Conveyor Transport of Coal Combustion Byproducts Feasibility Study

Abstract
In order to determine whether or not conveying coal combustion byproducts (CCBs) was cost competitive with trucking CCBs, we developed a preliminary design and cost estimate for three overland conveyor systems, and found that conveyors were cost competitive. Given their cost efficacy and minimal environmental and social impacts, we recommended that Stantec use conveyors for CCB transport.

Background
Coal combustion byproducts include:
1. Fly Ash
2. Bottom Ash
3. Synthetic (FGD) Gypsum
CCBs are stored in landfills or impoundments that are over 100 acres in size.

How do you cost-effectively move over one million tons of CCBs?

Trucking? Conveying?
Stantec planned to truck the CCBs to a landfill. Would it be cost-effective to use conveyors? Conveyors are quiet, inexpensive to operate, and can minimize dust.

Conveyor Design
Life of landfill: 20 years, 2016-2035
CCB Amount: 1,700,000 tons/year

Design Parameters
1. Belt type
2. Trough angle
3. Overland conveyor routes
4. Run times
5. Estimated power requirements

Results
Run times: 7hr Gypsum, 3hr Combined Ash
Belt Speed: 200 ft/min
Belt Width: 24 in.
Material Cross-Sectional Area = 0.44 ft²
Horsepower Requirements: 0.00235z + 0.241y + 0.00603x

Cost Estimate
The cost of the conveyor system was broken down into multiple sub categories and adjusted for inflation over the conveyor’s lifetime.

Expense Breakdown
- Transportation Infrastructure
- Maintenance
- Loading
- Operation
- Operations and Maintenance
  • Loading at Plant
  • Spreading at Landfill

System Operation
Maintenance
Belt Replacement

Results
Compared to trucking, conveyors have:
- Higher capital costs
- Lower operation costs

Lifetime Conveyor Savings: ~ 40%

Objectives
- Design a conveyor system
- Determine if conveying is cost competitive with trucking
- Recommend whether or not Stantec should continue their design with a conveyor system
- Gain real-world engineering experience

Capital Construction and Operation Costs (All values in 2010 Net Present Worth $)

<table>
<thead>
<tr>
<th>Site</th>
<th>Transportation Infrastructure</th>
<th>Maintenance</th>
<th>Loading</th>
<th>Operation</th>
<th>Operations and Maintenance</th>
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Total Lifetime (2016-2035)

<table>
<thead>
<tr>
<th>Site</th>
<th>Trunking</th>
<th>Conveying</th>
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<tbody>
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Acknowledgments
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Recommendations
- Move forward with conveyor design
- Consider fuel price volatility
- Weigh social and environmental impacts