

Ash Loading Test Evaluation

1.0 Objective

The objective of the Ash Loading Test Evaluation is to summarize the activities that took place during the Ash Loading Test at the Kingston Fossil (KIF) Plant Ash Recovery Project in Harriman, TN. A series of pre-qualified loading vendors were invited to participate in a rail car loading test. This document evaluates the loading, material containment, transportation, and unloading methodologies tested for processed ash removal from the site. Based on these evaluations, loading and disposal criteria have been established for the future loading, transportation, and disposal operations at the KIF Ash Recovery Project site.

2.0 Participating Contractors

The following contractors were pre-qualified for the Ash Loading and disposal contract. Each of the participating contractors participated in some aspect of the loading test:

Name	Contact No.	Role
Phillips & Jordan, Inc.	(813) 991.8130	Loading & Disposal
MACTEC	(865) 384.6789	Loading
Veolia Environmental Services	(478) 391.9493	Disposal
Norfolk Southern (NS)	(540) 588.4185	Railcar Provision & Transport

3.0 Loading Process

Each loading contractor performed their loading operations in the KIF Rail Yard along Track 16 just south of the contractor trailers (see Figure 1). Each contractor was required to load a total of 15 railcars to near capacity (approximately 80 tons each) with pre-specific but varying lining systems. Both loaders had wet weather to handle. Heavy rains occurred during loading operations or shortly thereafter.

3.1 Phillips and Jordan

Phillips and Jordan (P&J) elected to load all of its railcars with a hydraulic excavator equipped with a smooth-lipped bucket. Because of the excavator's cab elevation, an aggregate ramp was constructed for the excavator to work atop. The loading area was fixed so Norfolk Southern provided a tug to move the cars in and out of position during loading. The working area was protected from ash spillage with the use of a plastic liner encompassing the entire loading area.

The ash was brought to the loading area by tandem dump trucks and dumped into a large rock box for the excavator to remove material from. Each railcar took approximately 30 to 35 minutes to fill and position for the next load.

3.2 MACTEC

MACTEC elected to load its 15 railcars with the use of two front end loaders equipped with a 5 cubic yard bucket. The front end loaders removed material from a secondary stockpile in the Ash Storage Area (Ball Field) and operated along Track 16 to their desired railcar. Ash containment was achieved by placing a plastic liner along the loading side and opposite side of the railcar.

Each railcar was loaded in approximately 45 to 50 minutes. The longer loading time for each railcar can be attributed to the distance the loaders had to travel from stockpile to railcar (approximately 1/8 mile average) and the difficulty the larger loader bucket had in loading the narrow railcar opening.

3.3 Loading Summary

While the bucket capacity of MACTEC's front end loaders was much greater than the P&J excavator, the hydraulic excavator was more efficient at loading because of two main reasons: 1) proximity to the stockpiled material which was located at the railcar loading location and 2) ability of the smaller excavator bucket to operate within the limits of the railcar opening. Both systems were able to keep the work area reasonably clean.

4.0 Lining Systems

Prior to loading operations, a breakdown of the desired lining type was given to each contractor. The breakdown is listed below:

- (1 car) 6 mil thickness Flap Liner or "Burrito Liner"
- (2 cars) 10 mil thickness Flap Liner
- (1 car) 20 mil thickness Flap Liner
- (2 cars) 10 mil thickness zipper type liner
- (1 car) 13 mil thickness zipper type liner
- (8 cars) Soiltac© spray liner system

Both the burrito and zipper liners were easily installed, reasonably easy to close, and kept out water well. The zipper liner was the more efficient of the two from a

closure standpoint. The zipper liner could be quickly closed with the use of a single laborer. The burrito liners were more difficult to close and often required at least two laborers to do so.

While installing and closing, the 6 mil liner tended to damage or tear too easily. The 20 mil liner was very cumbersome during placement into the railcar and also during closing. The lining process was most efficient with the use of the 10 and 13 mil liners. They also were sufficient in resisting tears and abrasions and were light enough to work with.

The Soiltac® spray liner was the least effective of all three methods of containment. While Soiltac® maybe a very effective application for normal soil types, it did not develop a cohesive bond with the processed ash. The Soiltac® had a tendency to roll off the surface of the ash during application and settle in the corners of the railcar and in other craters or low spots.

5.0 Transportation

Prior to leaving the site, all railcars were inspected for leaks and residual ash. Each railcar was placarded with the proper waste identifier (UN 3077) and all indecent graffiti was painted over with black spray paint.

5.1 Phillips and Jordan (P&J) Railcars

Of the 15 Phillips and Jordan railcars destined for departure, there were only 7 that were approved to leave the site. All of the railcars with the Soiltac® application were rejected for transport by Norfolk Southern. Most of the Soiltac® cars were rejected due to visible water leakage, which appeared gray in color on two cars. The others were rejected because Norfolk Southern representatives did not have faith that the remaining Soiltac® cars would resist leaking in transit.

The Soiltac® mixture was not successful in coagulating with the processed ash and forming the protective seal it was intended to do. Because of this, water from storm events was able to seep into the ash and elevate its moisture content. An attempt was made to salvage these cars for transport by placing a protective 20-mil tarp over each car, but ultimately none of the P&J Soiltac® railcars were allowed to leave the site.

All of the railcars utilizing the flap “burrito” liners and zipper liners were approved for departure by Norfolk Southern. Some of the railcars did show signs of water leakage, but none of the water appeared gray in color which indicated it was water purged during loading that was present in the car before loading (in between the liner and railcar surface). No moisture from the ash could have escaped the car since it was completely contained within the liner.

5.2 MACTEC Railcars

Given lessons learned from the P&J loading procedures, Norfolk Southern provided railcars in better overall condition and an emphasis was made to more effectively seal the railcar joints with sealing compound. TVA/Jacobs directed that eight, instead of the planned seven, rail cars would be prepared and loaded utilizing burrito liners with the additional car liner being a 10-mil burrito liner. TVA/Jacobs directed five of the remaining seven cars to use Soiltac® be lined with 6-mil polyethylene plastic in the bottom and sides of cars first. The two of the seven cars in the best condition were not lined. All seven cars that received the Soiltac® application were tarped immediately with 20-mil tarps after loading to prevent the intrusion of rainwater. Because of these precautions, all but one of the railcars were permitted to leave the site by Norfolk Southern. The lone railcar that did not leave the site was an unlined, Soiltac® railcar. It showed small traces of leakage of gray water on one of its exterior corners.

5.3 Summary

Of all the lining systems utilized, the most effective were either the flap and zipper burrito lined cars and/or the cars that were pre-lined and tarped. The Soiltac® treatment was ineffective at forming a seal with the processed ash, and did not prevent water intrusion between the car surface and the ash material. This led to actual leakage of, or the belief that it would ultimately leak ash residue from the cars. The treatment was eliminated as a control measure, but pre-lining and tarping a car was established as a very effective method to control dust and water intrusion/leakage during transit. The other lesson learned was that the tarp systems must be kept clear of the railcar safety devices. Utilizing the correct size and configuration tarp is imperative for this reason, plus the efficiency of installation and removal.

6.0 Unloading and Disposal

Prior to site disposal unloading operations, representatives from TVA, Jacobs, NS, liner vendors, loader contractors and in Georgia, the state regulators, were present to witness unloading operations and to inspect the landfills. Both landfills were capable of handling the processed ash and cleaning of the railcars for return to site. Each waste handler effectively unloaded the railcars and designated a disposal area separate from its other municipal waste so the ash could be easily located in the future with the use of a GPS.

6.1 Perry County “Arrowhead” Landfill, Uniontown, Ala. (Phillips and Jordan Loader)

Unloading operations at the Perry County Landfill were performed with a clamshell specifically designed for railcar contents removal. The clamshell was able to remove about 98% of the ash and the remaining ash was removed by sweeping, shoveling, vacuum truck and pressure washer.

6.2 Veolia-Taylor County Landfill, Mauk, Georgia (MACTEC Loader)

Unloading operations at the Veolia-Taylor County Landfill were done with a hydraulic excavator with a one yard bucket being used for the test only. Residual ash was then removed by sweeping, shoveling, and using a vacuum truck and pressure washer. The unloading procedure at Veolia was effective, but was slower than the Perry County, due to the small bucket size of the unloading equipment bucket. Veolia plans to increase the size of their bucket in this operation, if they are awarded the contract. Pressure washing was discontinued after seven cars and cleaning was completed to the satisfaction of NS representatives with sweeping, shoveling, and vacuuming. The only time pressure washing will be utilized in the cleaning process is when cars will be returned to NS general service.

7.0 Recommendations:

As a result of the loading test, the following recommendations have been developed for full scale application:

- All Rail cars will have some form of a liner material between the car and the ash material. Rail cars will be either lined and tarped or they will have a 10-mil burrito bag liner installed.
- Rail cars must be in good condition and capable of holding a minimum of 100-tons of ash material.
- Rail car dimensions must be known in order to acquire the correct tarps to prevent intrusion on car safety devices, allow installation efficiently and ensure multiple uses.
- Use of the burrito bag liners is preferred during rain events and tarps/lining can be used for dry weather loading operations
- Complete cleaning of used rail cars using pressure washing will only be needed when the cars are being returned to the rail company for general service.

The lessons learned from this test were used by the various vendors to improve their bid estimates for TVA.

Figure 1
Ash Loading Test Area

