APPENDIX A

ELECTROSTATIC PRECIPITATOR OF GARRI 4 POWER PLANT

Figure A.1: Garri 4 power plant

Figure A.2: Manual discharge for fly ash
Figure A.3: Collection plats and wires discharge

Figure A.4: Rapping mechanism
## APPENDIX B

**ELECTROSTATIC PRECIPITATOR DATA**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emitting Electrode Type</td>
<td>spiral with hooks</td>
</tr>
<tr>
<td>Emitting Electrode Size</td>
<td>2.7 mm</td>
</tr>
<tr>
<td>Total no of Electrode</td>
<td>29808</td>
</tr>
<tr>
<td>Plate Wire Spacing</td>
<td>14 mm</td>
</tr>
<tr>
<td>No of Electrode per Field</td>
<td>24</td>
</tr>
<tr>
<td>No of Plates Each Row</td>
<td>6</td>
</tr>
<tr>
<td>Total Collecting Area</td>
<td>3456</td>
</tr>
<tr>
<td>Efficiency</td>
<td>99.9%</td>
</tr>
<tr>
<td>Inlet Temperature Degree</td>
<td>110</td>
</tr>
<tr>
<td>Velocity Of Gas at Electrode</td>
<td>0.95 m/s</td>
</tr>
<tr>
<td>Particle Diameter</td>
<td>2.5 µm</td>
</tr>
<tr>
<td>Gas Constant</td>
<td>8314.34</td>
</tr>
<tr>
<td>Gas Pressure</td>
<td>101325</td>
</tr>
</tbody>
</table>
APPENDICES C

MATLAB CODE FOR CALCULATION OF THEORETICAL EFFICIENCY

```
for (i=1:600)
T=109+273;
P=101325;
R=8314.34;
Dp=16E-06;
area=24*128*(25.4E-03)^2;
q=24*18*(25.4E-03)^2;
k=1.9;
gasmw=.06*44+.78*28+.16*32;
rhog=P*gasmw/(R*T);
v(i)=20000+i*100;
d=4.5*(25.4E-03);
mug=2.284e-05;
E(i)=v(i)/d;
charge(i)=(3*k/(k+2))*pi*8.853e-12*E(i)*Dp*Dp;
mfp=mug/(4.99*P*(8*gasmw/(pi*T*R))^.5);
kn=mfp/(Dp);
cc=1+kn*(1.257+.78*exp(-1.1/kn));
x=1+0.15*.4^.687;
ve(i)=(cc*charge(i)*E(i)/(3*pi*Dp*mug*x));
Re(i)=rhog*ve(i)*Dp/mug;
eff(i)=1-exp(-area*ve(i)/q*1.455);
end;
```
vv=v/1000;
efff=eff*100;
for (i=1:500)
plot((vv(i)),efff(i),'-b');grid on;hold on;
end;
x1 = [27 27 30 30 33 33];
y1 = [80.4 81.19 83.75 86.05 89.74 91.71];
plot(x1,y1,'o');grid on;hold on;

• matlab code for electrostatic field calculation

k = 9*10^9;

eps_r = 1;
charge_order = 10^-9;
const = k*charge_order/eps_r;

Nx = 101;
Ny = 101;

n = 3;

E_f = zeros(Nx,Ny);
Ex = E_f;
Ey = E_f;
\texttt{ex = E\_f;}
\texttt{ey = E\_f;}
\texttt{r = E\_f;}
\texttt{r\_square = E\_f;}

\texttt{Q = [-1,-1,-1];}

\texttt{X = [5,0,-5];}
\texttt{Y = [0,0,0];}

\texttt{for k = 1:n}
\texttt{q = Q(k);}

\texttt{for i=1:Nx}
\texttt{for j=1:Ny}

\texttt{r\_square(i,j) = (i-51-X(k))^2+(j-51-Y(k))^2;}
\texttt{r(i,j) = sqrt(r\_square(i,j));}
\texttt{ex(i,j) = ex(i,j)+(i-51-X(k))./r(i,j);}
\texttt{ey(i,j) = ey(i,j)+(j-51-Y(k))./r(i,j);}

\texttt{end}
\texttt{end}

\texttt{E\_f = E\_f + q.*const./r\_square;}

A1
Ex = Ex + E_f.*ex.*const;
Ey = Ex + E_f.*ey.*const;

end

x_range = (1:Nx)-51;
y_range = (1:Ny)-51;
contour_range = -8:0.02:8;
contour(x_range,y_range,E_f',contour_range,'linewidth',0.7);
axis([-30 30 -30 30]);
colorbar('location','eastoutside','fontsize',12);
xlabel('x ','fontsize',14);
ylabel('y ','fontsize',14);
title('Electric field distribution, E (x,y) in V/m','fontsize',14);