Total Suspended Solids Monitoring During Ash Impoundment Construction Activities

Rachel Combs (TVA)
Gabe Lang, PE (AECOM)
Glen Dieterle, PE (AECOM)
Andrew Rodzianko, PE (AECOM)

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Agenda
TSS Monitoring During Ash Impoundment Construction Activities

1 Defining the Needs
2 Evaluation of Potential Impacts
3 Contingency Planning
4 Implementation
5 Summary of Findings
6 Questions and Answers
TSS Monitoring During Ash Impoundment Construction Activities

Defining the Needs

Three Construction Projects within an active Ash Settling Pond System

• Pond A Spillway Upgrade Project
• Dike Remediation Project
• Pond D Spillway Upgrade Project

Purpose for these projects

• Improve hydraulic performance
• Reduce risk
• Increase dike stability
• Provide operational flexibility
• Address regulatory requirements

Construction Concerns

• NPDES compliance, particularly:
  Exceeding TSS Permit Limits!
Monitoring During Ash Impoundment Construction Activities
Defining the Needs

The Pond System

POND A
POND B UPPER
POND B LOWER
POND C
POND D MAIN
POND D UPPER
POND E
OUTFALL 001

FLOW

1,000 FT
The Projects – Pond A Spillway Upgrade

- Lower operating level by 2 feet
- Add siphons as primary discharge structure and for additional hydraulic capacity
- Stabilize and rehabilitate existing riser structures
The Projects – Dike Remediation Project

- Re-grading of downstream face of dike slope along Stilling Ponds B and C
- Add rip rap bench for construction and future maintenance
- Provide vegetative cover on newly exposed dike surfaces
The Projects – Pond D Spillway Upgrade Project

• Construct new Primary Spillway System
• Install Permanent Check Dam
• Rehabilitate Existing Riser Structures for use as Secondary Spillways
• Installation of a new discharge structure at the Cumberland River
These projects present several common elements which have potential impact on water quality during the construction activities:

• Erosion of adjacent dike surfaces
• Erosion of newly exposed surfaces within the ponds due to lowering of the water levels (head-cutting)
• Decreased water levels/detention times for settling
• Increased flow velocities in the ponds (modification/redirection of flow path)
• Disturbance of and re-suspension of fine sediments within the ponds, especially near-neutrally buoyant cenospheres
• Increased particulate from construction materials (fines from rip rap and other granular fill materials)
Concurrent schedules also were also of concern, due to compounding of impacts from multiple projects

- Of greatest concern was concurrent construction of the Dike Remediation and Pond D projects due to their locations farther downstream in the settling pond flow path

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Duration of Concern
Monitoring During Ash Impoundment Construction Activities

Contingency Planning

A plan was developed to:

- Address all three projects
- Be flexible and revised based upon lessons learned from each successive project
- Define risk reduction measures
- Establish a monitoring network and procedures for monitoring
- Define action levels and notification procedures

Plan the work, Work the plan!
Remediation Measures:

• Turbidity curtains
  - Permanent and temporary curtains at critical points along the flow path

• Check dams
  - Used between Pond D Upper and Main to minimize loss of detention volume during drawdown phase

• Construction sequencing and method modifications
  - Dike Remediation performed in phases from downstream to upstream

• Flow modifications (temporary detention)
• Washing riprap at the quarry to minimize fine particulate
• Polymer injection for coagulation and enhanced settling
Establish Monitoring Network:

- At transition points between pond segments
- Detention time considerations
- Shown for Pond A project, points were adjusted or eliminated for subsequent projects
Understanding historical baseline performance:

- Reported **monthly** eDMR data for Outfall 001 prior to execution of the Pond A Spillway project
- Provides a target to meet during project execution
- Shows that some deviations can be expected

**TSS Monitoring During Ash Impoundment Construction Activities**
**Contingency Planning**

![Graph of TVA GAF Ash Pond Discharge TSS Levels]

**Note:** GAF NPDES Permit No. TN0005428 limits Total Suspended Solids concentrations at permitted Outfall 001 to a monthly average of 28 milligrams per liter (mg/L) and a daily maximum of 53 mg/L.
TSS Monitoring During Ash Impoundment Construction Activities
Contingency Planning

Setting of Action Level and associated monitoring point:

- Set assuming the most extreme measure would involve polymer addition
- Polymer injection point and action level set based upon previous studies by GE Betz, Inc.
- Action Level set at 25 ppm, measured at Sample Point #5
Selection of Monitoring Equipment:

- Considerations
  - Laboratory Analyses
  - Direct Reading Turbidity Meters
  - Direct Reading TSS Meters

- HACH, Prod. No. LXV322.99.00002 chosen
  - Portable
  - Real-time direct TSS readings
  - Ability to fine tune with multiple calibration “curves”
  - Economical, one time expense
  - Can self perform with minimal training
  - Now has successful track record
Readings were taken on a regular basis and reduced to graphical form for evaluation.
Pond A Results

TSS Monitoring During Ash Impoundment Construction Activities
Implementation

POND A DRAWDOWN BEGINS

FLY ASH SLUICE DITCH RE-ROUTED

25 mg/L ACTION LEVEL

HIGHEST READING AT POINT 5

POND A DRAWDOWN BEGINS

1.3" RAIN

2.2" RAIN

0.8" RAIN

0.6" RAIN

1.1" RAIN

NOTES:
MONTHLY AVERAGE TSS LIMIT: 28 mg/L
DAILY MAXIMUM TSS LIMIT: 93 mg/L

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TSS Monitoring During Ash Impoundment Construction Activities

Implementation

Dike Remediation and Pond D Results

DIKE REMEDIATION AND POND D SPILLWAY PROJECTS - Total Suspended Solids (TSS) w/ Hach Handheld TSS Probe

NOTES:
MONTHLY AVERAGE TSS LIMIT: 28 mg/L
DAILY MAXIMUM TSS LIMIT: 95 mg/L

- PLANT TEMPORARILY SHUTS DOWN TWO UNITS
- 1.1" RAIN
- 3.5" RAIN
- CUTTING AND FILLING AT POINT 2
- NEW PRIMARY SPILLWAY PLACED IN SERVICE; BEGIN POND D MAIN DRAWDOWN
- 2.3" RAIN
- POND D RETURNED TO NORMAL OPERATING ELEVATION
- 2.8" RAIN
- 1.0" RAIN
- 1.2" RAIN
- HIGHEST READING AT POINT 5

NEW METER CALIBRATION
01 Demonstrated the ability of the pond system to handle spikes and upsets
   • Most upsets were from causes not related to the construction activities
     - Operational changes
     - Weather related
   • Provided confidence and prevented the need to “over-react”

02 Contingency Planning paid off
   • Remediation measures worked
   • Never had to implement polymer injection
   • Construction sequencing for Dike Remediation and Pond D projects avoided concurrent additional solids loadings to the pond system
     - Completed Dike Remediation construction actually lowered average solids loading to the downstream portions of the pond system
   • Check dam for Pond D lowering was a tremendous success
     - Expedited drawdown and re-fill times
     - Maximized detention time in the stilling pond system during the drawdown (would have lost approximately 50% of volume in the stilling ponds without the check dam)
03 Meter calibration lessons learned

Calibration was an on-going effort throughout the projects due to:
- Varying physical properties of the suspended solids along the flow path
- Lack of “homogeneity”, especially at the less-dilute concentrations closer to the outfall (probably due to turbulence)
- Potentially other unknowns (persistence pays off!)

Best calibration was based upon a two-point calibration using a fly ash sluice ditch sample for the high end and Sample Point #5 for the low end

Even in the absence of a good calibration, relative readings were useful in assessing pond performance
Thank you
Please contact us for more information

Glen Dieterle
AECOM
216.622-2392
Glen.dieterle@aecom.com

Rachel Combs
TVA
423.751.2827
rsburnette@tva.gov