

Management of fugitive dust (coal ash dust) issues:

A case study of Matimba power station

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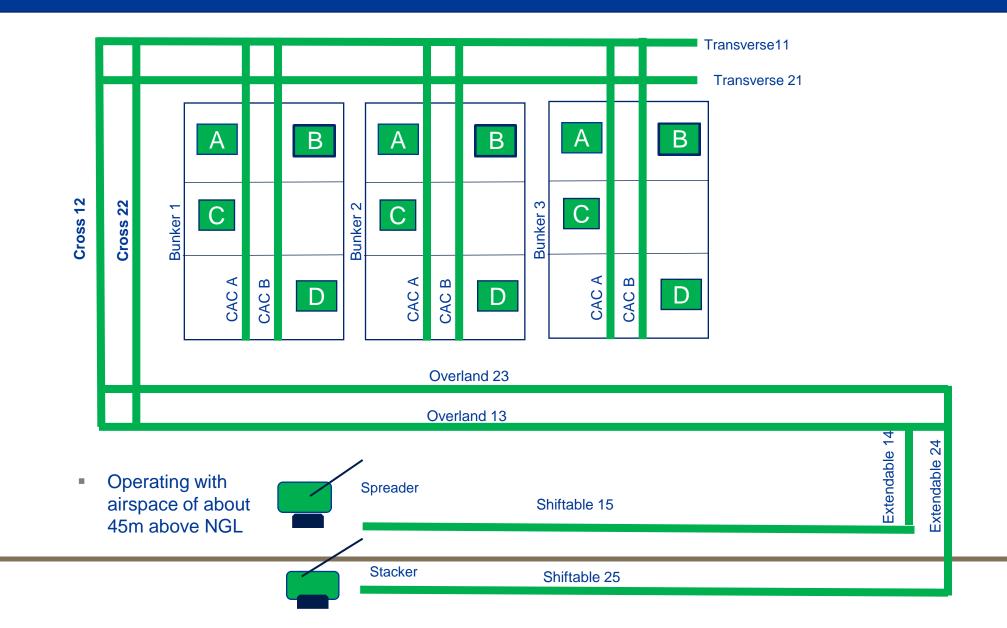


Background

- The Matimba Ash Disposal Facility was constructed on the Zwartwater farm which is approximately 5km south-west of the power station, started around 1987 with first generating unit commission.
- At the time of construction there were no environmental legislations that required lining of waste disposal facilities; thus, the Matimba ADF was not constructed with impervious liner to prevent contamination of soil and groundwater resources.
- Ash Disposal Facility (ADF) required to be licensed as per NEMA, Act no. 107 of 1998, EIA Regulations (2010) and NEMWA, Act no 59 of 2008.
- Waste licensing started in July 2012 and authorization granted in July 2016.
- Waste license required the area to be lined immediately after authorization.
- Due to the impracticality of having an immediate lined area, an exemption to line for a certain period and area was applied for.
- Matimba was granted exemption not to line an are
- a of 95ha or for a period of 5 years (2017 2022); whichever came sooner.
- Both the area and time were being exhausted while the lining project had not started.
- Decision was made to implement the piggybacking project (part of authorization) which entails disposing ash on top of the rehabilitated ash dump.

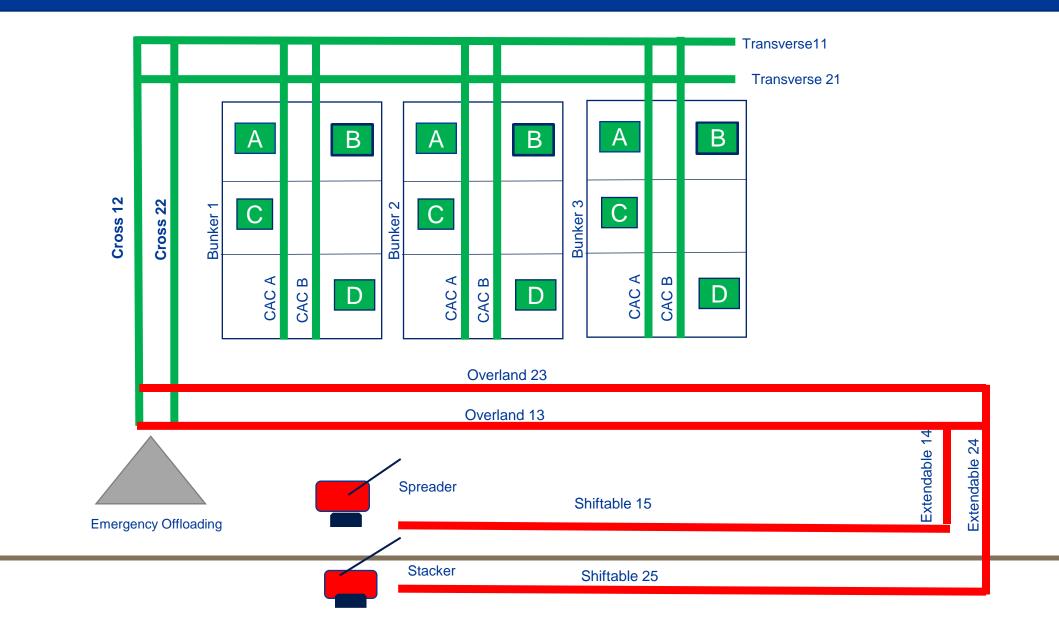
Ash Conveyor Series: Normal Operations





Ash Conveyor Series: Emergency Operations

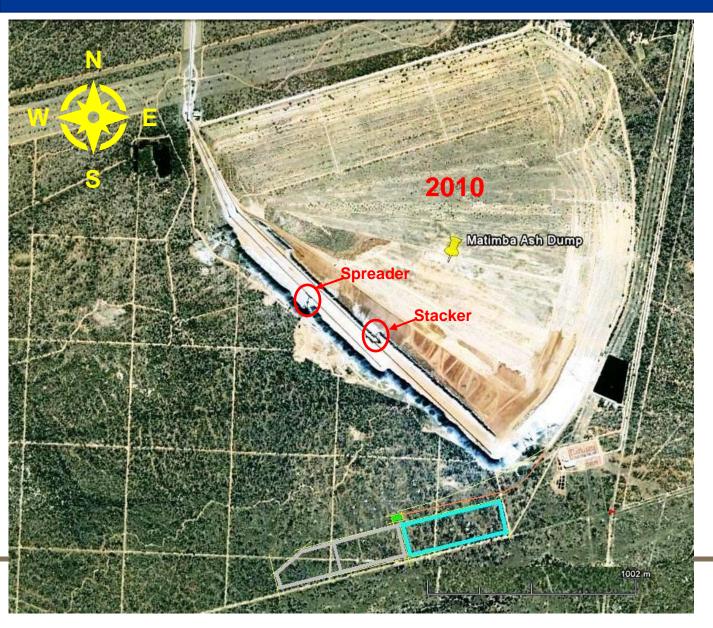




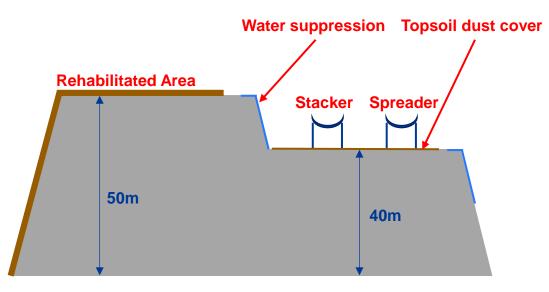
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Ash Disposal Facility: Normal Operations (historic)

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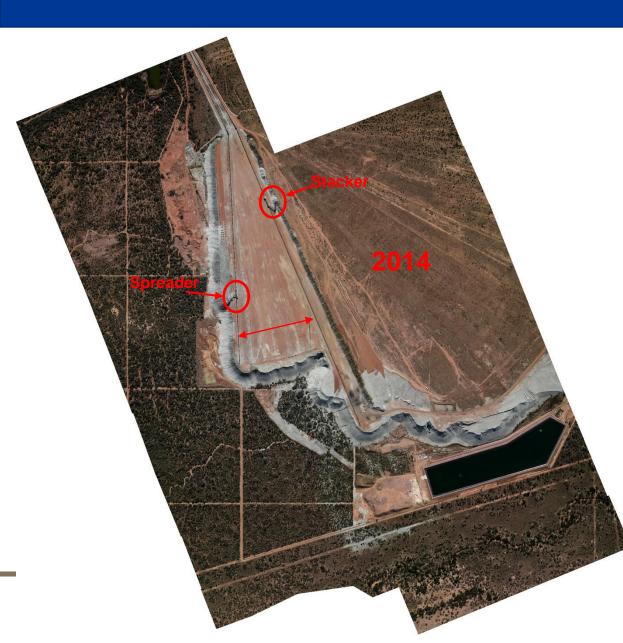


- Main (Stacker) and Stand-by (Spreader) systems run in parallel.
- Stacker operated 80% of the time and the Spreader at 20%.
- Shiftable conveyors shifted radially towards the western direction.
- Rehabilitation done after every second conveyor shift.
- Sprinkler and topsoil dust cover used for dust suppression.
- Process to license the ADF to comply to environmental legislation started in July 2012.

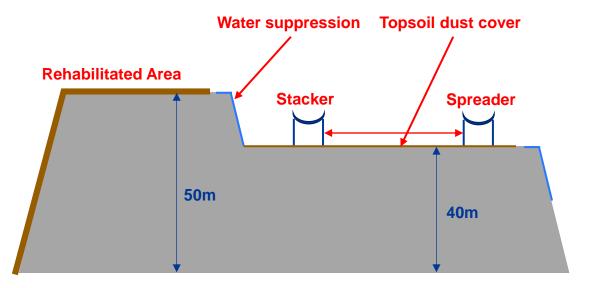


Ash Disposal Facility: Major Incident (Stacker Fire 2013/14)



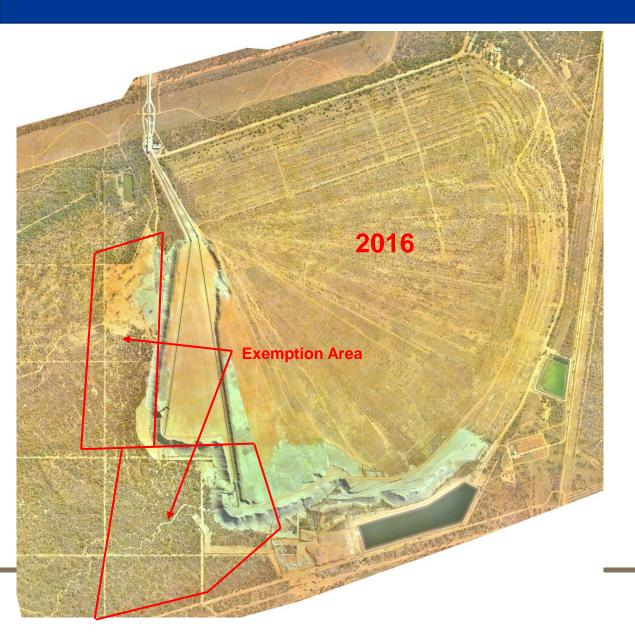


- Stacker machine got burnt and was out of service for approximately 12 months.
- Spreader was the only available machine to sustain the station's operations.
- Gap between Stacker and Spreader widened and were no longer running in parallel.
- Operations remained normal despite the gap between the machines.



Ash Disposal Facility: Waste License Authorization and Exemption

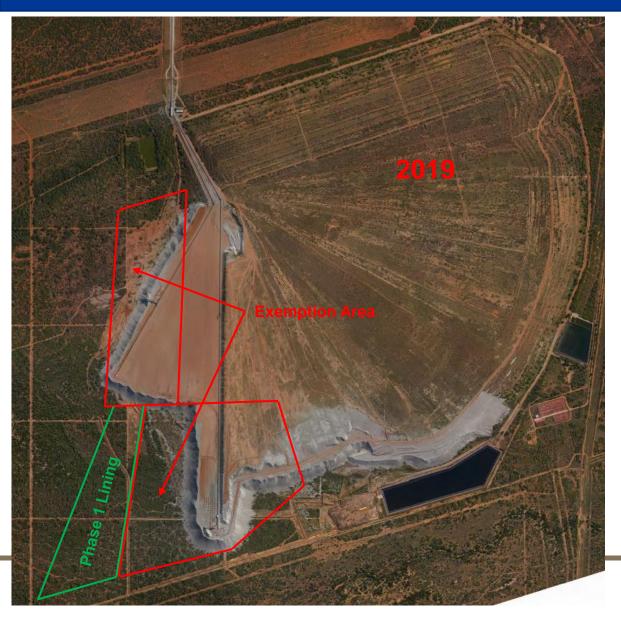




- The ADF Waste License was issued in July 2016.
- Authorized area was 700ha (510ha green fields and 190ha piggybacking (ash disposal on top of existing ash dump)).
- Requirement was to have a lined area before disposing ash on the green fields.
- Lined area was not ready in 2016 and an exemption was applied for and approved in February 2017.
- The exemption was for 95ha or 5 years (whichever came first).
- The process to appoint a contractor to line the first phase of the 510ha green fields was started.

Ash Disposal Facility: Piggybacking





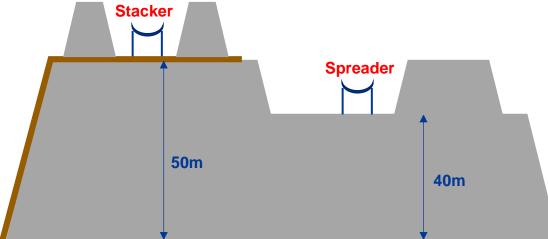
- In 2019, it was realized that the ADF development was faster than the process to appoint a contractor to line the ash dump.
- The ash dump was encroaching on the exemption line while the phase I lining project had not started.
- A decision was made to initiate the piggybacking method (ash disposal on top of the existing ash dump) to prevent going over the exemption line.
- Piggybacking entailed moving the Stacker machine on top of the ash dump and increasing the height of the dump.

Ash Disposal Facility: Piggybacking (continued)





- Piggybacking project started in November 2020 and the Stacker machine was commissioned in August 2021.
- During that period, the Spreader was the only machine keeping the station operational.
- Delayed commissioning of the Stacker caused emergency ash disposal with the Spreader on areas initially not intended for disposal.

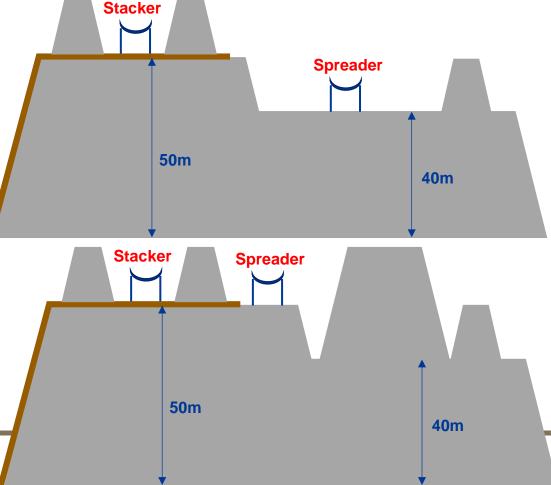


Ash Disposal Facility: Piggybacking (continued)





- Delays in placing the contract for the lining project caused the disposal of ash on larger areas.
- The Spreader ash disposal area increased creating a larger ash exposed area.

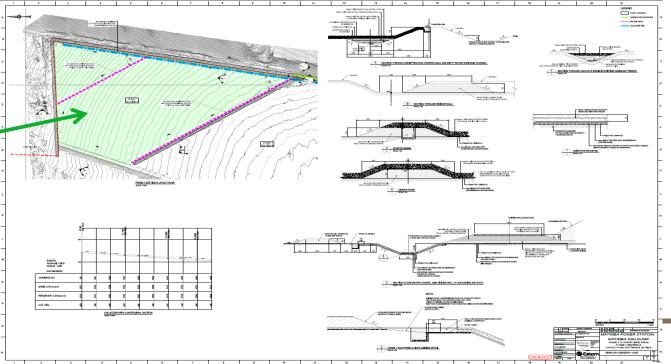


Ash Disposal Facility: Current Status





- The ADF is sitting with larger areas of exposed ash that are causing dust plumes during windy weather conditions.
- The demand for water dust suppression has increased to more than the capability of the pumping capacity.
- Dust cover using topsoil requires the exposed ash areas to be reshaped and leveled first.
- Reshaping and rehabilitation of the ADF requires additional yellow plant on site.
- Phase I lining project commenced in January 2023 and expected to be completed in March 2025.





Fugitive dust challenges



Dust problems

- Large areas of exposed ash resulted in excessive dust issues, leading to: community complaints, strained relationship with key stakeholders (neighbouring farmers, mining houses, Authorities, SAHRC and our own employees).
- Dust plumes aesthetically changed the landscapes in and around the ADF.
- The other issues brought by the dust were: standing time cost on the lining project, operational backlogs due to visibility issues the ash plant would stop from time to time and thus, this introduced stack emissions problems.
- The average fugitive dust fallout during that period that period was in excess of **750mg/m²/day.**
- The convectional (soil cover and water) way of dealing with dust was proving to be inefficient; thus, the application of chemical dust suppression was adopted.







The dusty areas that needed to be addressed: >200ha



Eskom Power Station Matimba Ash dump LiDAR Survey The main areas that were focused on was the spreader dumper STACKER DUMP TOTAL ASH AREA Area= 546.11 Ha The size of the area SPREADER DUMP which was treated Area= 105.35 Ha amounted to 100ha Area= 61.202 Ha

ESKOM PRODUCT AND EQUIPMENT SELECTION CRITERIA

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- **The product should be non-toxic.**
- □ The product needed to form a crust/ seal that ideally lasts for six months if undisturbed. Rainfall or severe weather conditions could cause the crust to soften however it must be necessary for the crust to reform once dry.
- Product intended for Non-Trafficked areas.
- Product needed to be applied in specialised spraying equipment.
- Equipment needed to be mobile, capable to driving on the surface of the ADF and Capable of spraying long distances.



PRODUCT SELECTION – FIELD TESTING





Various products were tested on site to ascertain the efficacy of the products. All products yielded good results with good binding capabilities and surface sealing.

PRODUCT SELECTION – KUP-XIL





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- □ The KUP-XIL treatment was the preferred chemical mixture for the ADF. Kup-Xil is a blend of natural fillers and nano binders which is preferred due to its elastic properties, longevity and lower material cost.
- Kup-Xil Blend was supplied in bulk tankers with 30KL capacity and was decanted into JoJo tank established on site.
- Mixing ratios: In order to provide for a 6-month solution. Kup-Xil blend was mixed as a 50% solution. IL of concentrated product is mixed with IL of water and applied to Im² of targeted area.
- □ Varying the dilution rates and application rates could increase or decrease the functional longevity.

PRODUCT APPLICATION - CRUSTING





A strong, durable, water resistant but elasticated crust is formed within 8 hours of the application. The seal was applied with a solution intended to last 6 months



PRODUCT APPLICATION







PRODUCT APPLICATION









The efficacy of the chemical was realised within days of application





The efficacy of the chemical was realised within days of application





POST APPLICATION – both convectional way methods and chemical application





Acknowledgements

Eskom

- Gratitude and acknowledgment to Mrs. Obakeng Mabotja, Power Station General Manager for allowing the sharing of this info,
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Thank you