Non Implemented Case Study– Energy Conservation Measure

Measure
Insulation of flanges, valves and pipes in steam lines
Equipment
Steam System
Industry / Sector
Chemical
Year of Implementation
-
Cost Benefit Analysis
‹› Type of Measure: Small Investment
‹› Annual Energy Savings: 113.6 Mt of coal
‹› Actual cost savings: Rs.2.84 lakh
‹› Actual investment : Rs. 1.20lakhs
‹› Payback: 6months
Implementation Highlights
⇨ Though the measure is very simple, it was not implemented. ⇨ Now a days all new installations have insulation over flanges and valves. ⇨ The plant personnel feel that insulation of flanges and valves will cause numerous maintenance problems. ⇨ The implementation also could not takes place since earlier days there was no concept of the insulating valves and flanges. ⇨ Plant gave least priority to this measure though the saving potential is high. ⇨ In addition to these, the insulation contractor expressed his reservations that most of the flanges and valves became aged / corroded and requiring replacement.

Summary

Insulation of flanges and valve will reduce the surface heat losses (distribution losses) from the steam lines very significantly thereby results in fuel savings in the boilers. The reduction in heat losses also improves the steam quality or dryness fraction.

Background

One chemical unit has one fluidized bed boiler to generate steam at 10 ata to meet the process requirements. The rated capacity of the boiler is 18 tph. The plant uses the coal as fuel. Plant consumes about 12000 Mt of coal per annum.

Detailed energy audit was carried out to identify various energy conservation measures. During the audit it was observed that all flanges, valves on the steam liners were uninsulated resulting in large surface heat losses. The measured temperatures of the surfaces of the uninsulated areas were in the range 125-175^{o}C.

Detailed survey indicated that due to uninsulation on valves and flanges the total heat losses were about 70000 kcal/h, which is equivalent 145 Mt of coal per annum.

Proposal:

It was suggested that to reduce the surface heat loss by insulation of these flanges and valves. The economic thickness was worked out to 50-mm thickness of glass wool.

Now-a-days prefabricated insulation materials are available which are best suitable for flanges and valves. These can be very easily removed for maintenance application.

The surface temperature after insulation is estimated at 40^{o}C, the corresponding heat losses were 9600 kcal/h (i.e, 99 Mt of coal per year)

Techno-economics:

Estimated surface heat losses before insulation	: 70000 kcal/h
Estimated heat losses after insulation	: 9600 kcal/h
Estimated energy savings	: 60400 kcal/h
Savings in coal @ 4250 kcal/h	: 14.21 kg/h
Average operating hours	: 8000 per year
Annual coal savings	: 113.6 Mt/year
Annual cost savings	: Rs. 2.84 lakh
Investment required	: Rs.1.20 lakh
Payback period	: 5 months

Principle

- In many plants most of the plant personnel will leave the flanges and valves uninsulated while insulating the pipe systems. In fact now-a-days most of plants insulate these flanges and valves at the beginning.
- Most of the contractors suggest the plant personnel not to insulate the flanges and valves if the temperature is less than 200^{o}C. Such recommendations show a complete lack of knowledge on the economy of the insulation. Often the flanges are left bare, due to fear that leaks may go undetected and that leakages may corrode the flange bolts.
- There are several reasons to dispel this practice. Molded box insulation can used with 75 mm length of 6 mm may be inserted in to the bottom of the box to give a early warning of any leak.

  A really bad leak will soon make itself known. Insulation of flanges and valves is one of the best ways of stopping the leaks.
- Bare flanges and valves introduce temperature stress, which may also cause the leaks.
- The heat loss from uninsulated flange and valve is equal to approximately that from a 0.5 meter and a meter bare piping respectively.