Title – Closed Loop System for Coal Combustion Residual Dredging and Dewatering from A Recycle Pond with Landfill Placement

Authors: Jerry Vetter [1], Eric Zeigler [2]

Organizations: [1] Mobile Dredging & Pumping Co., 3100 Bethel Road, Chester, PA 19013
[2] Metropolitan Environmental Services Inc., 5055 Hilliard Drive, Hilliard, OH 43026

Keywords – Coal Combustion Residuals Dredging, Dewatering, Landfill Placement, Water Treatment, Recycle Pond

Abstract

Two companies from the Carylon Sediments Group, Mobile Dredging and Video Pipe Inc. and Metropolitan Environmental Services Inc. developed a process which was used to successfully remove and dewater coal combustion residuals from an in-service 4.9 hectare lined Recycle Basin Pond at the OUC Stanton 1500 megawatts power generating station. The process involved hydraulic dredging of residuals from the Recycle Basin Pond, long distance pumping of residuals with a distance of approximately 1,300 meters and a 28 meters increase in elevation, mechanical dewatering of the residuals at the on-site Combustion Waste Storage Area landfill site, direct placement of the dewatered residuals on the landfill face, and treatment of the process filtrate to remove solids so that stringent 200 ppm TSS levels could be maintained for returning all process water to the Recycle Pond. Approximately, 21,000 cubic meters of residuals were removed, dewatered and placed at the site landfill with no TSS violations while the Recycle Pond remained in service.

Project Background

The Orlando Utilities Commission (OUC) Stanton Energy Center (SEC) 1500 megawatts power generating station began operation in 1987. Several lined ponds on the plant were used to manage, control and reuse water. One of these basins is the Recycle Basin (RB) which is used to collect water for use in the flue gas desulphurization (FGD) and ash handling systems. Suction pumps remove the water from the RB for the FGD process. The RB had not been dredged since plant startup and sediments had accumulated in the RB which were negatively impacting plant operations. The RB was approximately 4.9 hectares with a dual liner consisting of 0.45 meters of sand and a 60 mil HPDE liner. Initial estimates were approximately 23,000 cubic meters of sediments had accumulated in the RB. The sediments needed to be removed while the RB remained in service and water quality standards needed to be maintained for the FGD process which was critical to plant operations.

Original Project Scope of Work

In order to minimize impacts to SEC plant operations and protect the integrity of the RB liner system, the OUC selected hydraulic dredging as the preferred method to remove the accumulated sediments. However, the OUC did not have defined methods and the required FDEP permits to handle, dewater, place and dispose of the sediments after hydraulic dredging. The OUC desired that the sediments be dewatered to pass paint filter test requirements and be placed at the SEC's on-site Combustion Waste Storage Area (CWSA) Landfill which was approximately 1,300 meters from the RB. The OUC suggested 1. constructing a lined pond or; 2. constructing a lined area at the CWSA landfill for using geotextile tubes to receive and dewater the hydraulic dredged sediments. Dewatered sediments would eventually be placed at the CWSA landfill after being dewatered to meet paint filter test requirements, Paint Filter Liquids Test Method 9095B. Effluent from the dewatering process was to be returned to the RB after meeting a 200 ppm TSS standard. These methods were advertised in an RFP but neither option proved feasible for economic and FDEP permit related issues.

Change to Project Scope of Work

Two companies from the Carylon Sediments Group (CSG), Mobile Dredging and Pumping Company (MDPC) and Metropolitan Environmental Services Inc. (MESI) developed an alternate approach to this project for OUC. The CSG team had obtained representative samples from the RB and tested these samples in its in-house lab facilities for mechanical separation and dewatering of coarse sediments with screens and addition of polymers to enable mechanical dewatering of the fine sediments. The results of these test showed that another method could be used to complete this project. This method would include hydraulic dredging of the sediments from the RB; pumping of the sediments to the CWSA landfill site; mechanical dewatering of the sediments at the CWSA landfill; direct placement of dewatered sediments into the CWSA landfill; and a water treatment and clarification process for treatment of process effluent to meet the 200 ppm TSS standard. This alternate method was submitted to the OUC for review and was reviewed and accepted by OUS and FDEP. A contract for removal of 21,000 cubic meters of material from the ponds was awarded to MDVP to complete this work for the OUC.

Project Implementation

Recycle Basin Dredging Operations

Three key items needed to be achieved at the RB during removal of the sediments:

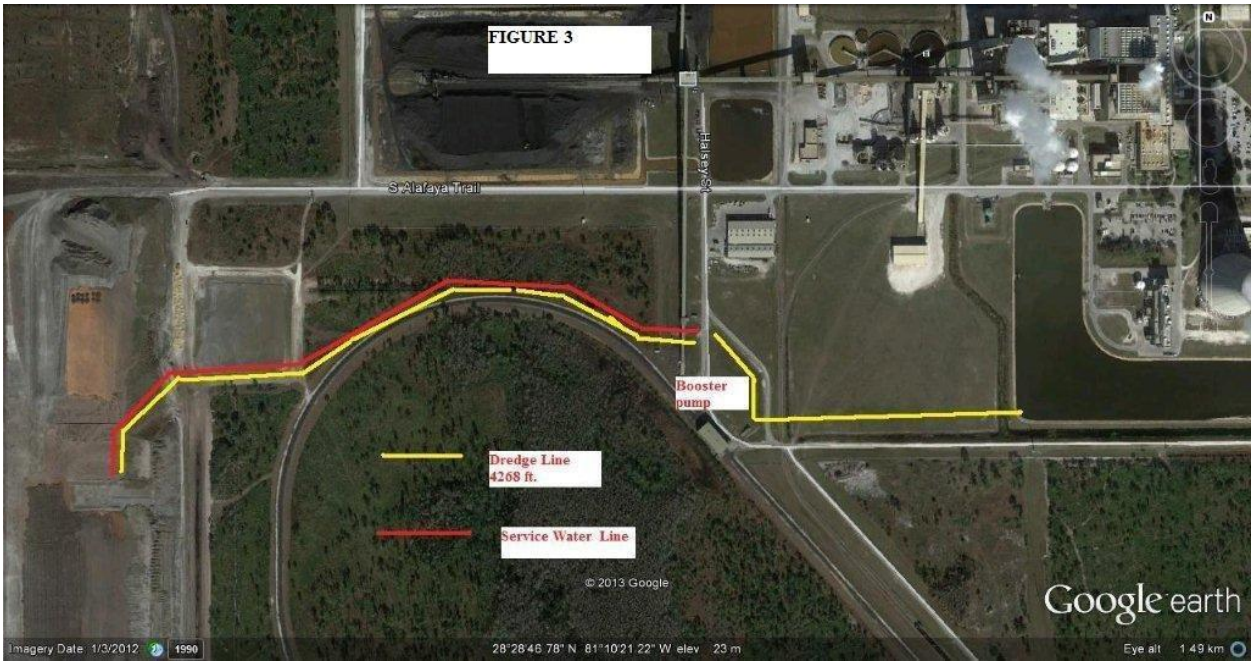
1. Protection of the sand and HDPE RB liner system
2. Maintaining water quality in the RB to allow continued operation of the FGD process.
3. Removal of 21,000 cubic meters of accumulated sediments

1. The dredge auger head was equipped with wheels to prevent the auger head from disturbing the sand layer. In addition, the dredge operator had a real time display of the auger head vertical location relative to the sand layer on a computer screen in the dredge cabin. DredgePAK software was used to monitor and record the dredge location and digging depth. Soundings were performed by MDPC during the dredging operations to detect any liner uplift and avoid damage to the liner.
2. MDPC placed two silt curtains in the Recycle Basin (RB). The RB was active and solids were being discharged into the RB during the dredging process. These silt curtains were used to keep solids from reaching the intake on the north side of the RB. One silt curtain was placed across the approximate 90 meters width of the basin, 30 meters south of the intake. A second silt curtain was used to segregate the dredge from active areas of the RB during dredging. This silt curtain was moved as dredging progressed from the east end towards the west.
3. Progress surveys in conjunction with flow monitoring, solids sampling of the dredge slurry, dewatered sediments and return flow were used to determine dredge quantity volume as the RB was in service and receiving influent solids loading from the plant during removal operations.

The following key pieces of equipment were used during the sediment removal and dewatering operations:

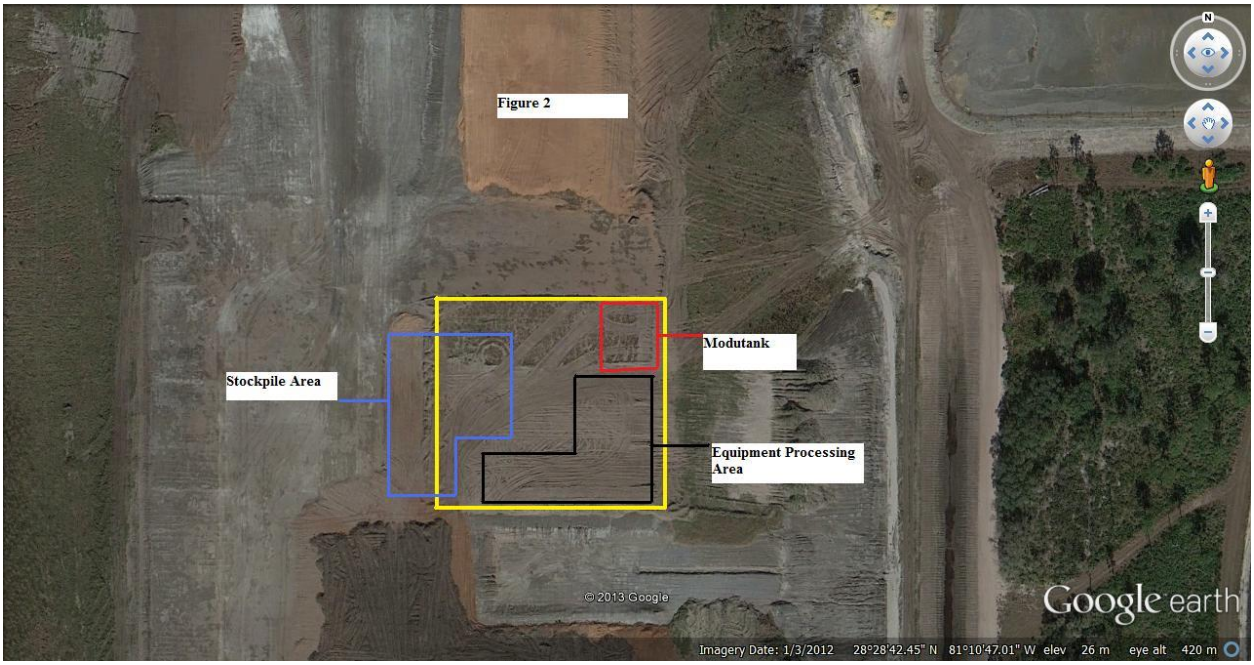
- Mudcat MC2000 270 HP – 20 centimeters horizontal auger dredge
- Morris 225 HP – 20 centimeters booster pump
- 20 Centimeters HDPE Dredge Pipe
- Tri-Flo 2,000 Hydrocyclone and Dewatering Screen System
- 4 – Trailer Mounted 2.2 Meter Charter Belt Filter Presses
- 170,000 liters DELTank Inclined Plate Clarifier System
- 30 meters by 30 meters Modutank Polishing Tank

The hydraulic dredge was placed into the RB for dredging of the solids. Dredging progressed from east to west in the RB. The solids were removed by the dredge and pumped through the HDPE pipe to the booster pump and mechanical dewatering equipment. See Figure 3 below for Pipe Route.



CWSA Landfill Sediment Dewatering Operations

The dewatering equipment was staged at the CWASP landfill at the location shown on the attached Figure 2. A level compacted pad for placement of the equipment was prepared at this location.



The dredge pumped the solids from the RB in a slurry through fuse welded 20 centimeters HDPE pipeline to a booster pump which pumped the slurry to a TriFlo 2000 unit at the dewatering equipment staging pad. The TriFlo unit separated the material into three phases for disposal using a series of pumps, screens and hydrocyclones. The coarse grained material was captured using hydrocyclones and dewatered on screens and discharged for loading into a stockpile. This dewatered material was placed to the west end of the staging area directly adjacent to our equipment staging pad.

An 80,000 liters mix/storage tank was placed in-line between the TriFlo unit and belt presses to provide a homogeneous feed to the dewatering equipment. This mix tank received the fine grained sediments which were not removed by screens and hydrocyclones. These fine grained sediments were conditioned with a polymer to enhance the dewatering process. Four trailer mounted 2.2 meter belt filter presses were utilized to dewater these solids and discharged into a stockpile to the west end of our staging area with a front end loader adjacent to our equipment staging pad. Power for the processing equipment was furnished by a 500KW diesel powered generator.

A photo of the dewatering process is shown below.

The filtrate from this stage of dewatering was discharged into a trailer mounted clarifier unit. Solids collected in the clarifier were returned to the belt filter press operation for dewatering. The filtrate from the clarifier was discharged into a lined 30 meter by 30 meter Modutank which was stationed adjacent to the dewatering equipment staging pad. The filtrate from the Modutank was discharged through a fuse welded pipe into the influent structure at the Landfill Leachate Pond for return to the RB. If TSS samples exceed 200 ppm, dewatering operations would be shut down until this limit could be achieved. A photo of the filtrate treatment process is below.

Project Issues

Two important issues developed during the performance of this project which needed to be addressed.

Several weeks into the project, H2S issues started to become apparent at the CWSA landfill dewatering site. Corrosion started showing on non-galvanized metal and H2S levels started approaching the daily Permissible Exposure Limits. The H2S was being released from the dredge slurry as it was deposited onto the dewatering equipment. The project was shutdown while procedures could be developed to deal with and monitor the

H2S levels. Individual H2S meters were provided for all site personnel and high volume ventilation fans were placed on the working decks of the dewatering equipment. The ventilation fans solved the issue and H2S levels were below permissible limits for the remainder of the project. Elevated H2S levels were not present at the RB nor elsewhere at the CWSA landfill.

Progress surveys conducted on the RB during dredging provided inconsistent results. The solids inflow to the basin and significant variation in the density and % Total Solids content of residual coal sediments in the basin caused problems with hydrographic survey methods generating accurate data while the dredging was in progress. Movement of residual sediments also appeared to be occurring in the RB. As a result, it was difficult to determine dredge quantities. A combination of sampling of the dredge slurry and dewatered sediment for % TS was used in combination with flow meters to calculate dry tons removed and convert this to cubic meters removed to verify dredge quantities.

Project Results and Costs

Approximately, 21,000 cubic meters of coal residual sediments were removed from the pond during 43 days of active dredging. There were no violations of the 200 ppm TSS standard for the return water to the RB during this period. The SES plant remained in service during the dredge event and there were no negative impacts to the plant's FGD system. All dewatered coal residual solids placed at the CWSA Landfill passed the paint filter test requirements and were typically in the 55 percent total solids range. There was an almost 6:1 volume reduction of the RB in-situ sediments volume to the dewatered sediments volume.

Almost one third of the slightly over $ 1 million dollars expended on this project was for one-time project mobilization and construction costs. The unit cost for hydraulic dredging, mechanical dewatering and landfill placement was approximately $32 per cubic meter of sediment removed from the RB.

The dredge operated for approximately 38% of the operating day, as the dewatering equipment capacity could not handle the full flow of the dredge slurry. The average dredge pumping rate was approximately 6,800 lpm while the average process rate of the dewatering equipment was approximately 2,650 lpm.

DREDGE PRODUCTION PARAMETERS

Avg. Dredge Feed Rate	6,800	Liters per minute
%TS in-situ in RB	9.0	%TS
% TS in dredge slurry	3.5	%TS
Daily Dredge Production	545	CM/Day

DEWATERING EQUIPMENT PRODUCTION

Avg. Process Rate	2,650	Liters per minute
% TS in feed slurry	3.5	%TS
Daily Process Rate	1,420,000	Liters per day
Daily Landfill Placement	55	Bone Dry Tons

This project demonstrated that a closed loop dredging and dewatering process could be used to remove sediments from an active, in-service basin at a power plant with minimal impact to plant operations. All coal sediments residuals that were removed from the basin were disposed on-site at the landfill. All water used during the process was recycled into the plant water management system and returned to the Recycle Basin for reuse in the operation of the plant.