

4th NIGERIAN DREDGING SUMMIT & EXHIBITION - CALABAR 2010

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CALABAR 2010

ORGANIZED BY

DREDGE SKILLS AND MARINE TRAINING CENTRE LTD.

LAGOS, NIGERIA.

22nd & 24th Sept. 2010

PRESENTER

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“The Role of Surveying in Dredging Field Measurements.”

“Pre-Dredge Surveys And Proofing Sand Search Reports – A Look at Modern Surveying Equipment”.

S U R V E Y I N G

DEFINITION:

Surveying could be defined as the art of making measurements (*distances, bearings and elevations*) of the relative positions of natural and man-made features on the earth's surface (or beneath the earth's surface) and the presentation of this information on maps (or plans).

OBJECTIVES OF SURVEYING

1. Preparations of maps (plans)
2. Setting-out
3. Alignments (Roads, Railway, Canals, Tunnels,
Transmission Power lines and Towers)
4. Detailed mapping.

BRANCHES OF SURVEYING

- i. Topographic Survey
- ii. Cadastral Survey
- iii. City Survey
- iv. Engineering Survey
- v. Astronomical Survey

- vi. Photogrammetric Survey
- vii. Hydrographic Survey

Survey Equipment

- **Tape**
- **Theodolite**
- **Total Station**
- **Automatic Level**
- **GPS**
- **Echo Sounder**
- **And other accessories**



THEODOLITE



ELECTRONIC THEODOLITE

TOTAL STATION



AUTOMATIC LEVEL



DIGITAL LEVEL



GPS



GPS UNIT



ANALOG ECHOSOUNDER



DIGITAL ECHOSOUNDER

Survey Applications

REMINDER

Hydrographic Survey plays a vital role in:

- ✓ Position fixing
- ✓ Pipe laying
- ✓ Sweeping
- ✓ Channels
- ✓ Pre-Dredge Survey
- ✓ Post-Dredge Survey

PRE-DREDGE SURVEY

This is the survey undertaken before dredging commences, it helps to determine the expected volume of excavation. This estimate must be reasonably accurate because a dredging contractor usually bids on the total volume to be removed; incorrect estimations lead to contractual difficulties.

Simultaneous, sub-bottom and echo-sounding profile can locate underlying rock or objects that could damage the dredge or affect the dredging time.

POST-DREDGE SURVEY

A post-dredge survey ensures that the area has been completely dredged and protects the client from needless costs of over dredging.

The side-scanning sonar finds a role in post-dredging operations to reveal under dredged peaks and locate any slumping of channel walls into the navigable water lane. It is an advantage to know how often channel need to be dredged and what area can best receive the spoil.

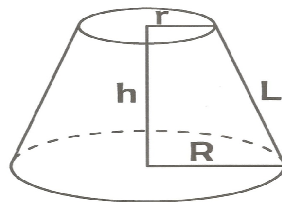
VOLUMETRIC ANALYSIS

SHAPES FOR CONSIDERATON

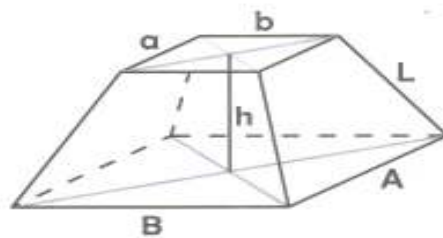
➤ **REGULAR SHAPES**

➤ **IRREGULAR SHAPES**

REGULAR SHAPES



TRUNCATED CONE



TRUNCATED PYRAMID

IRREGULAR SHAPES



STOCKPILES



RECLAMATION

METHOD OF VOLUME CALCULATION

- The Trapezoidal Rule
- The Simpson's Rule
- *The mid-ordinate rule*
- *The average ordinate rule*
- *Programs*

The Trapezoidal rule: -

In this method, a base line AB is drawn and is divided into equal parts.

The ordinates at each point of division are drawn and their lengths are scaled off. This method assumes that the area between adjacent ordinates is of the shape of a trapezium.

Note:-

When there is an apex at one or both the ends of the base, resulting h_1 and/or h_n , though being equal to zero, is also included in the trapezoidal formula.

The Simpson's rule: -

In this method, a base line is drawn and divided into portions of equal lengths at each point of divisions, ordinates are drawn and their lengths

are scaled off. The area of the portion boundary is calculated from the Simpson's rule which is stated below.

To the sum of the first and last ordinates, add twice the sum of the remaining odd ordinates and four times the sum of the even ordinates. Multiply the total sum by one third the common distance between the ordinates, the result gives the required area.

i.e. $[\text{Area} = d/3 \{h_1 + 2(h_3 + h_5 + h_7 + \dots) + 4(h_2 + h_4 + \dots) + h_n\}]$

Points to Note

The Simpson's rule is applicable only if number of ordinates is odd. If the number of the ordinates is even, the area of the last trapezoid may be calculated separately and added to the result obtained by applying the Simpson's rule to remaining trapezoids.

Even if first or/and last ordinate happens to be zero, these are not omitted from the Simpson's formula

Comparison of accuracies achieved by Simpson's Rule and Trapezoidal Rule

The results obtained by using the Simpson's rule are more accurate as compared to those obtained by trapezoidal rule. Hence, Simpson's rule is invariably used when better accuracy is

required. Results obtained by using the Simpson's rule are greater or lesser than those obtained by using the trapezoidal rule according as the curve of the boundary is concave or convex towards the base line.

REASONS FOR DIFFERENCES IN VOLUME DETERMINATION

It must be understood that no measurement in a survey is ever exact, every measurement, whether linear or angular, contains errors.

- 1) **Accidental Errors**
- 2) **Systematic Errors**
- 3) **Random Errors**
- 4) **Gross Errors or Mistakes**
- 5) **Shrinkage**
- 6) **Settlement**

SAND SEARCH REPORTING

As the name implies, it is the act of determining the availability of the good quantity and quality of sand deposit within a particular borrow pit.

The importance of Sand Search cannot be over emphasized.

Two major operations are involved

- Hydrographic Survey
- Drilling (Geotechnics)

Hydrographic Survey



Drilling (Geotechnics)



- Drilling at shore

Tidal Observation



TIDE GAUGE

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THANK YOU

FOR LISTENING