GREETINGS FROM
NEYVELI LIGNITE CORPORATION LIMITED

November 14, 2014

DELHI

NLC – A PROFILE

- Established in 1956, is a Schedule-A, Navratna PSU.
- 90% of the equity held by Government of India.
- Listed in Bombay Stock Exchange & National Stock Exchange.
- Operates three opencast lignite mines at Neyveli (28.5 MT) and one mine at Barsingsar, Rajasthan (2.1 MT).
- Operates three Thermal Power Plants (2490 MW) at Neyveli and one Thermal Power Plant at Barsingsar (250 MW).
- All the three mines and power plants at Neyveli are ISO certified
- Supplies lignite to TAQA, an Independent Power Producer (250 MW) through Fuel Supply Agreement.
- 16478 employees as on 31st October 2014.
- Earning profit for the last 34 years.
- Paying dividend since 1997.

NLC MINE-I

NLC MINE-IA

MINE-II

SEMI CONFINED MINE SOIL IS BEING USED AS BED MATERIAL

THERMAL POWER STATION-I 600 MW

THERMAL POWER STATION-II 7X210 MW

THERMAL POWER STATION-I EXPN. 2X210 MW

BARSINGSAR THERMAL POWER STATION 2X125 MW

MINING OPERATION

At present NLC operates the following lignite mines.

Mine	Capacity (MTPA)	Year of commissioning	Linked to
Mine-I, Neyveli, TN	10.5	1962	TPS-I & TPS-I Expn
Mine-II, Neyveli,TN	15.0	1985	TPS-II & TPS-II Expn
Mine-IA, Neyveli,TN	3.0	2003	IPP & Sales
Barsingsar Mine,* Rajasthan.	2.1	2010	Barsingsar TPS
TOTAL	30.6		

- *- Mining operations outsourced (Conventional Mining Equipment technology)
- All mines at Neyveli employ continuous mining technology with Specialized Mining Equipments using departmental workforce.

POWER GENERATION

At present NLC operates the following thermal power stations.

Power station	Capacity (MW)	Year of commissioning	Beneficiaries & Their share
TPS-I,Neyveli, TN	600	1962-1970	Tamilnadu (1180 MW, 47.4%), Telangana (149.27 MW,5.99%) Andra(127.73 MW, 5.12%), Karnataka (291 MW, 11.7%), Kerala (212 MW, 8.51%), Puducherry (93 MW, 3.72%) NLC (154 MW, 6.18%) Unallocated (283 MW, 11.37%)
TPS-II,Neyveli, TN	1470	1986-1993	
TPS-I Expansion, Neyveli, TN	420	2002-2003	
Total Neyveli	2490		
Barsingsar TPS, Rajasthan.	250	2011-2012	Rajasthan (245 MW, 98%) NLC (5 MW, 2%)
Total NLC	2740		

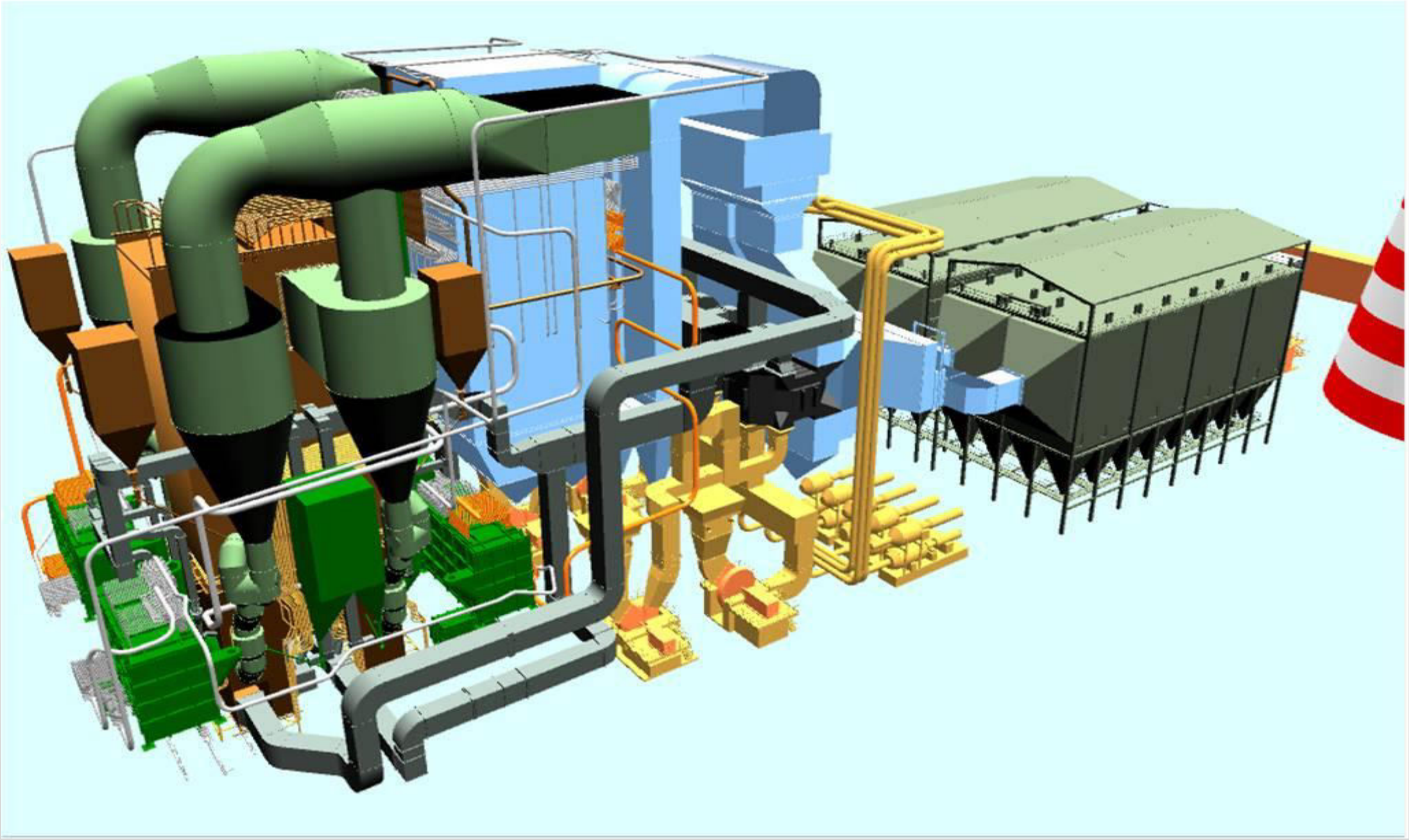
NLC GROWTH PLAN

	Projects under implementation		
Sl. No	Project	Thermal Capacity (MW)	Commissioning date
1	TPS-II Expansion	2 X 250	Unit-I: Nov’14 , Unit-II: Nov'14
2	NTPL (Coal)	2 X500	Unit-I: Nov’14 , Unit-II: Dec'14
3	NNTPS	2 x 500	Unit-I : 2017-18 Unit-II: 2018-19
4	Wind Power	51	March 2015
5	Solar Power	10	January 2015
	Total	2561@	

@ - 1000 MW NNTPS will replace 600 MW TPS-I.

NLC TPS-II EXPANSION PROJECT
2 X 250 MW – LIGNITE FIRED CFBC BOILERS

OVERALL VIEW OF 250 MW CFBC BOILER



OPERATION EXPERIENCES IN 125 MW AND 250 MW CFBC BOILERS

UNIQUE FEATURES

- This is the First time 250 MW Lignite Based CFBC Boilers of Pant Leg design are being installed in India.

PROJECT DETAILS- MAIN PLANT PACKAGE

Date of issue of LOA to

Main Plant contractor : 19.08.2005

(BHEL)

Capacity : 2 x 250 MW

Boiler Parameters : 845 T/Hr at 175 kg/cm^2 & 540^0 C

- **Boiler I was 1st lighted up on 28.02.2011.**
- **Unit I was first Synchronised with oil firing on 18.05.2011.**
- **Unit I was synchronised with lignite firing on 27-06-2011.**
- **Unit I Full Load of 250 MW was reached on 04-02-2012.**

Problems faced in the commissioning & operation of CFBC Boilers are discussed in the presentation

- PA Fans
- Lignite Feeders
- FBHE coils supports
- Refractory
- Startup Burner mouth choke
- Maintaining Differential pressure in Combustor Pant legs
- Lignite Bunker Choking
- NMEJ failure
- Sintering of Ash in Cyclone, BTPP (2 X 125 MW)

UNIT I INITIAL TEETHING TROUBLES

Problems faced	Action taken
a) Failure in PA fan 'A' impeller b) Failure of PA duct Metallic Expansion Joint.	a) PA fan Impeller shaft modified with higher diameter b) MEJs were modified.
Bed Formation & Choking in the Lignite Transport and Extraction feeders	❖Chain Arrestors erected in transport conveyor and Extraction feeder chains to arrest the lifting up of chain. ❖Serrated flights introduced in both Extraction and Transport feeders. ❖Transport Conveyor A and B Motor Capacity raised.

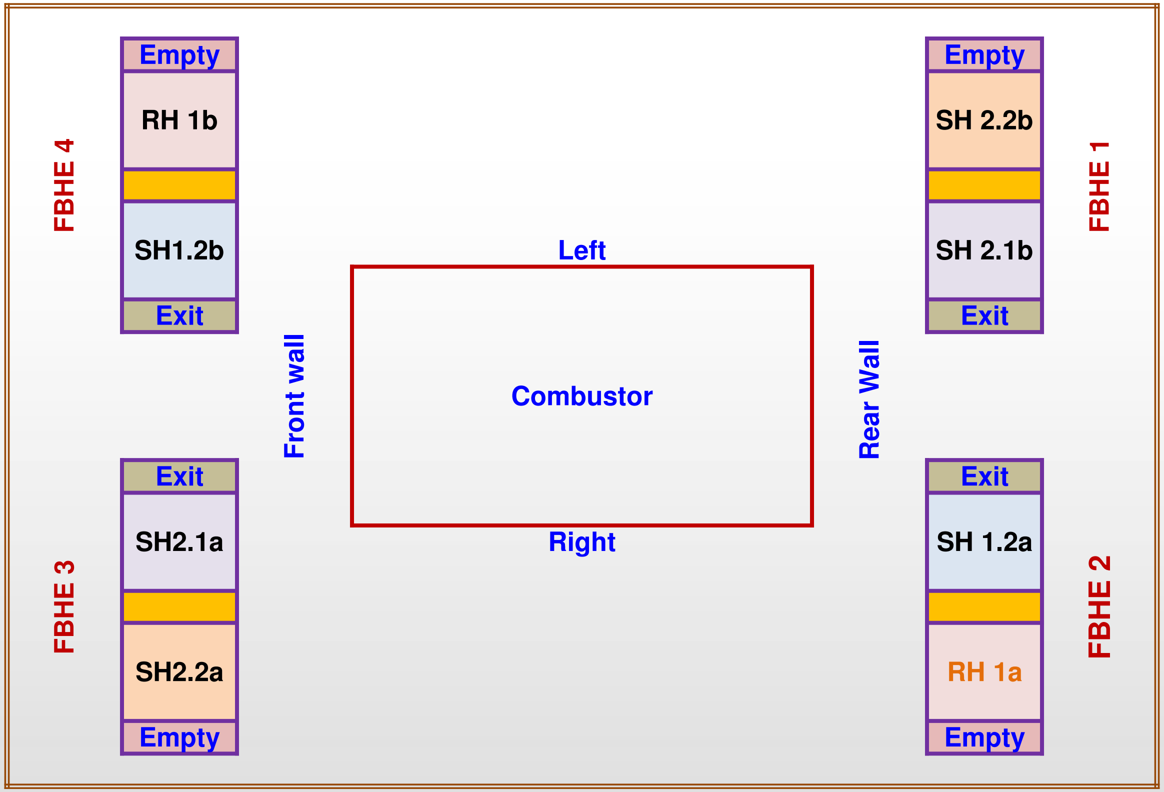
Bed Formation in Transport conveyor

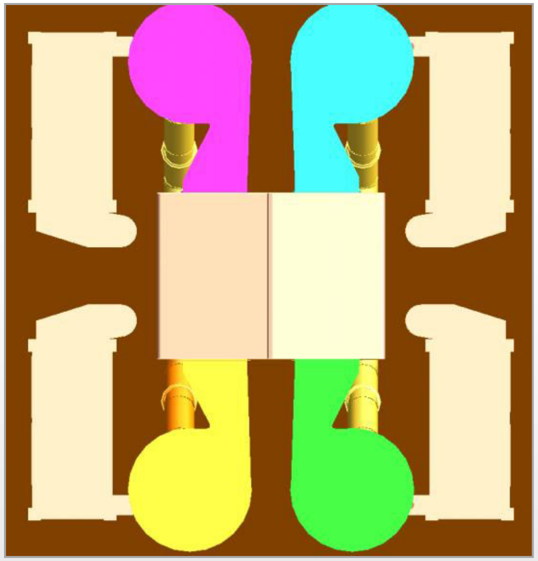
Bed Formation in Transport Feeders (View from the bottom)

Bed Formation in Transport Feeders

Problems faced	Action taken
FBHE SH/RH Coil support system failure 1. Stresses in the rods were very high compared to allowable limits at operating temperatures. 2. Natural frequency of tube bundle matches with excitation frequency during operation resulting in fatigue failure.	FBHE Coil supporting arrangements modified with steam cooled Hanger tubes and Dog bone arrangement

FBHE - Arrangement over view





SH Bundles:

Tube size : Φ 38 x 7.1 – SA 213 T91

SL – 80 / 130 and ST- 120

Sleeve : Φ 54 x 7.1 – SA 213 TP 347H

Spacer Rod : Φ 20 – SA 182 F310S

T91 :32000 metres; 185 tons

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RH Bundles:

Tube Size : Φ 51 x 5.6 – SA 213 T91

SL – 80 /130 and ST- 120

Sleeve : Φ 68 x 8 – SA 213 TP 347H

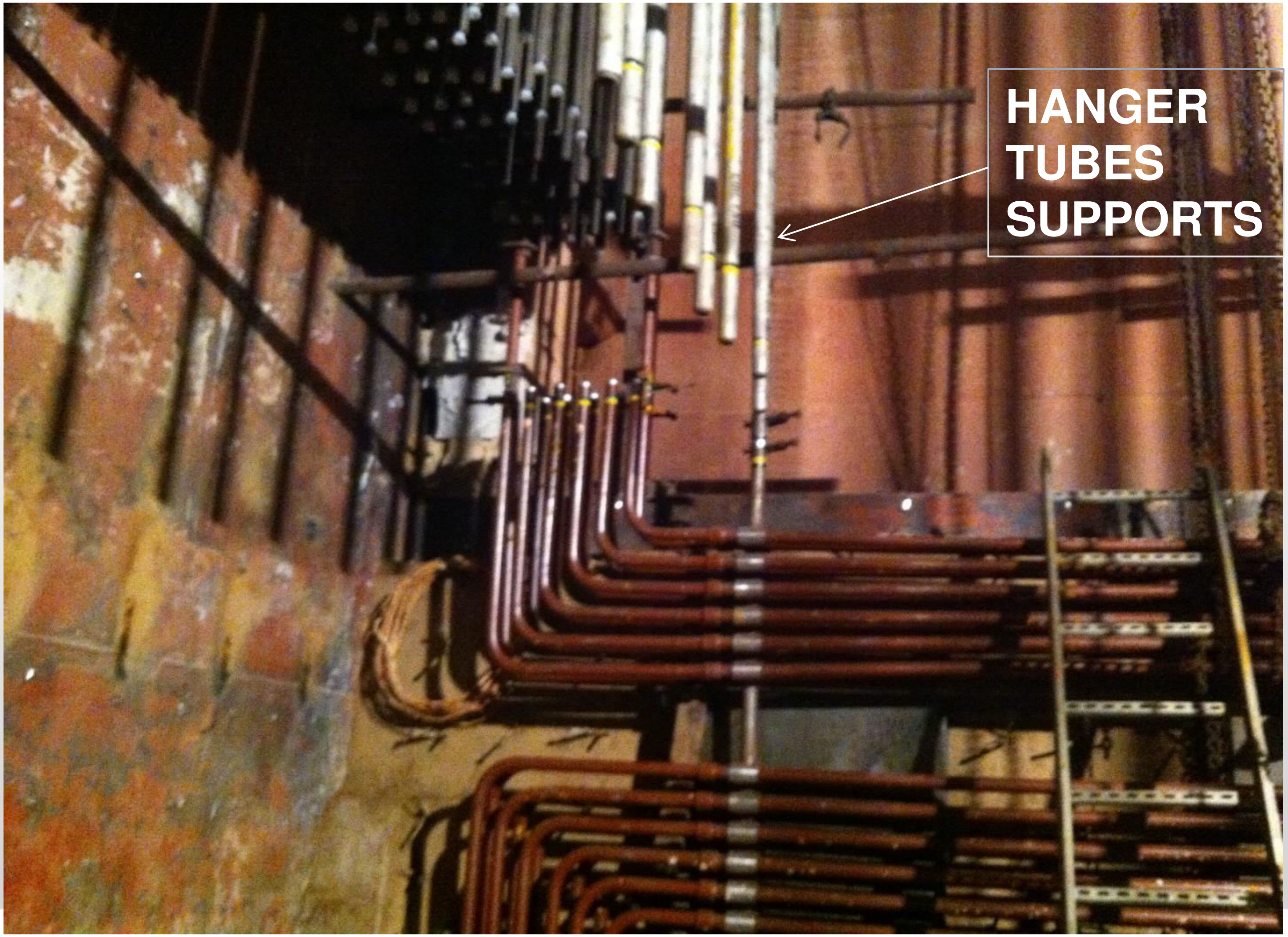
Spacer Rod : Φ 20 – SA 182 F310S

T91 : 10000 metres; 67 tons

FBHE Coils Supports Spacer rods failure

FBHE MODIFICATION

HANGER TUBE FORGED BLOCK ASSEMBLY



FAILURE OF SH COILS & HANGER TUBE ASSEMBLY

FAILURE OF SH COILS & HANGER TUBE ASSEMBLY

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FAILURE OF SH COILS & HANGER TUBE ASSEMBLY

Dog Bone
Arrangement

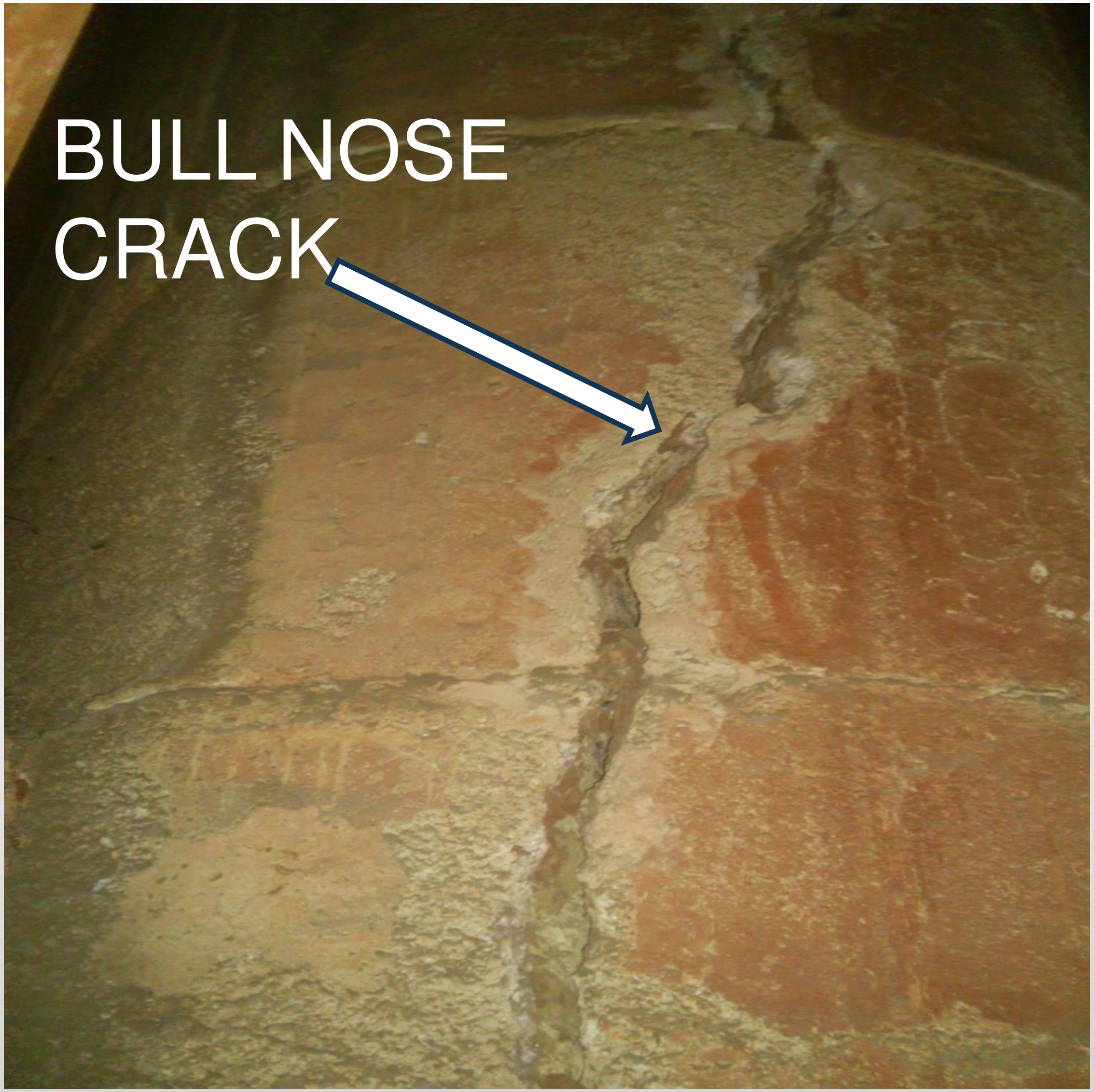
REFRACTORY MODIFICATIONS

- Empty Chamber Refractory bricks modified with two layer castables.
- FBHE bundle chamber refractory modified by two layer castables.
- Seal pot refractory castings were modified with two layer castables.
- Start up burner mouth refractory was modified with Plastic Refractory.
- Secondary air and Bed Lance openings refractory were modified with Plastic Refractory

REFRACTORY APPLICATION IN COMBUSTOR – UNIT I

START UP BURNER – REFRACTORY CHANGED TO PLASTIC REFRACTORY

Secondary air openings refractory were modified with Plastic Refractory


BULL NOSE
CRACK

OPERATION PROBLEMS FACED

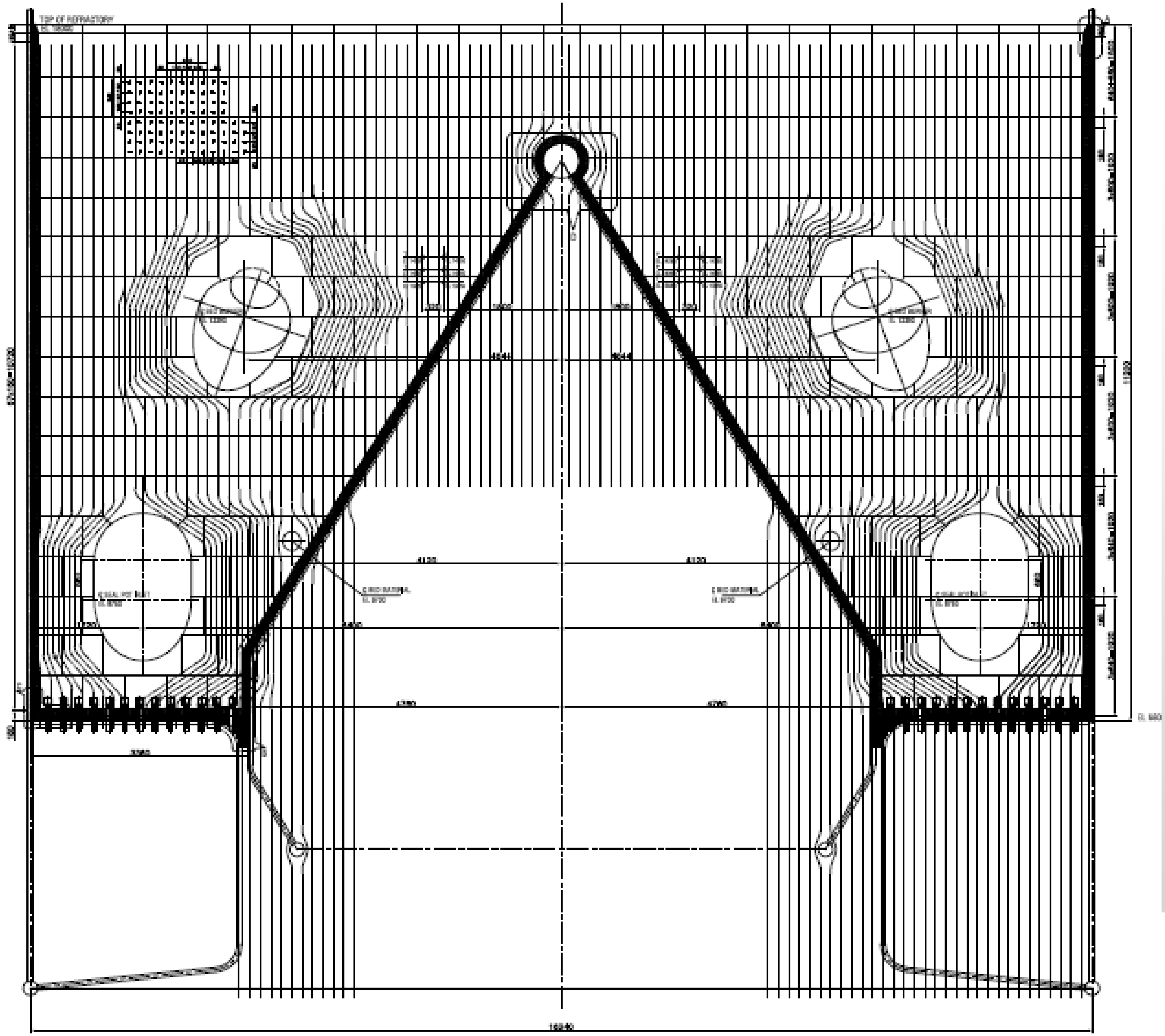
MAINTAINING DP IN COMBUSTOR: Problems were faced in maintaining DP in combustor due to unique pant leg design. The other factors influencing DP in combustor were

- **LOW ASH CONTENT IN LIGNITE**
- **PA CONTROL DAMPER**
- **TRIPPING OF LIGNITE FEEDERS**
- **UNEQUAL FIRING IN PANT LEGS**

DUE TO THE ABOVE REASONS,SHIFTING OF BED INVENTORY FROM ONE PANT LEG TO OTHER AND CLINKER FORMATION IN COMBUSTOR PANT LEGS WERE EXPERINCED.

The problem was resolved by suitable correction in the control system

Pant Leg Design Combustor



Non- Fluidisation in Combustor leading to Clinker formations

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Clinker formations in Combustor

Clinker formations in Combustor

Start up Burner Mouth choking

- The SUB Refractory has been modified with Plastic refractory
- The Start up Burner has been replaced with modified Gun and swirler

Start up Burner Mouth choke

START UP BURNER MOUTH CHOKE

START UP BURNER MOUTH CHOKE

LIGNITE BUNKER CHOKING

- LIGNITE PARTICLE SIZE < 10 MM
- INADEQUATE BUNKER CHUTE OPENING
- PROBLEMS IN AIR BLASTERS
- INSUFFIECIENT AIR BLASTERS

DUE TO THE ABOVE REASONS WELL FORMATION IN THE LIGNITE BUNKERS LEADING TO LESS OR NIL FLOW.

TO OVERCOME THE ABOVE PROBLEM BUNKER CHUTE MODIFICATION WAS CARRIED OUT AND DEFECTS IN AIR BLASTERS WERE ATTENDED.

Lignite Bunker A outlet chute above bunker isolation gate while emptying

NMEJ FAILURES

NMEJs have failed in the following areas

- Primary Air duct to Combustor wind box
- Secondary Air to Combustor
- Secondary Air to Start up Burners
- Seal pot to Combustor return leg
- Combustor to Ash Cooler

Out of the above Seal pot to Combustor return leg & Combustor to Ash Cooler NMEJs have been modified into MEJs

NMEJ FAILURE IN SEAL POT RETURN LEG

NMEJ MODIFIED WITH MEJ IN SEAL POT TO COMBUSTOR RETURN LEG

Barsingsar Mine & Thermal Power Project
An Oasis in the Desert

BARSINGSAR LIGNITE MINE

REMOVAL OF OVERBURDEN

LIGNITE PRODUCTION

NLC BTPP
PLANT OVER VIEW

PROBLEMS FACED AND REMEDIAL MEASURES TAKEN

PROBLEMS FACED	REMEDIAL MEASURES TAKEN
Cyclone choking due to ash sintering	Removing primary loop temperature restriction, the operating temperature raised to 960 ^{0}C / 970 ^{0}C. The problem was solved.

Ash Sintering

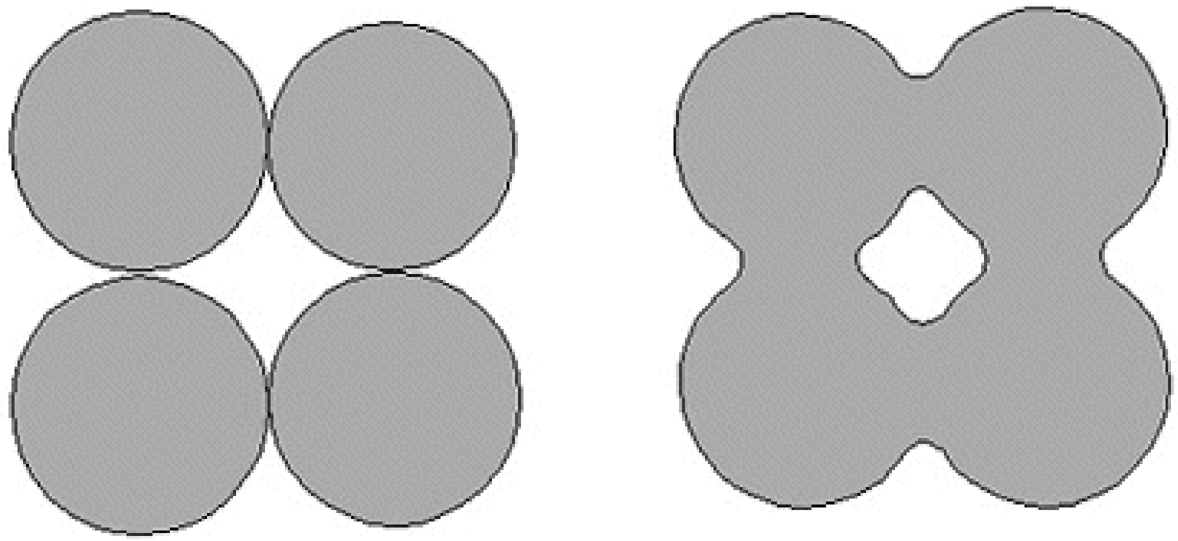
a) **Sintering is the ‘welding’ together of separate ash particles into a single solid material which takes place below the melting point of the material**

b) **Sintering – Coalescence of particles in terms of viscosity, surface tension and particle size**

c) **Different mechanisms of sintering by which particle to particle bonding can take place: viscous flow, vapour condensation, diffusion and surface tension**

d) **Particle to particle sinter bonding usually results in a shrinkage of the external dimensions of a powder compact**

Ash Sintering



Representation of the initially unsintered powder particles.

Represention of Sintered Powder Particles

CYCLONE CHOKING DUE TO ASH SINTERING

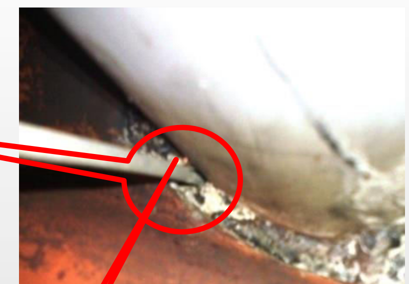
Refractory Damages in both Units

DAMAGED DRAG CHAINS

IMPORTANCE OF SEAL WELD IN COMBUSTOR

Inspection carried out on combustor deashing pipe and found improper welding and holes are found on deashing pipe welding with grate

Combustor PA wind box filled with ash(photo taken inside PA Duct under combustor)



SUB – CLINKERING ISSUE


Thank You