CHAPTER 8

RESULTS AND DISCUSSIONS

8.1 INTRODUCTION

As mentioned in the previous chapters, on conducting the doctoral work being reported here, it was found that cassette filter is the most efficient and economically performing device that can control pollution effectively in foundries. In order to corroborate this finding, cost of operation of wet scrubber and cassette filter was gathered from the report of a foundry. Using these data, comparative investigation were conducted. The results of this comparative investigation are presented in next section. In this subsequent section, the results are subjected to discussion.

8.2 RESULTS

In the following subsections, first, the cost of operation of wet scrubber of cassette filter is presented.

8.2.1 Operational Cost of Wetscrubber

The expenses incurred to pay the electrical power consumes by the wetscrubber constitute its operational cost. While operating, the electrical power is consumed by three devices of the wetscrubber. These devices are ID fan, venturi pump and recirculating pump. The monthly average electric power cost of these devices are presented in the following subsection with details. These specifications are pertaining to the controlling of pollution within 50mg/nm$^3$. 
POWER COST OF RUNNING ID FAN MOTOR

Recommended motor : 132KW
Operation : Continuous
Number of shifts : 2 shift (i.e., 16 hours)
Power cost per unit = Indian National Rupees (INR).5

Running power cost per day = 132 × 5 × 22 = 14,520/-

Average Running power cost per month = 14,520 × 26 = 377,520/-

POWER COST OF RUNNING VENTURI PUMP MOTOR

Recommended motor : 37KW
Operation : Continuous
Number of shifts : 2 shift together of 16 hours of operation per day

Power cost per unit = INR.5
Running power cost per day = 37 × 5 × 22 = INR.4,070/-

Average Running power cost per month = 4,070 × 26 = INR.105,820/-
POWER COST OF RUNNING RECIRCULATING PUMP MOTOR

Recommended motor : 0.75KW

Operation : Continuous

Number of shifts : 2 shifts together of 16 hours of operation per day

Power cost per unit = INR.5

Running power cost per day = 0.75 × 5 × 22 =

INR 82.5/-

Average Running power cost per month = 82.5 × 26 = INR 2,145/-

Hence, the total power cost for OPERATING a venturi scrubber per month to achieve outlet emission level >= 50mg/Nm$^3$ and efficiency between 92 – 95% IS

= 377,520 + 105,820 + 2,145 = INR 485,485/-

In the above mentioned operational cost the followings are not considered;

- Cost of water
- Cost of water treatment for recirculation
- Cost of the proper treatment and disposal of slurry

8.2.2 Operation Cost of Cassette Type Filter

While operating the cassette filter, three of its devices consume electric power. These devices are ID fan, reverse air cleaning carriage motor, and dust dosing motor. The average monthly electrical power cost of these devices are presented in the following subsection with details.
POWER COST OF RUNNING  ID fan motor

Recommended motor : 110KW
Operation : Continuous
No of shifts : 2 shift together of 16 hours of operation per day

Power cost per unit = INR.5
Running power cost per day = $110 \times 5 \times 22 = \text{INR12,120/-}$
Average Running power cost per month = $12,120 \times 26 = $\text{INR314,600/-}$

POWER COST OF RUNNING REVERSE AIR CLEANING CARRIAGE MOTOR

Recommended motor : 5.5Kw
Operation : Continuous
No of shifts : 2 shift shift together of 16 hours of operation per day

Power cost per unit = INR.5
Running power cost per day = $5.5 \times 5 \times 22 = $\text{INR605/-}$
Average Running power cost per month = $605 \times 26 = $\text{INR15,730/-}$
POWER COST OF RUNNING DUST DOSING MOTOR

Recommended motor : 0.55Kw
Operation : Continuous
No of shifts : 2 shift shift together of 16 hours of operation per day

Power cost per unit = INR.5
Running power cost per day = \(0.55 \times 5 \times 16\) = INR44/-
Average Running power cost per month = \(44 \times 26\) = INR 1,144/-

Hence, the total power cost for operating a CASSETTE FILTER per month to achieve outlet emission level \(\leq 20\text{mg/Nm}^3\) and efficiency > 99% IS = 314,600+15,730+1,144 = INR 3,31,474/-

8.3 DISCUSSION

The calculations presented in the previous sections have revealed that, the following saving in the operational and cost can be achieved in case cassette filter is used in place of wetscrubber as the PCD in iron foundries.

Savings in a month =INR 485485-INR331474=INR1,54,011.

As shown above, about 25% cost reduction is possible in case Cassette filter is employed in iron foundries instead of wetscrubber. In the above calculations, cost of water, cost of water treatment for recirculation and the cost of the proper treatmental dispose of slurry were not considered. This
is due to the reason that, in both wetscrubber and cassette filter, these operational cost would be approximately the same. Besides revealing the financial saving, the emission control in the case of cassette filter is superior than that is achieved by employing wetscrubber in iron foundries. As mentioned in the previous section, for the same capacity, cassette filter has the capacity to control emission to the level of 20mg/nm$^3$, whereas it is, 50mg/nm$^3$ in the case of wetscrubber.

8.4 CONCLUDING REMARKS

Throughout the world, foundry engineers have been striving to identify a PCD that would be technically and finally effective in controlling pollution. The results of the investigation reported in this chapter have revealed that, the engineers of iron foundries located in Coimbatore have also been striving to identify a PCD that would be technically and financially effective. This situation indicates that the scenario prevailing in the foundry cluster of Coimbatore is similar to that is prevailing in the foundry cluster located in different parts of the world. The comparative investigations reported in this chapter have revealed that cassette filter is the most technically effective device that can be used in iron foundries as the PCD.