Material Integrity Solutions, Inc.

PROJECT BULLETIN

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Boiler Wall Heat Loss by Thermographic Inspection

BACKGROUND

Due to economic forces in the utility marketplace, it is essential that fossil power-generating stations operate as efficiently as possible. One area for efficiency improvement is heat loss through deteriorating boiler wall insulation (*Fig. 1*). The breakdown and failure of wall insulation is mostly due to age and weathering.

Visible Image Infrared Image

Figure 1. A thermographic image of a boiler wall showing heat loss through the insulation (photo courtesy of PG&E)

The losses can be significant depending on the location and size of the insulation breakdown as well as environmental factors such as wind and temperature.

DISCUSSION

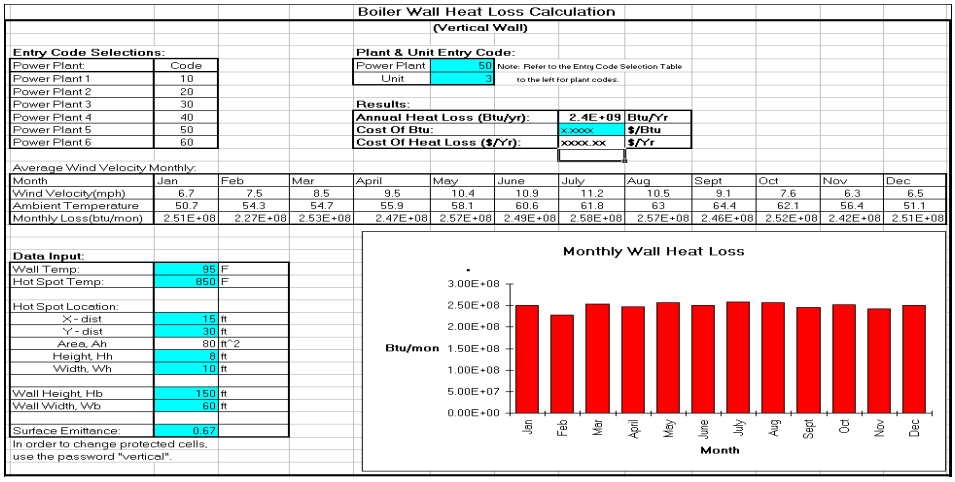
To evaluate the economic effect of heat losses through boiler wall, MIS developed a program to help plant personnel locate deteriorating boiler wall insulation, evaluate the heat loss from the area, and estimate the financial impact of this heat loss.

Methodology, algorithms, and software to estimate boiler wall losses in thermodynamic and economic terms were developed. Two modes of heat transfer (convection and radiation) were accounted for. These calculations considered natural, forced, and mixed convection and radiation for all surface orientations. Monthly weather data (mean wind velocity and temperature) and the unit capacity factor are also included in the heat loss calculations.

The software was developed in an easy-to-use spreadsheet format using a well known and widely used commercial software *(Fig. 2)*. The user enters data from thermographic images of the boiler wall and the weather data. The results, in both graphic and numerical format, show the heat loss through the area and its associated economic cost.

CONCLUSION

The Boiler Wall Heat Loss Program is a simple and useful tool that allows plant personnel to evaluate the economic impact of deteriorating boiler insulations to decide if repair of damaged insulation is warranted and to prioritize repairs. With this information, plant management can decide whether to repair or ignore a insulation problem.



Boiler Wall Heat Loss Calculation

(Vertical Wall)

Entry Code Selections:	
Power Plant:	Code
Power Plant 1	10
Power Plant 2	20
Power Plant 3	30
Power Plant 4	40
Power Plant 5	50
Power Plant 6	60

Plant & Unit Entry Code:
Power Plant 50
Unit 3
Note: Refer to the Entry Code Selection Table to the left for plant codes.

Results:
Annual Heat Loss (Btu/yr): 2.4E+09 Btu/Yr
Cost Of Btu: x.xxxx $/Btu
Cost Of Heat Loss ($/Yr): xxxx.xx $/Yr

Average Wind Velocity Monthly:

Month	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Wind Velocity(mph)	6.7	7.5	8.5	9.5	10.4	10.9	11.2	10.5	9.1	7.6	6.3	6.5
Ambient Temperature	50.7	54.3	54.7	55.9	58.1	60.6	61.8	63	64.4	62.1	56.4	51.1
Monthly Loss(btu/mon)	2.51E+08	2.27E+08	2.53E+08	2.47E+08	2.57E+08	2.49E+08	2.58E+08	2.57E+08	2.46E+08	2.52E+08	2.42E+08	2.51E+08

Data Input:

Wall Temp:	95	F
Hot Spot Temp:	850	F
Hot Spot Location:		
X - dist	15	ft
Y - dist	30	ft
Area, Ah	80	ft^2
Height, Hh	8	ft
Width, Wh	10	ft
Wall Height, Hb	150	ft
Wall Width, Wb	60	ft
Surface Emittance:	0.67	

In order to change protected cells, use the password "vertical".

Figure 2. Calculation sheet showing annual heat loss and cost