iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: III Month of publication: March 2019

DOI: http://doi.org/10.22214/ijraset.2019.3087

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

Design of a Glass Tube APH to Increase the Efficiency of the Furnace and Compare with Conventional APH

G. Venkat Kumar[1], S. Rakesh Sundar[2], P. Ponraj[3], D. Prakash[4], T. R. Mohan[5], P. J. Moneshraj[6], S. A. Mageshwaran[7], S. Niresh kumar[8]
[1, 2, 3, 4]Mechanical Department, Prathyusha Engineering College

***Abstract:** Air preheater are heat exchanger to preheat or air heating of the combustion air by means of flue gas, steam, water or thermal oil. Air preheaters are used when exhaust temperatures of combustion systems are particularly high. This extracts the hot exhaust valuable energy, which discharged otherwise unused into the atmosphere and warming means of this exhaust heat the combustion air of the combustion process. In the classical use, air preheaters are connected behind high-pressure steam boilers or thermal oil boilers with a flue gas temperature up to 400°C. Their exhaust temperatures lend themselves to preheat the combustion air up to 300 ° C. In this way, an air preheater save up to 10% of fuel costs and thus enables payback periods of less than two years. Meanwhile, air preheater also be used in low temperature ranges in order to make the most efficient use of the fuels and counter the rising fuel prices.*

***Keywords:** Air preheaters flue gas temperature, thermal oil, thermal oil boiler, exhaust heat.*

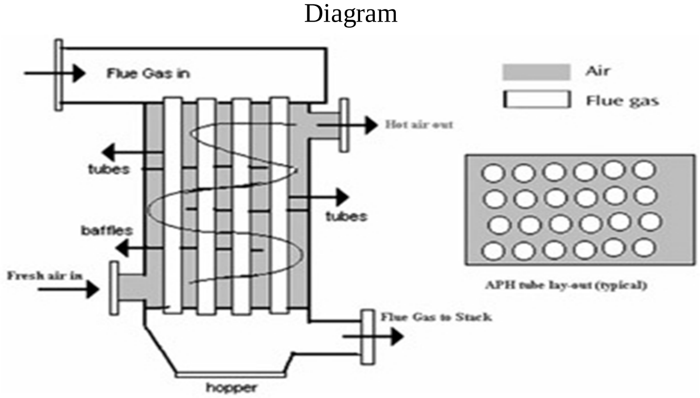
I. INTRODUCTION

Now a day's most of automobile industries having major problem that recovery the failure product to working model. So we analysed some of the methodology that getting New Product Development (NPD) procees by analysing failure cases. For this process we gone through **cross over** failed product by working through design to find error destination to be rectified. We used design software called Auto-Cad for making a rectifying product. Most of industries getting suffered to do production without error and failure of products. But by using this methodology can get clear solution from this and they can improve production as well as reduce cost by making more targets by keeping customer demand in our mind. By analysing failure model we found that major error was degree changing on interlink place of cross over. Finally we changed degree by doing some work flow and specification on failed design to get rectified product.

II. WORK FLOW

1) *Step 1:* Prospective studies of the NPD process are performed using the existing literature and preliminary references.
2) *Step 2:* Comparative analysis between the current processes and a NPD process is performed.
3) *Step 3:* Phase-based evaluations upon failed product cases are conducted with a NPD process so as to identify the abridged steps and root-causes of failures.
4) *Step 4:* Finally, renewed priorities are set forth by utilizing the analytic hierarchy process analysis and questionnaire analysis upon the above identified causes of failures.

Diagram



International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

III. OPERATIONS & MAINTENANCE INSTRUCTIONS

A. Equipment Description

The heat exchange surface in the Air Pre-heater consists of Cast iron tubes. The Cast tube air pre-heater module is an assembly of rectangular cast tubes. The cast iron tubes have integral fins on both internal and external surfaces. The entire tube
Assembly is built inside a steel frame made by beams and fully insulated casings.
Air terminal connections are made of rectangular flanges formed from rolled steel sections and forms an integral part of the Air Pre-heater frame. The entire Air Pre-heater assembly can be considered as part of ducting system because of its general
arrangement. The tube is made up of two half sections, cast independently and then bolted together. To prevent air leakage the longitudinal direction two grooves have been provided on the flanges on either side. The Air Pre-heater is assembled in 4 super imposed air passes with the axis of the tubes horizontal. Flue gas enters at the top of module no 1 and flows vertically down over the outside of Cast Tubes in series and leaves the Air Pre-heater at the bottom of module No 4of Air Pre-heater. A static wash water system is installed above the top row of cast tubes.

B. Maintenance

Due to tubular construction of the Ca st Air Pre -heate r there a reneiti extensive flat surfaces nor small ducts nor no flow zones. The whole heat transfer surfis swept by the flue gases thus preventing soot deposit. The Air Pre-heater is to be k(as close as possible to the design conditions and the minimum metal temperature be kept at least 100C above the flue gas dew point. The Frequency of washing at the beginning of the Air Pre -heater's operatishallbe of once in three weeks. This frequency can be decreased provided following conditions are met: The deposits on the cast tube surfaces are not significant. This can be deducted if the PH factor of the outgoing water rises very quickly during the washing procedure. The specified process operating conditions can be achieved. Flue has pressure drop does not increase drastically and limits ID fan capacity. In case the above conditions cannot be achieved, it is required to wash the A Pre-heater immediately. The actual frequency of washing of cast tubes may be finalized based on the operational feedback.

IV. DESIGN CALCULATION

PROPERTY	AIR	FLUE GAS
DENSITY	0.74 Kg/m	0.525 Kg/m
VISCOSITY	25.99 N/M	$31.68*10^{-6}$
THERMAL CONDUCTIVITY	0.03931 N/M.K	0.03260
SPECIFIC HET	1.026 KJ/KG K	1.151 KJ/KG K
$\triangle P_{ALLOWABLE}$	110mm H_2O	

$Q_h = m_h C_{ph} (T1-T2)$

$= 1.2*20.53(383-201.2)$

$Q_h = Q_a$

$Q_c = m_c C_{pc} (t1- t2)$

$t_2 = t_1 + Q / (t2- t2)$

$= 40+ 45428.0295/19.53*1.005$

$=270.69°\mathbf{C}$

A. For Counter Flow

LMTD = (T2- t2) - (T2- t1) /[((T1- t2)/((t2- t2) (T2- t1)]

=-46.89/-0.343

=136.7°C

ASSUME

U_D =25 w/m^2 k

=4528.096/25*136.8

A=1.32 m^2

A=3.14*d_o L N_T

1.32=1.34*(19.05*10^{-3})*7*N_T

N_T =3.15

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

= 4 TUBES

Mass velocity $G_S / A_S = M_S$

$= 19.53/2.73$

$= 7.590\ I_g / ms^2$

B. *Equivelent D_e For Square Pitch*

$D_e = 1.27/d_0\ (P_r - 0.785\ d_0\ ^2)$

$= 1.27/19.05*10^{-3}\ (25*10^{-3} - 0.785(\ 19.05*10^{-3})$

$=0.03931$

$d_{e\ =\ 0.023\ m}$

$N_{RE\ =\ 3.36}$

$N_{pr\ =\ 25}$

$=h_0\ d_e\ = 0.36*\ (3.36)^{0.55}\ (25.5)^{0.55}$

$=0.03931$

$=0.8025$

C. *Overall Heat Transfer Coefficient*

$1/U\ = 1/H_1 + 1/\quad \lambda\ 1/H_2$

For cast iron aph

$U = 1.246\ W/(m^2\ {}^0C)$

For glass iron aph

$U = 6.716\ W/(m^2\ {}^0C)$

V. CONCLUSIONS

The Objective of the Project is to analyse the efficiency of the AIR PREHEATER and Contrast it with existing convrntional cast iron air preheater. Thus The tabulated results show thst there is a significant increase in the Products efficiency in glass tube air preheater. Thus the project has been elucidated and explained

VI. ACKNOWLEDGMENT

We are very please in presenting our project on “ANALYSING AND PROCESS DEVELOPMENT OF PRODUCTS IN PRODUCTION” under us ateam work.

We would like to thank our chairman Mr. P. RAJA RAO, our honorable Principal Dr.P.L.N. RAMESH of this institution for extending their cooperation throughout our project.

It is our privilege to express our sincere gratitude to Dr. P. JAYARAMAN, Head of the department of mechanical engineering for prompt and help in providing facilities to complete this project successfully.

We own our sincere gratitude to Mr. K. BALACHANDER, Assistant professor, Department of mechanical engineering, who guided us throughout the process of the process work. His enthusiasm and vision always inspired and enlightened us.

REFERENCES

[1] Yeon-Hak Kim, Sun-Wong Park, Yeong-WhaSawng, (2016) "Improving new product development (NPD) process by analysing the existing NPD process and failure cases of the Company.", Asia Pacific Journal of Innovation and Entrepreneurship, Vol. 10 Issue: 1, pp.134-150.
[2] Edgett, S. & Cooper, R. 2008. Ideation for Product Innovation: What are the best methods?. PDMA Visions Magazine, .pp. 3-4.
[3] Soni, A. & Cohen, H. 2000. Successfully launching your product: getting it right. Handbook of Business Strategy, 5(1), pp. 263-268.
[4] Thomke, S. & Donald, R. 2012. Six myths of product development. Harvard Business Review
[5] Ulrich, K. T. &Eppinger, S. P. 2012. Product Design and Development. McGraw-Hill. New York.
[6] Adams, D. 2012. B2B Launch:Advanced Industrial Marketing, Inc. 1st ed. Akrani, G., 2010. Marketing Mix and 4P´s of Marketing.