

Non Implemented Case Study– Energy Conservation Measure

Measure
Use of energy efficient ladle preheating system
Equipment
Combustion system & waste heat recovery
Industry / Sector
Iron & steel
Year of Implementation
Not implemented
Cost Benefit Analysis
⦿ Type of Measure: Medium investment
⦿ Annual Energy Savings: 106.5 KL of HSD
⦿ Actual cost savings: Rs.7.45 lakh
⦿ Actual investment : Rs. 5 lakh
⦿ Payback: 8 months
Implementation Highlights
<ul style="list-style-type: none"> ☞ Very simple in construction and operation. Similar concept is very popular in developed countries. ☞ Not implemented ☞ The reasons for non-implementation are: <ul style="list-style-type: none"> ⦿ Plant not shown any interest in ladle preheating since it is not considered as important operation in the plant. ⦿ No manufacturer or supplier of such efficient systems are domestically available. ⦿ Plant, if wants to implement the measure it has to design or construct efficient ladle preheating station with in house expertise.

Summary

The energy efficient ladle preheating station is expected to yield energy savings to the tune of 10-15% by preheating the combustion air and heating the ladle from outside by exit gases.

Background

The mini steel plant has two ladle preheating stations for preheating the ladles before pouring the molten metal from the melting furnace. Each ladle capacity is 20 Mt.

The energy balance of the ladle preheating furnace indicated the flue gas losses accounted for 33% of the total heat input which indicates on very high side.

The hourly consumption of HSD in the ladles is 173 lph (147 kg/h). The brief details of the ladle preheating station operation are:

HSD consumption	: 173 lph (147 kg/h)
Flue gas temperature	: 960°C
Combustion airflow	: 2064 kg/h
Total flue gas quantity	: 2211 kg/h
Heat in flue gas	: 514060 kcal/h
% heat losses	: 33.3% of total heat input

Proposal:

It can be seen that about 33% of the total heat input is exhausted at very high temperature. In view of huge potential available in the exhaust gases, significant potential exists in recovering the heat in exhaust gases. Latest ladle preheating stations are available (which are very simple in construction) with developed countries. These type of units are not domestically installed due to non-priority given to the ladle pre-heating system.

In the latest system the combustion is preheated. After preheating the air the flue gases heat the outer periphery of the ladle.

Techno-economics:

Expected air preheat temperature	: 400°C
Recoverable heat	: 190920 kcal/h
% heat recovery	: 12.4% of heat input
HSD savings	: 21.3 lph
Operating hours per year	: 5000
Annual HSD savings	: 106.5 kL
Cost savings	: Rs 7.45 lakh/year
Investment required	: Rs 5.0 lakhs

Payback period : 8 months

Principle

Waste heat recovery from the exhaust gases is proven concept to improve the energy efficiency of combustion system.