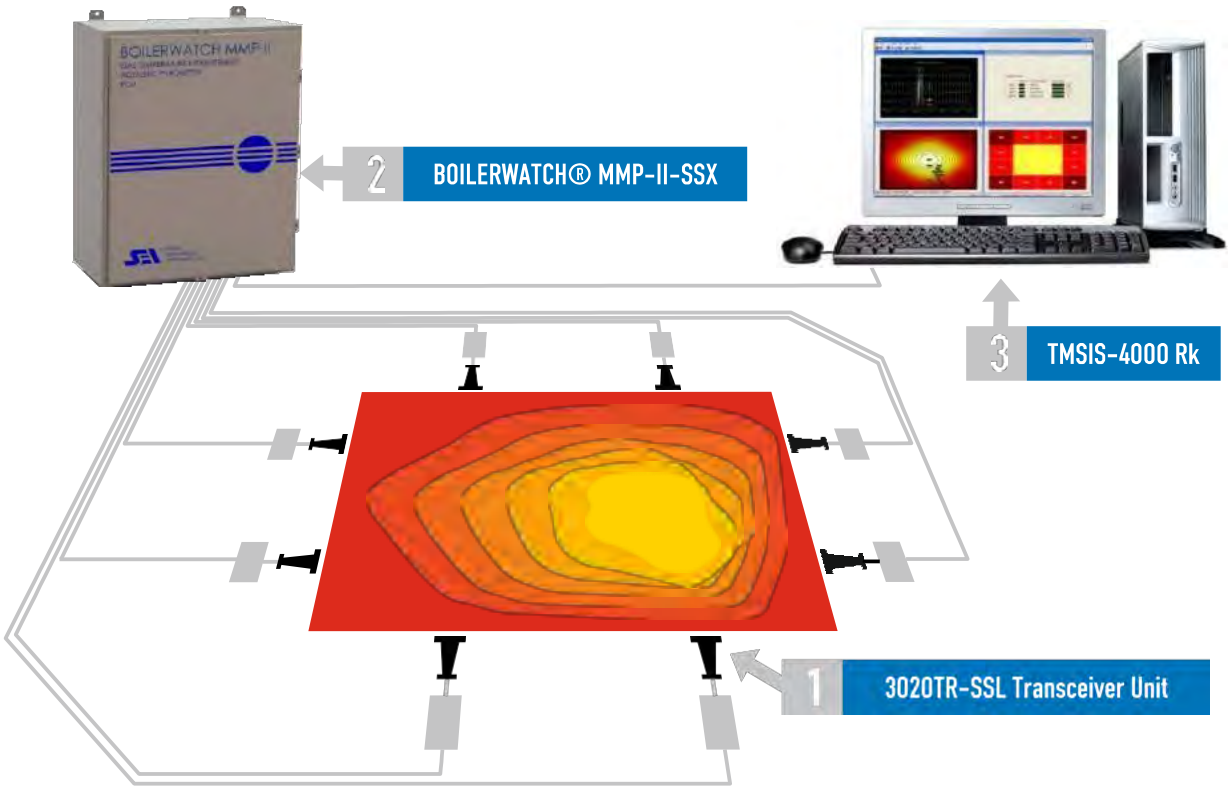
Pneumatically driven acoustic sound source and receiver. Mounts on exterior furnace /heater wall/observation door, and provides acoustic transmitter and receiver functions for balanced-draft furnace applications.

2 BOILERWATCH® MMP-II-SSX · Processor Control Unit (PCU)

Sound spectrum used for reliable detection is from 500 Hz to 3,500 Hz. Simultaneous detection is available to sample all paths in less than 15 seconds. Provides temperature measurement capacity for up to eight (8) independent paths (requires 2 model 3020TR Transceiver units per path), or up to a twenty-four (24) path array for spatial temperature distribution mapping (using up to 8 model 3020TR Transceivers). Features RS-422 serial data output and 16 channels 4-20 mA current output.

3 TMSIS-4000

The TMSIS-4000 utilizes the TMS-2000 software to convert path temperature data provided by the BOILERWATCH® PCU into area data for planar temperature distribution mapping applications. The area temperature data is then fed directly into the plant Distributed Control System (DCS), Data Acquisition System (DAS), for data presentation and archiving.
Features include: Industrial computer with pre-configured mapping software; 21 inch LCD monitor; modem for remote accessibility; 24 users programmable 4-20mA current / OPC outputs for integration into plant DCS.



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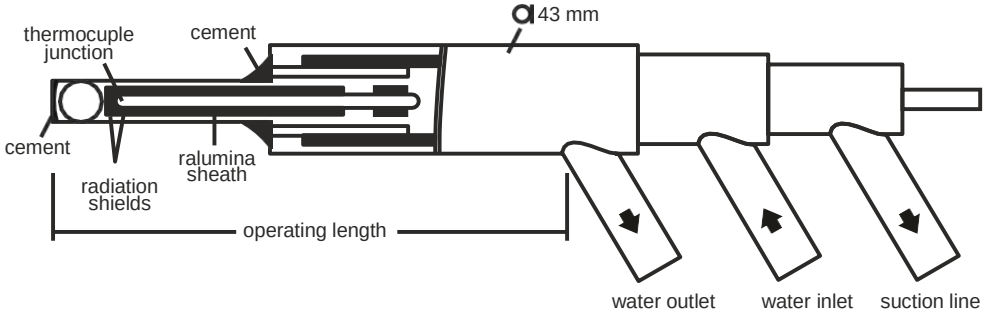
Verification of Acoustic Pyrometer Temperature with Suction Pyrometer

In IFRF suction pyrometers, the thermocouple is protected from chemical attack by a ceramic sheath. Ceramic radiation shields surround this sheath, in turn. Hot gases from the location under investigation are drawn between the shields and over the sheath at a high velocity to promote convective heat transfer. Velocity must be sufficient to ensure that the equilibrium thermocouple temperature is nearly that of the gases without the need for any correction for radiation.

The response time of the instrument depends upon the size of the shields and the suction velocity. From ambient to 1700ºC and with a suction velocity of 250 in/s the time to achieve equilibrium is of the order of 3 min., and for subsequent temperatures changes of 100C, about 1 min.



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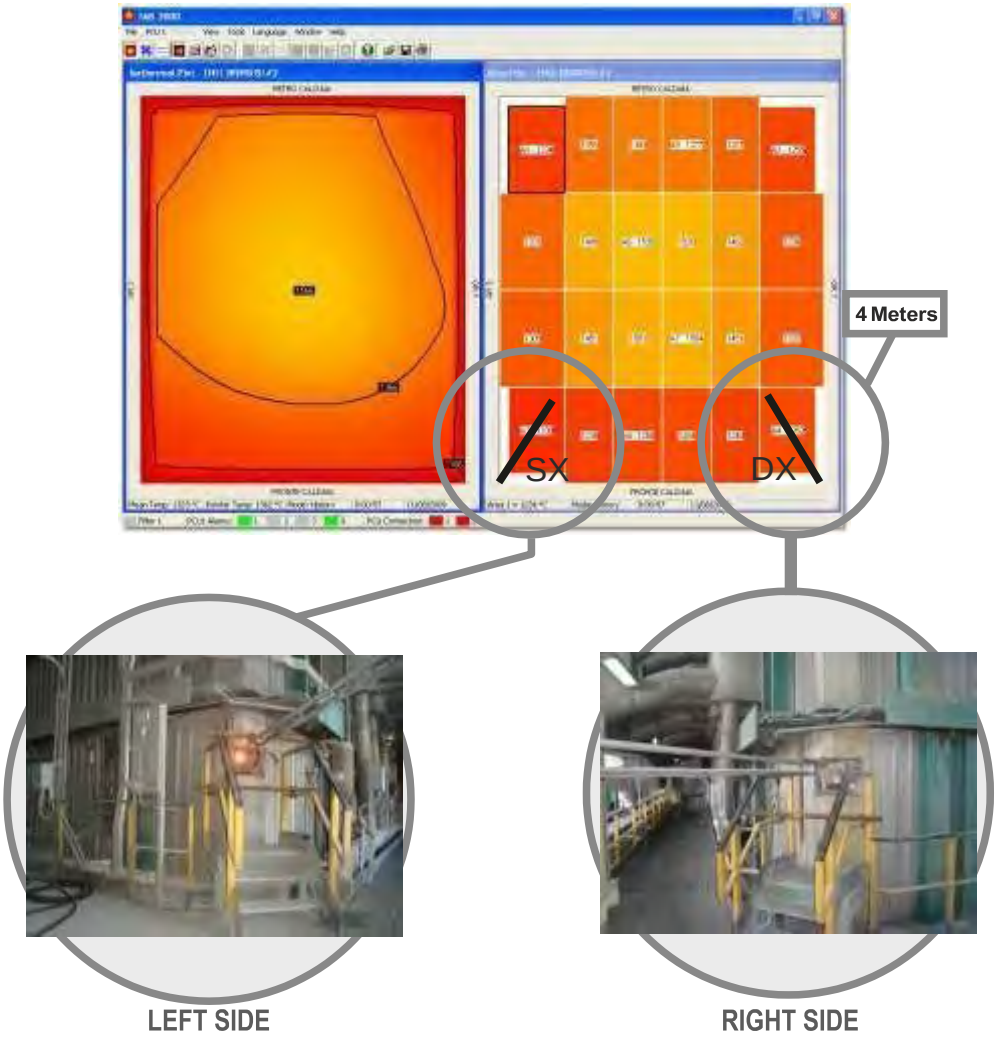
Verification of Acoustic Pyrometer Temperature with Suction Pyrometer

ENEL Brindisi requested to comfirm the Acoustic Pyrometer temperature with the Suction Pyrometer and sees what is the performance between both system at different load. The test was done introducing 4 meters the Suction Pyrometer at each front corner of the boiler.



The measurement location are at the same level that are installed the Acoustic Pyrometer sensor for the Horizontal Map.

Test Condition:

The tests were done with maximum load (660 MW) as a low load (490 MW). The coal used during the tests is a mixture of South African coal and American coal. During the test, the sootblowers were interrupted.

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Verification of Acoustic Pyrometer Temperature with Suction Pyrometer

BOILERWATCH MMP-II-SSX
ACOUSTIC PYROMETER

Time	Temp.C°
14:45	1364
14:50	1361
15:00	1368

1364 °C

Suction Pyrometer

Aff. cm.	Temp.C°
50	1090
100	1220
150	1320
200	1340
250	1355
300	1360
350	1385
400	1415

1342 °C

BOILERWATCH MMP-II-SSX
ACOUSTIC PYROMETER

Time	Temp.C°
4:35	1329
4:43	1327
4:50	1323

1326 °C

Suction Pyrometer

Aff. cm.	Temp.C°
50	1045
100	1175
150	1295
200	1315
250	1355
300	1375
350	1380
400	1385

1326 °C

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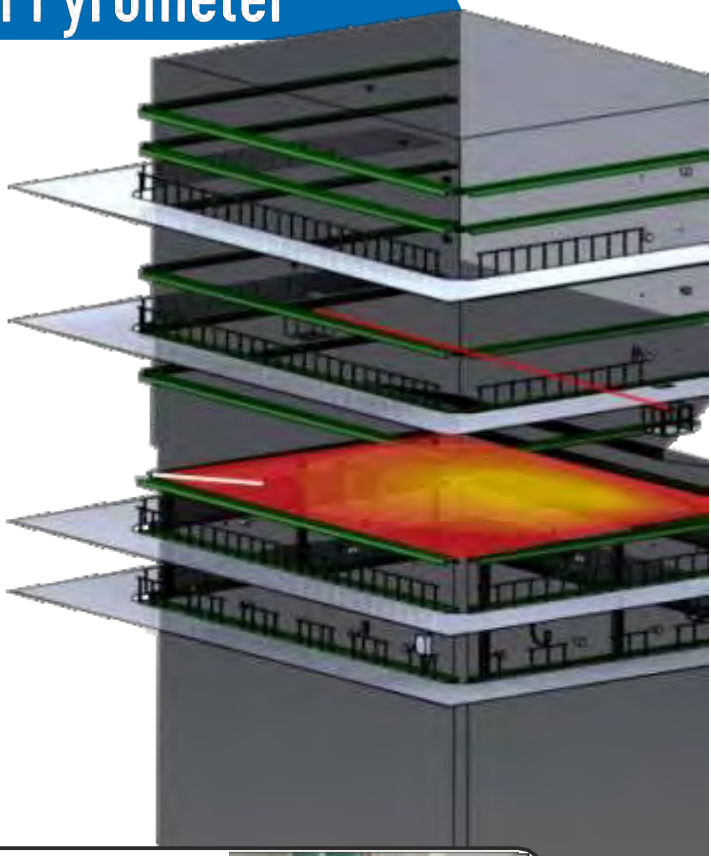
Verification of Acoustic Pyrometer Temperature with Suction Pyrometer



TEST 3

INSPECTION DOOR 9° FLOOR
FRONT LEFT SIDE

DATA: May 13, 2009

TIME: 15:00 to 15:20

Boiler Conditions

LOAD: 660 MW
FUEL: 100% COAL
SOOTBLOWER OFF

15:00

15:10

15:20

BOILERWATCH MMP-II-SSX ACOUSTIC PYROMETER

Time	Temp.C°
15:00	1351
15:10	1361
15:20	1354

1355 °C

Suction Pyrometer

Aff. cm.	Temp.C°
50	----
100	1270
150	----
200	1323
250	----
300	1385
350	----
400	1400

1345 °C

GOOD MATCH

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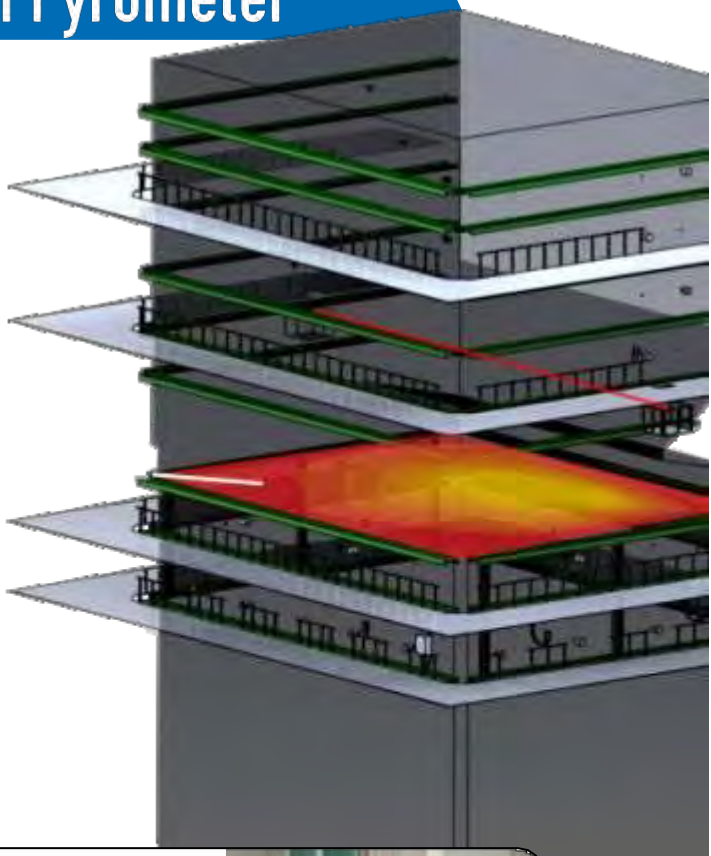
Verification of Acoustic Pyrometer Temperature with Suction Pyrometer



TEST 2

INSPECTION DOOR 9° FLOOR
FRONT LEFT SIDE

DATA: May 12, 2009

TIME: 17:25 to 17:40

Boiler Conditions

LOAD: 660 MW
FUEL: 100% COAL
SOOTBLOWER OFF

17:25

17:33

17:40

BOILERWATCH MMP-II-SSX ACOUSTIC PYROMETER

Time	Temp.C°
17:25	1354
17:33	1353
17:40	1351

1353 °C

Suction Pyrometer

Aff. cm.	Temp.C°
50	1115
100	1245
150	1305
200	1335
250	1340
300	1358
350	1368
400	1382

1333 °C

GOOD MATCH

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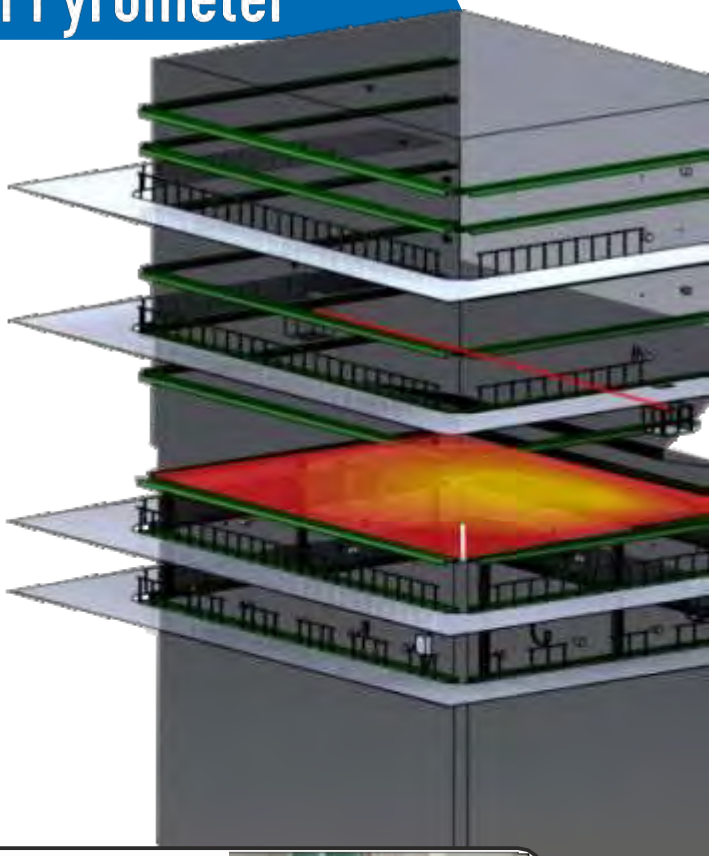
Verification of Acoustic Pyrometer Temperature with Suction Pyrometer



TEST 4

INSPECTION DOOR 9° FLOOR
FRONT RIGHT SIDE

DATA: May 14, 2009

TIME: 4:35 to 4:50

Boiler Conditions

LOAD: 450 MW
FUEL: 100% COAL
SOOTBLOWER OFF

4:35

4:43

4:50

BOILERWATCH MMP-II-SSX ACOUSTIC PYROMETER

Time	Temp.C°
4:35	1329
4:43	1327
4:50	1323

1326 °C

Suction Pyrometer

Aff. cm.	Temp.C°
50	1045
100	1175
150	1295
200	1315
250	1355
300	1375
350	1380
400	1385

1326 °C

GOOD MATCH

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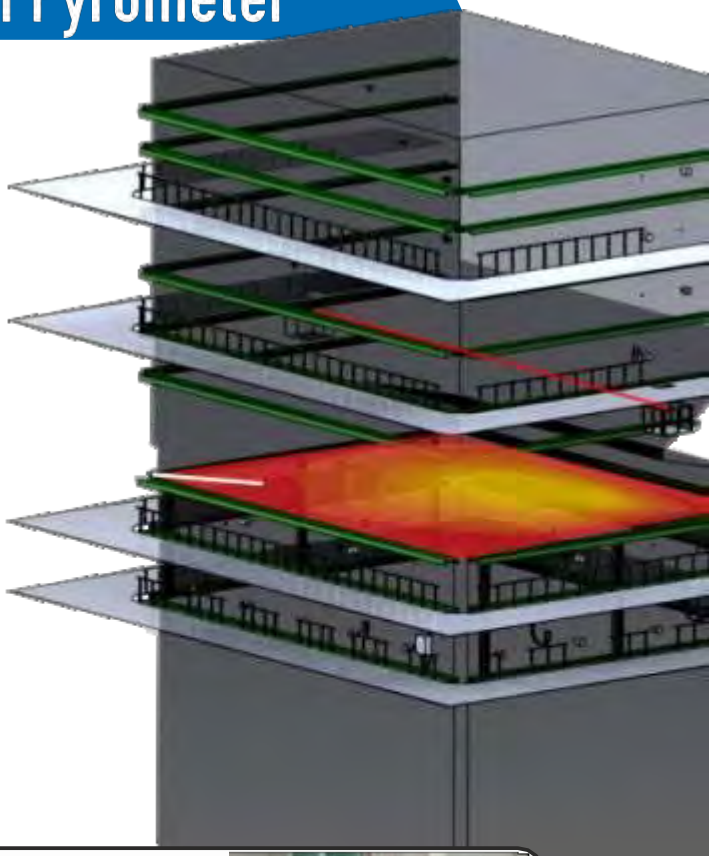
Verification of Acoustic Pyrometer Temperature with Suction Pyrometer



TEST 5

INSPECTION DOOR 9° FLOOR
FRONT LEFT SIDE

DATA: May 14, 2009

TIME: 6:05 to 6:25

Boiler Conditions

LOAD: 450 MW
FUEL: 100% COAL
SOOTBLOWER OFF

6:05

6:15

6:25

BOILERWATCH MMP-II-SSX ACOUSTIC PYROMETER

Time	Temp.C°
6:05	1287
6:15	1300
6:25	1297

1294 °C

Suction Pyrometer

Aff. cm.	Temp.C°
50	----
100	1200
150	1270
200	1280
250	1290
300	1335
350	1340
400	1350

1295 °C

GOOD MATCH

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Conclusion

The comparison of data relating from the front corners shows that the values obtained with the Suction Pyrometer technique are very similar, remembering that the Acoustic Pyrometer has the mean temperature of the Area and the Suction Pyrometer has the mean temperature of 7 point.

At 660 MW the difference between both systems are from 25ºC to 10ºC, nevertheless the temperature differences at 450 MW are 100% exacts.

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Conclusion

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