Review Of Research
Vol.2, Issue. 8, May . 2013
ISSN:-2249-894X Available online at www.lbp.world

ORIGINAL ARTICLE

RE-DESIGNING OF BOILER AGAINST FOULING TO INCREASE THE EFFICIENCY OF BOILER

Mahendrakumar K. Patil
Department of Chemistry, Agricultural Development Trust's ShardabaiPawar MahilaMahavidyalaya, Shardanagar, Baramati, Dist.Pune, India.

ABSTRACT—

The heat loss in boilers is via many ways such as discharge of hot combustion gases to the atmosphere via chimneys, release of hot unused water, and heat transfer from hot area. This energy loss can be recovered via heat switchs and be put to other use such as warm up other industrial fluids such as water or air. This survey focuses on recovering heat that is lost via boiler chimney flue gas. The major advantages of heat recovery include increasing the energy efficiency of the boiler& decreasing thermal and air pollution dramatically.In this survey scope, an initial design of chimney for heat recovery in heat switch is provided. The design had a completely fabricated heat exchange core, furnace framework but an incomplete ducting framework. This survey is based on the work undertaken to redesign the flue gas duct in chimney to have effective heat recovery from flue gases in heat switchframework. This framework was specifically designed for boiler chimney and therefore the frameworks ducting was designed to confirm to the general boiler stack. In the completion of the pattern, the major factor to consider was to redesign duct to reduce the fouling in heat switchframework.

KEYWORDS—*fouling; boiler stack; heat switch framework;*

I. INTRODUCTION

A. INDUSTRIAL WASTE HEAT

This is heat lost in industries via ways such as discharge of hot burnning gases to the atmosphere via chimneys, discharge of hot waste water, heat transfer from hot areas. This energy loss can be recovered via heat transferred and be put to other use such as warm up other industrial fluids such as water or air. This survey focuses on recovering heat that is lost via boiler chimney flue gas.

The advantages of heat recovery include:

i). Increasing the energy efficiency of the boiler.

ii). Decreasing thermal and air pollution dramatically.

B. Challenges to recovering low temperature wasteheat (hodge b.k, 1990)

Waste of heat switcharea: as the water vapor contained in the exhaust gas cools some of it will condense and deposit corrosive solids and liquids on the heat switcharea. The heat switch must be designed to withstand exposure to these corrosive deposits. This generally requires using advanced materials, or frequently replacing substances of the heat switch, which is often wasteful. Large heat exchengerarea required for heat transfer; since low temperature waste heat will involve a smaller temperature slope between two fluid streams, larger surface areas are required for heat transfer. This limits the economy of heat switchs. Finding use for low grade heat: recovering heat in low temperatures range will only make sense if the plant has use for low temperature heat.

II. LITERATURE REVIEW

EFFICIENT OPERATION OF BOILER [1] IS LIKELY TO PLAY A VERY BIG ROLE IN FOLLOWING YEARS TO COME. INDUSTRIES ALL OVER THE WORLD ARE GOING VIA INCREASED AND POWERFUL COMPETITION AND IMPROOVE AUTOMATION OF PLANTS. THE SUSPENSION COST OF SUCH FRAMEWORK IS EXPECTED TO BE VERY HIGH. TO GET AWAY WITH THIS CHALLENGE, IT IS CLEARER BY THIS SURVEY. WE HAVE TO USE THE ADVANCED SYSTEM AND MANAGEMENT SKILLS IN ALL SPHERES OF ACTIVITIES TO PERFORM ITS EFFECTIVE ROLE IN THE TURNOVER OF THE COMPANY.

[2] Heat exchanger are devices that facilitate the exchange of heat between two fluids that are at different temperatures while keeping them from combining with each other. Heat transfer in heat switchs involves convection in each fluid and conduction via the wall separating the two fluids. In order to account for the contribution of all the effects of convection and conduction, an overall heat transfer coefficient (U), is used in the analysis. Heat transfer rate depends on the temperature differences between the two fluids at the location and the velocity of the fluids (time of interaction) between the fluids.

III. PROBLEM STATEMENT

The comapanys boilers are working on very high temperature & pressure. And the some flue gasses forms in the boiler which required exhausting in atmosphere. Because of this the boiler chimneys are provided to the boiler. Via the chimney that gasses are exhausted to the atmosphere. During this system some fouling are formedon the heat exchanger, furnace framework. And after some period fouling will become considerable & heat transfer rate decreses drastically. Therefore this will reduce the efficiency of boiler and increase the chances of accident.

This survey is to redesigning of the boiler chimney to reduce the fouling creation in furnace, heat transfer area & ducting framework.

IV. OBJECTIVES

- To design the boiler Chimney opposed fouling.
- Introduction about the flappers at various angles to increase the flue gas velocity in chimney convergent air duct.
- To increase the efficiency of boiler by reducing the fouling creates in heat transfer region, system.
- Designing of 3D testing model of flue gas duct in chimney.

V. FOULING

A. Introduction

The deposition of any unused material on heat transfer areas is called fouling. Fouling may parameters impact the thermal and mechanical performance of heat transfer rate. Fouling is a dynamic phenomenon which changes with time.

Fouling increases the overall thermal resistance and lowers the overall heat transfer coefficient of heat switchs. Fouling also impedes fluid flow, accelerates corrosion and increases pressure drop across heat transfer rates.

Fouling tendencies works on the type of heat switch and the fluids. During the design stage certain considerations may help minimize fouling experienced in the field:

1. If possible, assign the more fouling fluid to the tube side
2. Create a fouling fluid velocity of 5 ft/sec on the tube side and 3 ft/sec on the shell side
3. Try to keep the fluid velocity same manner.
4. Allow for easy access for cleaning
5. In water service, ensure the tube wall temperature is not modirate to create salt deposits or render treatment chemicals ineffective
6. Do not throttle water flows in winter time

B. Types of fouling

1. Macro-fouling
2. Micro-fouling

3. Precipitation fouling

C. Why Fouling Occurs?

Fouling from chemical reactions in the fluid stream which results in the deposition of material on the heat transfer rate onareaoccurs when biological organisms grow on heat transfer areas. It is a common fouling mechanism where untreated water is used as the coolant.

Fouling is a general term that involve any kind of deposits of extraneous material that appears on the heat changerarea during the lifetime of the heat exchanger.

Fouling reduce heat transfer across the switcharea hence reduces efficiency of the heat switch. The fouling deposits also reduce flow cross-section area causing a pressure deferential across the heat switch which in turn increasing on the fan power required. It might also eventually block the heat switch.

The forms of fouling may therefore include

- Particulate fouling.
- Scaling/precipitation.
- Chemical/corrosion fouling.
- Solidification.

D. Forms Of Fouling

- Scaling/precipitation:
- Particulate fouling
- Chemical /corrosion fouling
- Solidification fouling

E. Fouling Factor

The outcome of heat transfer rate usually deteriorates with time due to accumulation of deposits on the heat transfer area. The accumulation of deposits leads to increased resistance to heat transfer and causes the rate of heat transfer in a heat switch to decrease. This accumulation of deposits on the heat transfer area is known as fouling and the net effect of fouling is represented by a fouling factor, Rf, which is a measure of the thermal resistance introduced by fouling.

VI. DESIGN CONSIDERATIONS

In the designing of the switch following factors were put to consideration.

i) The exchangerarea has to be the most useful and suitable for gas-gas heat exchange.
ii) The create system has to consider the fouling effect of the flue gases.
iii) The devloped system has to allow for quick maintenance without interfering with the boiler action.
iv) The ducting design has to conform to the boiler chimney design.

Based on the above points, flapper provided at various angles in chimney convergent duct to check the velocity increase of flue gases in chimney area.

VII. CONCLUSION

This survey is convergent on the diverse aspects of the action of Boiler efficiently. Efficient operation of boiler is likely to play a very big role in following years to come. Industries all over the world are going via increased and powerful competition and increased automation of plants. The suspension cost of such framework is expected to be very high. To get away with this challenge, it is shown by this survey. Hence, we have to use the advanced technology.

REFERENCES

[1] Fouling of Heat Switchs (Chemical Engineering Monographs) 1st Edition by T. R. Boat book

[2] http://www.hcheattransfer.com/fouling1.html
[3] Lon E. Bell "Cooling, Heating, Generating Power, and Recovering Waste Heat with Thermoelectric Frameworks" VOL 321 12 SEPTEMBER 2008
[4] Rahul Dev Gupta, Sudhir Ghai1, Ajai Jain.
[5] Kirtikanta sahoo, "analysis of self supported steel Chimney as per indian standard" Department of Civil Engineering National Institute of Technology Rourkela Orissa -769008, India May 2012
[6] Leonardo E Carrión, Rodrigo A Dünner And Iván Fernández–Dávila, "seismic analysis and design of industrial chimneys"
[7] Rahul Dev Gupta, Sudhir Ghai1, Ajai Jain, "Energy Efficiency Improvement Strategies for Industrial Boilers: A Case Study"
[8] Fargione, J.; Hill, J.; Tilman, D.; Polasky, S.; Hawthorne, P. Land clearing and the biofuel carbon debt. Science 2008, 319, 1235–1238.
[9] Khan, A.A.; de Jong, W.; Jansens, P.J.; Spliethoff,H. Biomass combustion in fluidized bed boilers: Potential problems and remedies. Fuel Process. Technol. 2009, 90, 21–50.