POND ASH STOWING IN UNDERGROUND COAL MINES

By

Dr. C.N. Ghosh,
E-Mail : cngcmri@yahoo.com
Scientist & Head,
Mine Stowing & Filling Dept.
CMRI, Dhanbad

Areas of Fly Ash Utilization :

- Brick manufacturing
- Cement manufacturing
- Part replacement of cement in mortar & concrete
- Roads & Embankment construction
- Dyke raising
- Structural fill for reclaiming low lying areas
- Stowing material for underground mines
- Open cast mine fill
- Agriculture & Forestry
- Other medium & high value added products (tiles, wood, paints, LWA,extraction of alumina etc.)

Reasons For Low Utilization of Coal Ash in Our Country

- Lack of propaganda and promotional measures
- Non availability of dry fly ash collection facilities at many power plants
- Easy availability of land with top soil at cheap rates for manufacturing of conventional bricks
- Psychology of prospective users to keep away from flyash utilization specially in agriculture sector since the fly ash is made available free of cost

Reasons For Low Utilization of Coal Ash in Our Country

- Lack of proper co-ordination and dialogue between power plants and ash user
- Lack of confidence of mining companies to use ash as a filling material for underground as well as open cast mines
- Higher cost of production of building material by using fly ash
- Wide variations in quality and fineness of ash not desired by ash users specially in cement, sheets, titles etc.

Objectives

- Feasibility study
- Model Study
- Modification of the existing stowing plant
- Description of underground locales
- Field trial at different phases
- Sieve size analysis of ash at different phases of trial
- Instrumentation at the barricade
- Recommendations

Physical Characteristics

- Specific gravity :
  - (a) Pond ash - 2.00
  - (b) Sand - 2.65
- Bulk density :
  - (a) Pond ash - 1.06 t/m^3
  - (b) Sand - 1.67 t/m^3
- Percentage Void :
  - (a) Pond ash - 47 %
  - (b) Sand - 40 %

Granulometric Distribution

Size fraction (microns)	Weight (gm)	% Retained	% Cumulative Retained
+150	10.5	1.05	1.05
-150+100	21.5	2.15	3.20
-100+50	640.4	64.04	67.24
-50+20	240.0	24.0	91.24
-20+10	47.5	4.75	95.99
-10	40.1	4.01	100.00

Chemical Characteristics

Parameters	Concentration (% by wt.)
SiO_2	59.007
Al_2O_3	19.551
Fe_2O_3	15.350
TiO_2	3.158
K_2O	1.271
CaO	1.151
Mn_2O_3	0.197
ZrO_2	0.184
SrO	0.028
NiO	0.042
Nb_2O_5	0.012
V_2O_5	0.049

Water Percolation Rates:

- Percolation rate of pond ash only = 16.235 cm/hr
- Percolation rate of pond ash + Additive
  = 18.970 cm/hr

It can be seen that the use of additive has a positive impact on the percolation rate.

Spontaneous Heating Characteristics

- **Proximate analysis**

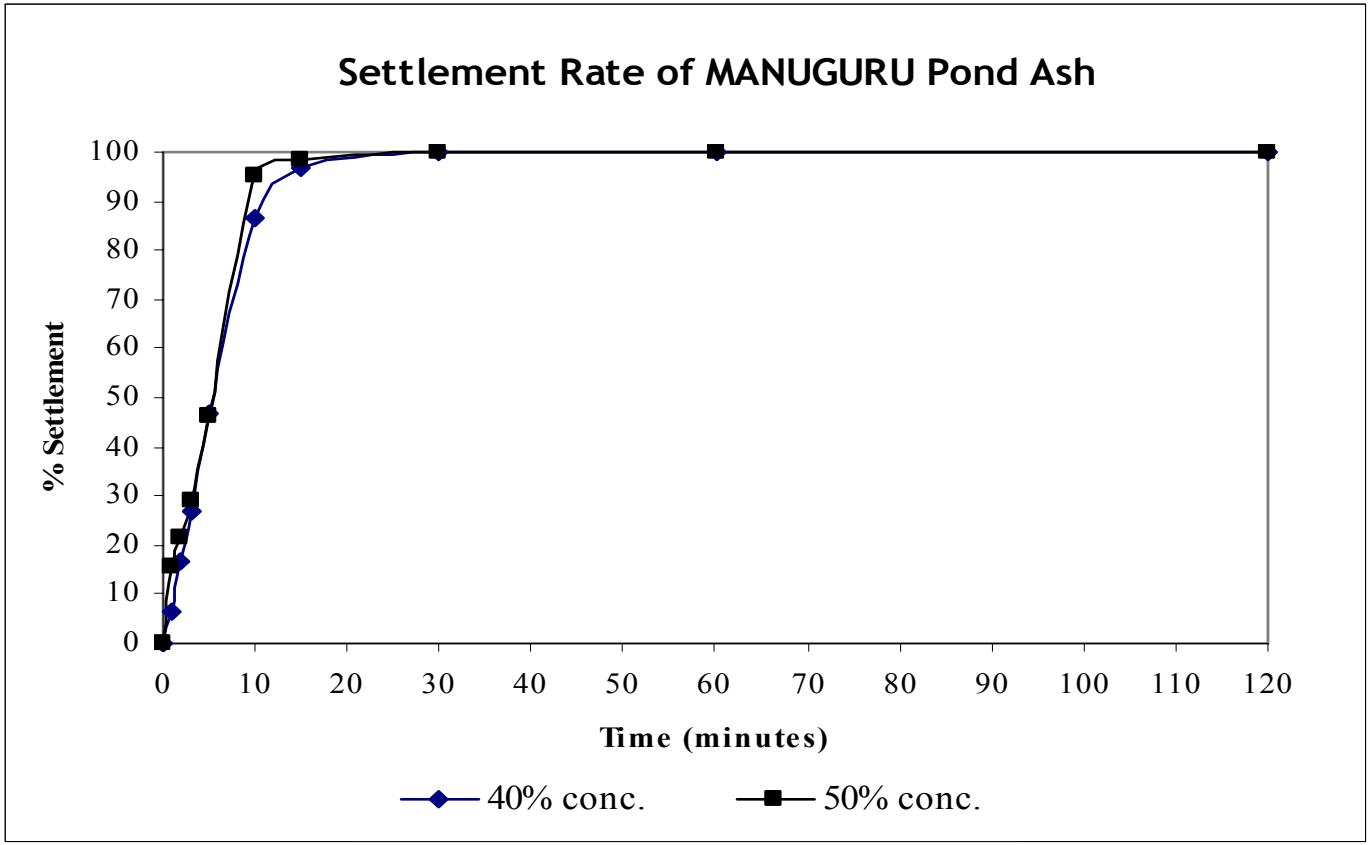
Moisture %	0.2905
Ash%	97.4655
Volatile Matter%	1.6898
Unburnt Carbon%	0.5542

- **Crossing Point and Ignition Point Temperatures**

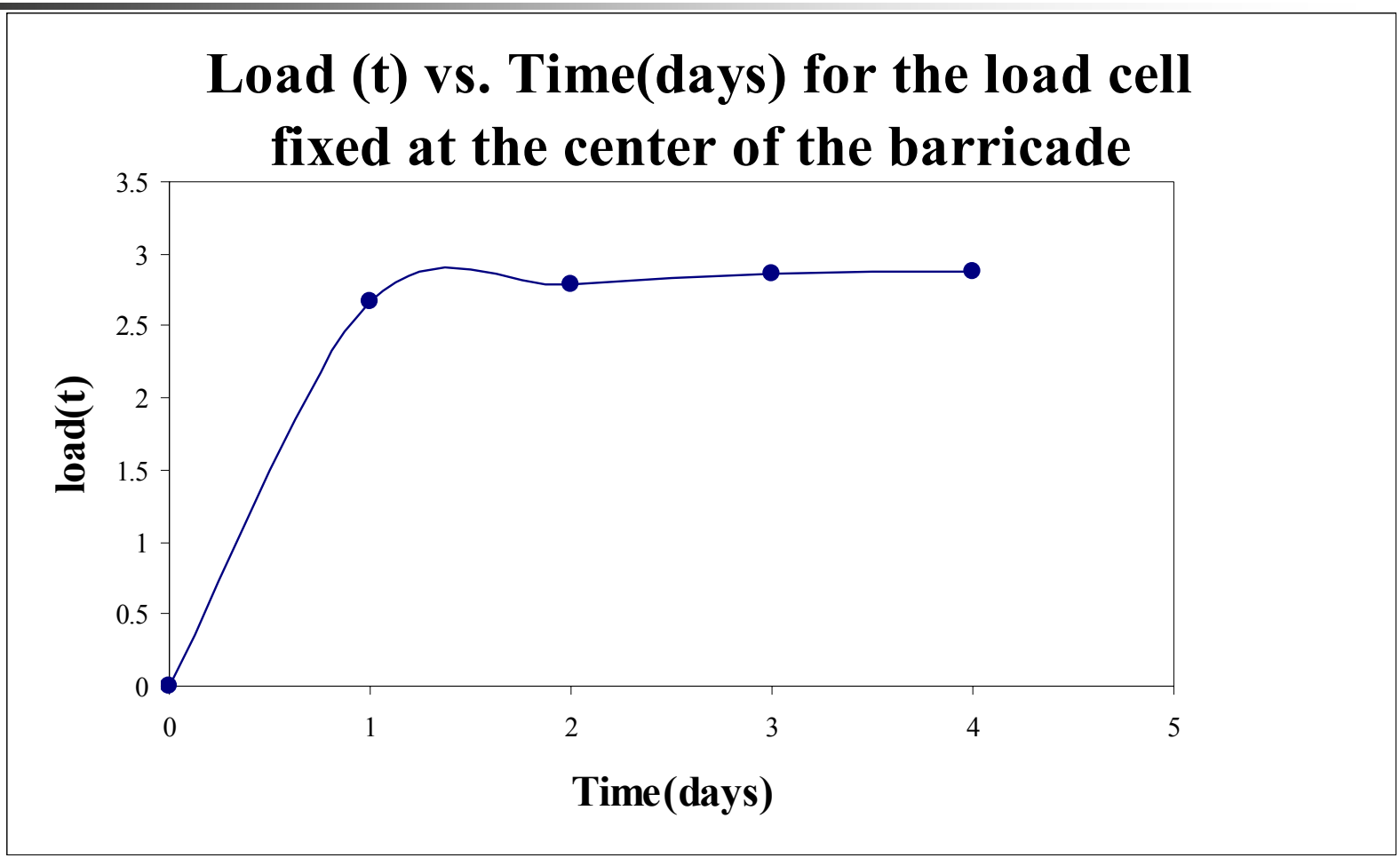
CPT : Not reached till 200^{o}C

IPT : Not reached till 200^{o}C

Settlement Characteristics



Field Trials



Field Trials

- An additive was used for fast settlement and high percolation rate at a very low proportion (5-10 ppm).
- The stowing was conducted at water ash ratio of 1:1.
- The average stowing rate of 105 m^3 per hour could be achieved.
- People could walk over the stowed pack within 20 minutes of stowing.

Field Trials

- Within one hour the pack was consolidated completely and walking over it did not create any type of impression or sinking.
- The water percolation through the barricade was satisfactory and the water percolating out through the barricade was found to be clear.
- Hardly 0.1% fines escaped through the corners of the barricade.
- No substantial or notable bulging could be seen at the barricade.


TO SIMULATE
STOWING IN MINES

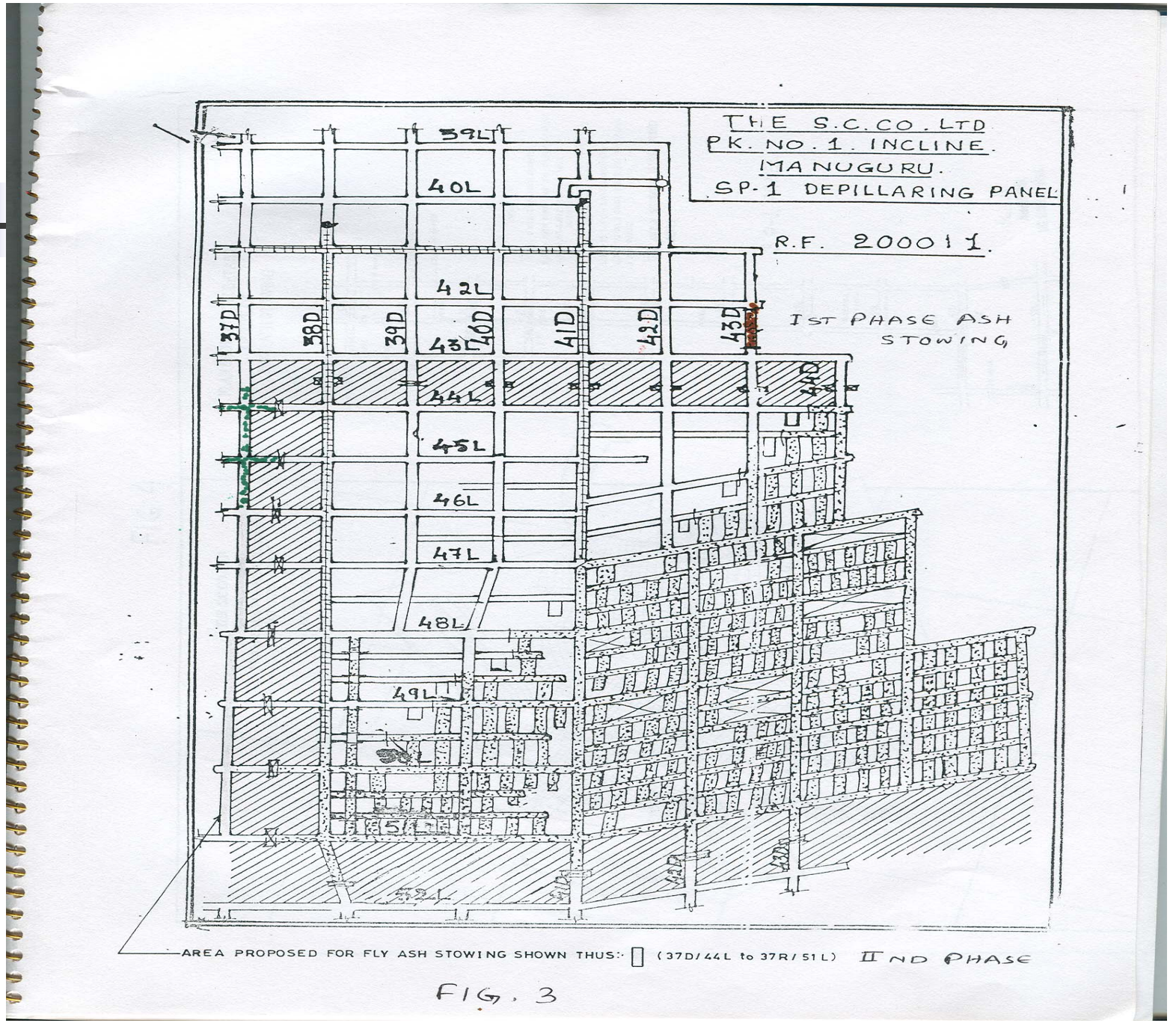

THE S.C.CO.LTD
PK. NO. 1. INCLINE.
MANUGURU.
SP-1 DEPILLARING PANEL
R.F. 20001.
1ST PHASE ASH STOWING
39L
40L
42L
37D
38D
39D
40D
41D
42D
43D
44D
44L
45L
46L
47L
48L
49L
51L
AREA PROPOSED FOR FLY ASH STOWING SHOWN THUS:- (37D/44L to 37R/51L) IIND PHASE

FIG. 3


CELLS

National Award for Ash Utilization

Jointly Awarded by MOP, MOEF and DST, Govt. of India

THANK YOU