Welcome to Swalf Dredging...

To know our standards, how we function and what we are then do enjoy the presentation!
“Dredging solutions for cooling water intake at Thermal Power plant I, Expansion Issues & Opportunities”

J.P. Senthil Kumar
Established in June 2008 at Chennai
Associates- EIC, Dubai; Athena HESS in Singapore, NRC Oman

About SWALF

SWALF

- Established in June 2008 at Chennai
- Associates- EIC, Dubai; Athena HESS in Singapore, NRC Oman

Specialist support services to the industry in:


- Disaster Management Planning, Hazard Mapping, Vulnerability Assessment, Community Based Disaster Risk Reduction (CBDRR).

LIST OF CLIENTS

- PWD - Departments
- PWD Contractors
- Inland Waterways
- Fisheries Department
- Metropolitan Municipalities
- Tourism Department
- Minor Ports
- Major Ports
- Forest Department
- Wapcos
- Wascon
- Worldbank Projects
- Krishna River Projects
PHYSICAL OCEANOGRAPHY

BATHYMETRY SURVEY AND DATA COLLECTION
HYDROGRAPHIC SURVEY METHODS
PHYSICAL OCEANOGRAPHIC OBSERVATIONS

- Differential GPS or RTK
- Optical Gyro & motion sensor
- Sound Velocity Probe
- Multibeam and Side Scan Sonar

- Data acquisition
- Navigation Display
- Helmsman’s Display
- Positioning QC

15 m survey launch
Here is the typical setup with the typical pieces: Global Positioning System, the laptop or simply something that can integrate the position and depth data, the depth sounder, and the transducer.
SINGLE BEAM ECO SOUNDER

APPLICATIONS

- Lake and River Hydrographic Surveys
- Inshore and Coastal Hydrographic Surveys
- Pre and Post Dredging Assessment Surveys
SINGLE BEAM ECO SOUNDER
Single Beam Echo Sounder

A single-beam echo sounder produces soundings by transmitting short pulses of aquastic energy down towards the lake bed and detecting those pulses reflected.

The depth under the vessel is then calculated from the 2-way travel time of pulses and the mean speed of sound over the water column.
Conducting Survey

- Equipment Requirements:
- Boat
- Power Source
- Generac 5550 Watt/8550 surge generator / BATTERY 12 V
- Survey Equipment
- ODOM MK III single beam echo sounder
- GPS receiver
- Analytical Software
- Hypack
- Laptop
- Calibration Device
Analysis

• Assumptions

• Volume Calculations
  - Hypack
  - Notepad
  - Microsoft Excel
  - AutoCAD Land Desktop

• Map and Volume
Here is the data edited and thinned.
You still can’t triangulate this data or it misrepresents the curvature of the river, especially along the thalweg or centerline.
DREDGING
METHODS AND CHALLENGES
**What is Dredging? & Why Dredge?**

<table>
<thead>
<tr>
<th>Capital works</th>
<th>Maintenance works</th>
<th>Remedial works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of new or improved facilities, such as harbour basins, deeper navigation channels, etc.</td>
<td>Maintain desired depth of navigation channels and ports.</td>
<td>Careful removal of contaminated material and treatment, reuse or relocation of the material.</td>
</tr>
</tbody>
</table>
| - Navigation  
  - Infrastructure  
  - Coastal Engineering  
  - Mining Industry  
  - Offshore industry | - To deepen waters for vessel access (capital dredging)  
  - To maintain depths subject to sedimentation (maintenance dredging) | - Excavation  
  - Lifting  
  - Transportation  
  - disposal |

Removal of soil from an underwater location and transporting it to another location
Movement of sediment into basins
Dredging & Dredge Types

Capital Dredging
Removal of virgin sediments present at bed level where either dredging has never been carried out or dredging for deepening of channel / basin area.

Maintenance Dredging
Removal of sediments accumulated in the channel
Types of Dredgers
Hydraulic Dredgers

TSD

CSD
Hydraulic Dredge

Self Propelled Hopper Dredge

Hydraulic Pipeline Cutter Head Dredge
Cutter Suction Dredger
Dam Dredging
Layout view of Cutter suction dredger
Swing Pattern
Cutter head

Movement Left - Right

Movement Left - Right

Cutter head
Advantages and Limitations of Cutter head Pipeline Dredge

**ADVANTAGES**
- Almost all types of material can be excavated
- Material can be pumped directly to disposal site if pipe is installed
- Continuous dredging is possible
- Some rock types can also be dredged without blasting

**LIMITATIONS**
- Limited capability in rough open water
- Pipeline can be obstruction to navigation
- Debris in sediments can reduce efficiency
Advantages and Limitations of TSH Dredge

**ADVANTAGES**

- Dredge type for rough open water
- Can move quickly
  - Minimizes traffic interference
- Improves navigation depth quickly
- Economical for long haul distance

**LIMITATIONS**

- Cannot work in shallow depths
- Cannot dredge continuously
- Less Precision in excavation
- Difficult to dredge hard banks and consolidated materials
Areas of application

- Cutter Suction dredger – dredging harbors and fairways as well as land reclamation projects.

- The dredging depth – limited - maximum depth range between 25 and 30 m – minimum depth determined by the draught of the pontoon.
Mechanical Dredgers

Clamshell

Back Hoe
Mechanical Dredgers
Self Propelled Back hoe Spud Type Dredging
Pontoon Mounted Crab & Crawler Dredger using nearby berth, wharf and breakwater.
Self Profelled Hopper Barge with back hoe Dredger
Advantages and Limitations of Mechanical Dredge

**ADVANTAGES**

- Rugged and capable of removing hard packed material
- Can remove debris
- Can work in tight areas

**LIMITATIONS**

- Difficult to retain fine loose material in conventional bucket
- Production low compared to pipeline dredges
The dredge pumps

- Dredge pump selection depends on - working range of the pump capacity and pump pressure.
- Production capacity in various types of soil must be translated into:
  - The mixture capacity
  - The mixture concentration
The Jet Pump

To promote mixture forming when dredging sand, some cutter suction dredgers are equipped with water jet installations.

- One or more jets are mounted on the sides of the ladder close to the cutter ring.
Dredge pump
Factors in Selection of Type of Dredging Equipment

- Physical Characteristics of Sediments
- Quantities to be dredged
- Depth of Dredging
- Distance between dredging and disposal or placement areas
- Contamination level of sediments
- Physical Environment of dredging area and between dredging & disposal area
- Method of disposal
THE MUD PUMP
PLAN WORK:
FUNCTIONAL DESIGN > STRATEGY

Strategic objective, results & quality
Stakeholders, project scope
Time, budget, risks & quality
Tendering strategy
Plan determines input necessary

PROJECT STRATEGY
Research, Design, Contracting, Dredging, O&M

FIRST FOCUS ON FINAL OBJECTIVE
Dredging lakes and rivers

@ Neyveli TPS and Fertilizer lakes

Challenges & Consequences
Weed control

- Weed cutting - hand held knives, weed cutting bucket or weed cutting boat - includes raking and dredging.

- Two advantage
  - has an immediate effect as there is no delay between the action of cutting or removing the weed and the relief of the problem.
  - no persistence of effect, unlike the other methods, all of which remain (as herbicide residue; biological control agents or altered environment) for various lengths of time after application.
- They tend to produce poor results when used against-filamentous algae and the small free-floating weeds such as Duckweed. Have no effect on unicellular.

- Algae with the exception of the weed cutting bucket and the dredger, most forms of mechanical control cut.

- The most expensive and time consuming part of the operation is the removal and disposal of cut weed.
METHODOLOGY FOR DREDGING TPS & FERTLIZER LAKES
Location of cooling water in take pond using WGS-84
Status of TPS I cooling
water intake Pond
Approximate depth of the ponds
SOUNDING OF FERTILIZER LAKE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Present</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>5.8 lacs CBM</td>
<td>6.6 lacs CBM</td>
</tr>
<tr>
<td>Area</td>
<td>29.85 Ha</td>
<td>33 Ha</td>
</tr>
<tr>
<td>Max depth</td>
<td>4.59m</td>
<td>3m</td>
</tr>
</tbody>
</table>
SOUNDING OF TPS 1 LAKE

<table>
<thead>
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<th>Parameter</th>
<th>Initial</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>5.4 lacs CBM</td>
<td>6.2 lacs CBM</td>
</tr>
<tr>
<td>Area</td>
<td>27 Ha</td>
<td>26 Ha</td>
</tr>
<tr>
<td>Max depth</td>
<td>3 m</td>
<td>5.36 m</td>
</tr>
</tbody>
</table>
X- Section of Fertilizer Lake
X- Section of TPS 1 Lake
Vegetation in the ponds
Our previous experiences for De-Weeding
Vegetation removal & Dredging
Manual deweeding/
Aquatic Cleaning, Garbage removing
Type of Dredging Equipment to be used in TPS I Pond

WORKING DEPTHS

- Dredger designed for shallow waters
- The maximum reach is 7 meters
- The most efficient working depth is up to 10 meters
- Spuds and rear legs to anchor itself to the bottom
- It can operate in very shallow waters, wetlands or even on dry ground
Mobility in land

- Transportable on public roads on a standard size trailer
- Is transported as a complete unit – no assembly times
- Moves in and out of water without crane assistance
Tooth and cutting edge system

"PICK-POINT"
Hard rock

TRAPEZOIDALE PICK-POINT
Soft rock

NARROW CHISELS
Cemented sand

WIDE CHISEL
Sand and loose soil

CL FLARED
Clay

BELOW CL FLARED
TYPE A

BELOW CL FLARED
TYPE B (CLAY FLARE)
Harbour Dreging
Rock Drilling Equipment
Dewatering
Project Containment
Management of dredge spoils
Environmental monitoring
**Monitoring of the environment?**

**Dredging is sediment management**
- Investigate and understand the sediment balance.
- Environmental requirements concerning the return of sediment into the natural system.

**When to monitor**
- Environmental Monitoring
  - 6 different phases:
    - Phase 1: before dredging
    - Phase 2: during dredging
    - Phase 3: no dredging (weather)
    - Phase 4: during dredging
    - Phase 5: no dredging (holiday)
    - Phase 6: During dredging

**What to monitor**
- Most dredged material is clean sediment.
  - Turbidity
  - Persistent pollutants
  - Sediment texture
  - Plumes
Effects of dredging
Contractors are responsible for minimising environmental impacts during project realisation (process impacts).
Sand Quarrying
Thank you for patiently going through our presentation!
We hope this has enabled you to understand us better!
we are looking forward in working with you!