Audit Report

for

ASH GENERATION AND UTILISATION

at

THERMAL CAPTIVE POWER PLANT

of

M/s. JINDAL STEEL & POWER LIMITED

Submitted to:

M/s. JINDAL STEEL & POWER LIMITED

Dongamahua Captive Power Plant

Dongamahua, Tamnar, Raigarh

Chhattisgarh

Submitted by:

School of Infrastructure

Indian Institute of Technology Bhubaneswar

Argul, Odisha

November 2024

ENIVRONMENTAL AUDIT:		
Audit team:	IIT Bhubaneswar	
	1. Dr. B. Hanumantha Rao 2. Ms. Satabdi Swapna 3. Mr. Jajti K Rout	
Audit date:	26th & 27th Sept 2024	
Report finalized:	20th Nov-2024	

Name: Dr. B. Hanumantha Rao

Signature with seal:

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M/s. JINDAL STEEL & POWER LIMITED
Dongamahua, Tamnar, Raigarh

1. Preamble

M/s. Jindal Steel & Power Limited (JSPL) at Dongamahua, Tamnar, Raigarh district of Chhattisgarh state, has awarded a consultancy work vide WO No: 4521506077 dated: 09.08.2024 to the school of infrastructure at IIT Bhubaneswar. The title of the work is "Audit compliance on fly ash generation and utilization". This report entails information on ash generation and its utilization for the FY 2023-24, as achieved by Jindal Steel & Power Limited, Thermal Captive Power Plant, at Dongamahua. This report is prepared based on the factual information provided by Jindal and site visit to witness the same.

2. Site Visit

A site visit was made on 26th & 27th Sept 2024 to JSPL plant at Dongamahua to audit the information furnace by them to SPCB from time to time over ash generation and utilization. Further on the utilization aspect, places were visited where ash is being utilized. This includes the backfilling site in the de-coaled area of Gare Pelma IV/1 of coal mine area and own fly ash brick plant. A few photographs illustrating the actual usage of ash are enclosed in this report at the end of this report.

3. Introduction

M/s Jindal Steel & Power Limited (JSPL) is operating 4x144 MW Thermal Captive Power Plant at Dongamahua, Tamnar District-Raigarh, Chhattisgarh. The Company approached IIT Bhubaneswar for conducting an audit study regarding the ash generation and its management in and around the plant area. This includes the backfilling site in the de-coaled area of Gare Pelma IV/1 of coal mine area. The proposed study focuses mainly on the examination of fly-ash management on the backfilling sites with due consideration of environmental and geotechnical aspects. In this regard, three members of IIT visited and inspected all the sites including the power plant and the backfilling mine area and observation made are incorporated in this report

4. Purpose of the Study

According to the Notification S.O. 5481 (E) dated 31.12.2021 published by the Ministry of Environment, Forest and Climate Change (MoEF&CC) of India a detailed stock of disposal and utilization of ash (fly and bottom) in coal or lignite based thermal power plants, has to be provided on a regular basis. The provisions specify for the utilization of 100% of ash, in an eco-friendly manner

for specified purposes such as the manufacture of cement, building materials. or mine void filling, filling of low-lying areas etc. Additionally, unutilized ash (accumulated) stored before the publication of this Notification must also be completely utilized within 10 years, and if this is not achieved, environmental compensation will be imposed based on the quantity to the particular organization. The government authority monitors ash utilization on a quarterly basis, and thermal power plants are required to upload monthly information on the generation and utilization of ash on the portal within the 1st week of the following month.

4.1 Responsibilities of thermal power plants in the disposal of fly ash and bottom ash:

(1) Every coal or lignite based thermal power plant (including captive or co-generating stations or both) shall be primarily responsible to ensure 100 percent utilisation of ash (fly ash, and bottom ash) generated by it in an eco-friendly manner as given in sub-paragraph (2);

(2) The ash generated from coal or lignite based thermal power plants shall be utilised only for the following eco-friendly purposes, namely: -

(i) Fly ash based products viz. bricks, blocks, tiles, fibre cement sheets, pipes, boards, panels;

(ii) Cement manufacturing, ready mix concrete;

(iii) Construction of road and fly over embankment, Ash and Geo-polymer based construction material;

(iv) Construction of dam;

(v) Filling up of low lying area;

(vi) Filling of mine voids;

(vii) Manufacturing of sintered or cold bonded ash aggregate;

(viii) Agriculture in a controlled manner based on soil testing;

(ix) Construction of shoreline protection structures in coastal districts;

(x) Export of ash to other countries;

(xi) Any other eco-friendly purpose as notified from time to time.

(3) A committee shall be constituted under the chairmanship of Chairman, Central Pollution Control Board (CPCB) and having representatives from Ministry of Environment, Forest and Climate Change (MoEF&CC), Ministry of Power, Ministry of Mines, Ministry of Coal, Ministry of Road Transport and Highways, Department of Agricultural Research and Education, Institute of Road Congress, National Council for Cement and Building Materials, to examine and review and recommend the eco-friendly ways of utilisation of ash and make inclusion or exclusion or modification in the list of such ways as mentioned in Sub-paragraph (2) based on technological developments and requests received from stakeholders. The committee may invite the State Pollution Control Board or Pollution Control Committee, operators of thermal power plants and

mines, cement plants and other stakeholders as and when required for this purpose. Based on the recommendations of the Committee, Ministry of Environment, Forest and Climate Change (MoEF&CC) may publish such eco-friendly purpose.

(4) Every coal or lignite based thermal power plant shall be responsible to utilise 100 percent ash (fly ash and bottom ash) generated during that year, however, in no case shall utilisation fall below 80 per cent in any year, and the thermal power plant shall achieve average ash utilisation of 100 per cent in a three years' cycle. Provided that the three years cycle applicable for the first time is extendable by one year for the thermal power plants where ash utilisation is in the range of 60-80 per cent, and two years where ash utilisation is below 60 per cent and for the purpose of calculation of percentage of ash utilisation, the percentage quantity of utilisation in the year 2021- 2022 shall be taken into account as per the table below:

Utilisation percentages of thermal power plants	First compliance Cycle to meet 100 per cent utilisation	Second compliance cycle onwards, to meet 100 per cent utilisation
>80 per cent	3 years	3 years
60-80 per cent	4 years	3 years
<60 per cent	5 years	3 years

Provided further that the minimum utilisation percentage of 80 per cent shall not be applicable to the first year and first two years of the first compliance cycle for the thermal power plants under the utilisation category of 60-80 per cent and <60 per cent, respectively.

Provided also that 20 percent of ash generated in the final year of compliance cycle may be carried forward to the next cycle which shall be utilised in the next three years cycle along with the ash generated during that cycle.

(5) The unutilised accumulated ash i.e. legacy ash, which is stored before the publication of this notification, shall be utilised progressively by the thermal power plants in such a manner that the utilization of legacy ash shall be completed fully within ten years from the date of publication of this notification and this will be over and above the utilisation targets prescribed for ash generation through current operations of that particular year:

Provided that the minimum quantity of legacy ash in percentages as mentioned below shall be utilised during the corresponding year and the minimum quantity of legacy ash is to be calculated based on the annual ash generation as per installed capacity of thermal power plant.

Year from date of publication	1st	2nd	3rd -10th
Utilisation of legacy ash (in percentage of Annual ash)	At least 20 per cent	At least 35 per cent	At least 50 per cent

Provided further that the legacy ash utilisation shall not be required where ash pond or dyke has stabilised and the reclamation has taken place with greenbelt or plantation and the concerned State Pollution Control Board shall certify in this regard. Stabilisation and reclamation of an ash pond or dyke including certification by the Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) shall be carried out within a year from the date of publication of this notification. The ash remaining in all other ash ponds or dykes shall be utilised in progressive manner as per the above mentioned timelines.

Note: The obligations under sub-paragraph (4) and (5) above for achieving the ash utilisation targets shall be applicable from 1st April, 2022.

(6) Any new as well as operational thermal power plant may be permitted an emergency or temporary ash pond with an area of 0.1 hectare per Mega Watt (MW). Technical specifications of ash ponds or dykes shall be as per the guidelines of Central Pollution Control Board (CPCB) made in consultation with Central Electricity Authority (CEA) and these guidelines shall also lay down a procedure for annual certification of the ash pond or dyke on its safety, environmental pollution, available volume, mode of disposal, water consumption or conservation in disposal, ash water recycling and greenbelt, etc., and shall be put in place within three months from the date of publication of this notification.

(7) Every coal or lignite based thermal power plant shall ensure that loading, unloading, transport, storage and disposal of ash is done in an environmentally sound manner and that all precautions to prevent air and water pollution are taken and status in this regard shall be reported to the concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) in Annexure attached to this notification.

(8) Every coal or lignite based thermal power plant shall install dedicated silos for storage of dry fly ash silos for at least sixteen hours of ash based on installed capacity and it shall be reported upon to the concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) in the Annexure and shall be inspected by Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) from time to time.

(9) Every coal or lignite based thermal power plant (including captive or co-generating stations or both) shall provide real time data on daily basis of availability of ash with Thermal Power Plant (TPP), by providing link to Central Pollution Control Board's web portal or mobile phone App for the benefit of actual user(s).

(10) Statutory obligation of 100 percent utilisation of ash shall be treated as a change in law, wherever applicable.

Thermal power plants are responsible for utilizing 100% of ash generated in a given year, however, in no case may the utilization rate fall below 80% and must achieve an average ash utilization rate of 100% in a three years cycle. It may be noted that for the first applicable three years cycle, there are mitigation measures as shown in the table below (effective from April 1, 2022).

5. Methodology for audit

The IIT Bhubaneswar study team visited the sites and followed the following methodology for the audit of ash management study.

1) Enlisting the parameters and preparations of the documentation
2) Filling up of the required documents/forms as per the list /notification
3) Site visit and discussions with the concerned officials
4) Understanding the level of compliance based on field-based observations during the site visit and review of the documentation provided.

6. Audit Team

The audit team comprises of the following members:

1. Dr. B. Hanumantha Rao
2. Ms. Satabdi Swapna
3. Mr. Jajti K Rout

7. Assumption and Limitations

This auditing study report is limited to the field observations, the documents reviewed, and other relevant information provided by the concerned officials at the time of field visit.

8. Acknowledgements

The study team extends its appreciation to all the individuals who provided verbal, visual or documentary assistance during the assessment study.

9. Findings

In the Table below, reference is made to general observations made during the documentation review/assessment as well as site specific observations made during the site visit.

TABLE A: Summary of audit details on fly ash generation and utilization for the FY 2023-24

Sr. No.	Details: 2023 - 2024	
1.	Name of Power Plant	Thermal Captive Power Plant, Dongamahua
2.	Name of the company	M/s. Jindal Steel & Power Limited
3.	District	Raigarh
4.	State	Chhattisgarh
5.	Postal Address for communication	Jindal Steel & Power Limited Dongamahua Captive Power Plant, Dongamahua Tamnar, Raigarh - 496107
6.	E-mail	subhendu.patra@jindalsteel.com
7.	Power Plant installed capacity (MW)	4x144 MW
8.	Plant Load factor (%)	64.89 %
9.	No. of units generated (MWh)	3077949.79 MW
10.	Total Area under power plant (ha) Including area under ash pond	(1) Total Plant Area - 38.84 Ha (2) No Ash Pond
11.	Quantity of coal consumption during reporting period (Metric Tons / Annum):	2716094 MT
12.	Average Ash content in percent :	44.93 %
13.	Quantity of current ash generation during reporting period (Metric Tons / Annum): Fly Ash (Metric Tons / Annum): Bottom Ash (Metric Tons / Annum):	 1220395 671217 549178
14.	Capacity of Dry fly ash storage silo(s) (Metric Tons / Annum)	2 Nos X 2625 MT
15	Details of utilization of current ash generated during reporting period. (a) Total Quantity of current ash utilised (MTPA) during reporting period: (b) Quantity of current fly ash utilised (MTPA): (i) Fly ash-based products (**Bricks** or blocks or tiles or fibre cement sheets or pipes or boards or panels): (ii) Cement manufacturing: (iii) Ready mix concrete: (iv)Ash and geo-polymer-based construction material: (v) Manufacturing of sintered or cold bonded ash aggregate: (vi) construction of roads, road and fly over embankment: (vii) Construction of dams:	 (a) 1220395 (b) 671217 (i) 18.22 (ii) - (iii) - (iv) - (v) - (vi) - (vii) -

	(viii) Filling up of low lying area: (ix) Filling of mine voids: (x) Use in overburden dumps: (xi) Agriculture: (xii) Construction of shoreline protection structure in coastal districts: (xiii) Export of ash to other countries: (xiv) Others (Dyke/Embankment Raising) c) Quantity of bottom ash utilised in MTPA (i) Fly ash-based products (**Bricks** or blocks or tiles or fibre cement sheets or pipes or boards or panels): (ii) Cement manufacturing: (iii) Ready mix concrete: (iv)Ash and geo-polymer-based construction material: (v) Manufacturing of sintered or cold bonded ash aggregate: (vi) construction of roads, road and fly over embankment: (vii) Construction of dams: (viii) Filling up of low lying area: (ix) Filling of mine voids: (x) Use in overburden dumps: (xi) Agriculture: (xii) Construction of shoreline protection structure in coastal districts: (xiii) Export of ash to other countries: (xiv) Others (Please specify) Total Quantity of current ash utilised (MTPA) during reporting period: **2023 – 2024.**	(viii) - (ix) 671198.78 (x) - (xi) - (xii) - (xiii) - (xiv) - (C) 549178 (i) 21.63 (ii) - (iii) - (iv) - (v) - (vi) - (vii) - (viii) - (ix) 549156.37 (x) - (xi) - (xii) - (xiii) - (xiv) - 1220395
16.	Percentage utilization of current ash generated during reporting period: **2023 – 2024**	100%
17.	Details of disposal of ash in ash ponds (a) Total quantity of ash disposed in ash pond(s) (Metric Tons) as on 31st March (Excluding reporting period): (b) Quantity of ash disposed in ash pond(s) during reporting period (Metric Tons): (c) Total quantity of water consumption for slurry discharge into ash ponds during reporting period (m3): (d) Total number of ash ponds:	Not Applicable, as there is no ash pond for this project

	(i) Active: (ii) Exhausted (yet to be reclaimed: (iii) Reclaimed: (e) Total area under ash ponds (ha):	
18.	Individual ash pond details Ash pond -1,2, etc (please provide below mention details separately, if number of ash ponds is more than one) (a) Status: Under construction or Active or Exhausted or reclaimed (b) Date of start of ash disposal in ash pond (DD/MM/YYYY or MMYYYY): (c) Date of stoppage of ash disposal in ash pond after completing its capacity (DD/MM/YYYY or MM/YYYY): (Not applicable for active ash ponds) (d) Area (hectares): (e) dyke height (m): (f) volume (m^3): (g) quantity of ash disposed as on 31st March (Metric Tons) (h) available volume in percentage (percent) and quantity of ash can be further disposed (Metric Tons): (i) expected life of ash pond (number of years and months): (j) co-ordinates (Lat & Long): (please specify minimum 4 co-ordinates) (k) type of lining carried in ash pond: HDPE lining or LDPE lining or clay lining or No lining (l) mode of disposal: Dry disposal or wet slurry (in case of wet slurry please specify whether HCSD or MCSD or LCSD) (m) Ratio of ash: water in slurry mix (1: __): (n) Ash water recycling system (AWRS) installed and functioning: Yes, or No (o) Quantity of waste water from ash pond discharge into land or water body (m^3): (p) Last date when the dyke stability study was conducted and name of the organization who conducted the study: (q) Last Date when the audit was conducted and name of the organization who conducted the audit:	Not Applicable, as there is no ash pond for this project
19.	Quantity of legacy ash utilised (MTPA): i. Fly ash based products (Bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels): ii. Cement manufacturing: iii. Ready mix concrete: iv. Ash and geo-polymer based construction material:	-

	v. Manufacturing of sintered or cold bonded ash aggregate: vi. construction of roads, road and fly over embankment: vii. Construction of dams: viii. Filling up of law mine voids: ix. Filling of mine voids: x. Use in overburden dumps: xi. Agriculture: xii. Construction of shoreline protection structure in coastal districts: xiii. Export of ash to other countries: xiv. Others (please specify):			
20.	Summary: **2023 – 2024**			
	Details	Quantity generated (MTP)	Quantity utilized (MTP) and (percent)	Balance quantity (MTP)
	Current Ash during reporting period	1220395	1220395 and 100%	Nil
	Legacy Ash	-	-	-
	Total	1220395	1220395 and 100%	Nil
21.	Any other information: Soft copy of the annual compliance report and shape files of power plant and ash pond may be e-mailed to: - moefcccoalash@gov.in			
22.	Signature of Authorised Signatory:		 Dr. B. Hanumantha Rao IIT Bhubaneswar	

9. Conclusions

The fly ash generated after coal combustion in boiler in pneumatically conveyed and stored in dry form in concrete silo. This is to certify that M/s. Jindal Steel & Power Limited, Thermal Captive Power Plant, Dongamahua, has accomplished 100 % ash utilized in back filling of de-coaled areas of Gare IV/1 coal mines by mixing of ash with overburden as per DGMS and CPCB guidelines. Fly ash are also being used for making in captive flyash brick plant for internal consumption. From the evidential experience, it is found that ash is utilized in brick manufacturing. The same was witnessed during the site visit. It is to be noted that the activities under taken by M/s. JSPL, Thermal Captive Power Plant, Dongamahua, in regards with fly ash management are adequately addressed. The pertinent rules / regulations issued by MoEF & CC, CPCB & CECB for fly ash management are adhered. The same practises should be continued.

Some photograph showing ash utilization captured during the field visit are provided here with.

Figure 1 Flyash storage Silo	Figure 2 Flyash storage Silo
	

Figure 3 Fly Ash dosing and compactingusing overburden and Soil	Figure 4 Fly Ash dosing and compactingusing overburden and Soil
	

Figure 5 Truck mounted water tanker for dust suppression at fly ash back filling site	Figure 6 Truck mounted water tanker for dust suppression at fly ash back filling site
	
Figure 7 Ash utilization in brick manufacturing for own use	Figure 8 Ash utilization in brick manufacturing