

BEACH NOURISHMENT BY RAINBOWING FOR THE VISAKHAPATNAM PORT TRUST BY DCI

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ABSTRACT

The coastal city of Visakhapatnam had a long wide beach. Over past three decades, this beach has progressively eroded leaving only a strip of what was once a fairly wide beach. As the continental shelf is fairly steep the erosion has exposed the rock formations which makes the beach highly dangerous for tourists / swimmers. In an effort to arrest this erosion and to protect the coast, the beach has been nourished by pumping sand from the sand trap area. Since mid 1970, this pumping of sand was carried out via a shore pipeline between the months of April to September by the dredgers of the Port and from 1990 by DCI. However, since the year 2003 the beach is being nourished by Rainbowing sand directly onto the beach front by the DCI's Trailer Suction Dredgers. This paper will highlight three important points / aspects:-

- a. The efforts of Visakhapatnam Port over the year to battle with the natural phenomenon called the Littoral drift silting up the Port approaches and its channels.
- b. The adaptation of Rainbowing technique that has resulted in the pumping of sand precisely in the zones with maximum erosion thereby making this technique effective and also reducing the time frame of the Project.
- c. This cost saving technique can be adapted at other locations, depending upon the requirement, so that the need to lay and maintain a fixed pipeline can be dispensed with.

Key words: Beach erosion, Littoral drift, siltation & Rainbowing technique.

INTRODUCTION

Brief background:



Fig.1 - Sand bars at the entrance channel of Vizag port

This had arrested formation of sand bars at the entrance of the inner channel and improved the conditions for entry of ships. The sand formation on the seaward side of the sunken ships was by passed via a floating pipeline across the channel with the help of a Trailer Dredgers carrying out stationary dredging. However, this arrangement caused quite a bit of disruption to shipping and there was an urgent need to find a solution.

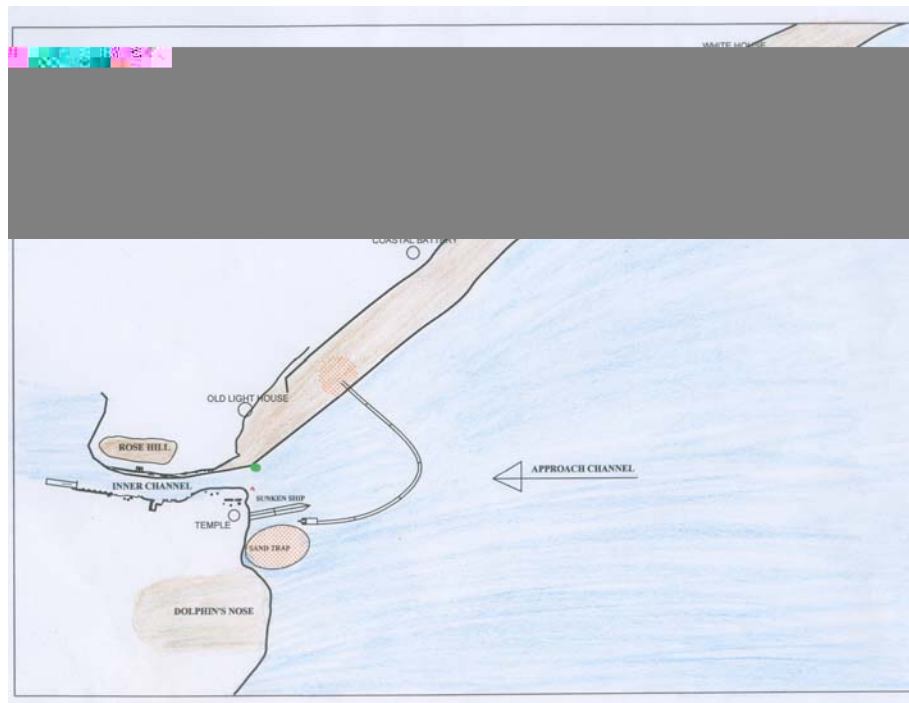


Fig.2 - Sunken ships and pumping across the channel

While this operation continued for many years the Port had constructed Outer Harbour between 1970 - 75. The Outer Harbor project envisaged the construction of an Island breakwater (South breakwater) having a gap between the Dolphin hill and the western head of the south breakwater to let the Littoral sand into the new sand trap area created by deepening the trap to – 18.0 m. The sand trap was designed to take about 0.6 M cu.m. During the early stages the Littoral sand was collected from the new sand trap area by stationary dredging with port dredgers and then the sand was pumped through a 2 kms shore pipeline onto the southern portion of the beach. The pumping was carried out from the Dredger lay up berth at the outer harbor.

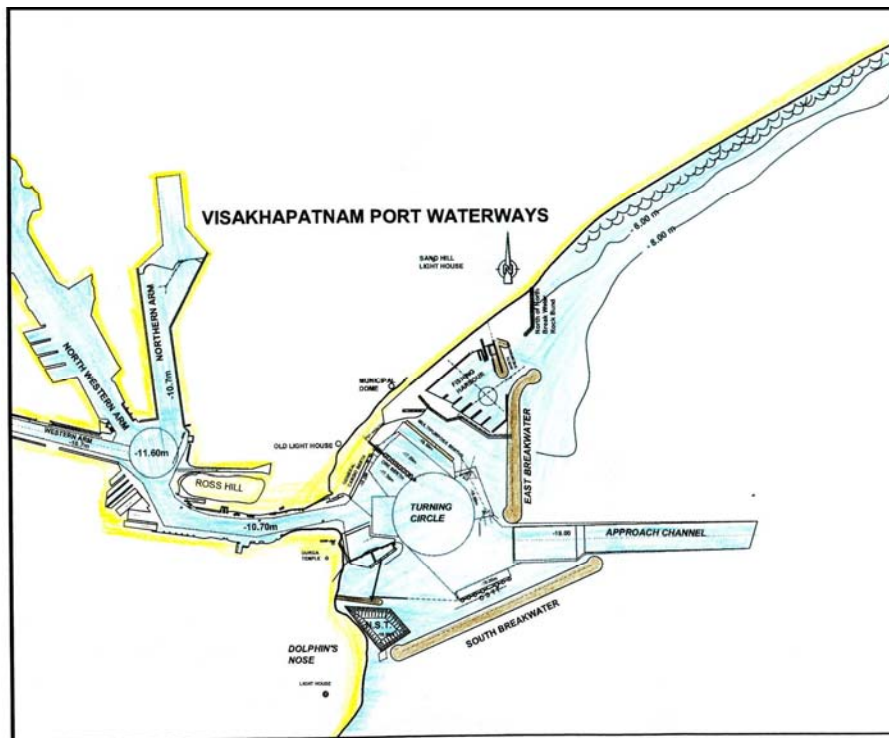


Fig.3 - Vizag Port Outer Harbor

The material was pumped onto the southern portion of the beach for the north eastern currents to spread it along the coast. This activity was carried out by the Port with their own dredgers for about 15 years. Over the years as these dredgers had outlived their economic life and not able to cope up with the requirement of beach nourishment, it was outsourced to DCI. DCI has been carrying out beach nourishment for Vizag port since the year 1990.

To take advantage of the north eastern currents and ensure spread of material across the beach there was a need to carry out dredging during the monsoon months i.e. June to September. Handling the dredgers during this period was extremely difficult due to strong winds and restricted space available for maneuvering. This resulted in down time due to bad weather conditions and also put the dredgers and its operations to a great amount of risk. However, DCI utilizing their skilled manpower, carried out dredging and pumping operations by this method during the monsoon period for over a decade. Later in the year 2002 it was found that the pipeline that was laid along the coast was corroded and damaged over large stretch. There was also a need to extend the length of the pipeline due to construction of new container terminal. The extended length of pipeline calls for installation of a booster to enable the TSD's to cope up with the power requirements. The frequent movements at the container terminal had resulted in idle time for the dredger which may increase with traffic over the years. Thus, the above constraints made the Port and DCI to come up with the thinking of carrying out Rainbowing directly onto the beach and dispense with the installation of booster and laying of pipeline altogether.



Fig.4 - Rainbowing for Beach Nourishment

The methodology for beach nourishment by Rainbowing technique was prepared jointly by DCI and Vizag Port. It consists of filling up the hopper with sand by stationary dredging in the new sand trap area as was done earlier by the Trailer suction dredgers. The dredger would then unmoor and then steam about 1.5 Nautical miles and approach on the transits placed ashore perpendicular to the beach upto 8.0 mtrs contour. The dredger would hold her position at this point and discharge the mixture to a distance of approx 100 m so that the material falls within the 0 – 6 mtrs contour (the Littoral drift zone). On completion of the discharge within about 1.5 hrs the dredger returns to the new sand trap area and positions / moors for the next load. The cycle time is approx 4.5 hrs and at least 5 loads were pumped every day with cumulative quantities ranging from 20000 – 22000 cu.m. per day. Direct Rainbowing onto the beach resulted in savings in time due to reduced discharge time and time loss on account of positioning (mooring / unmooring) with anchors. There is also an advantage of pumping in locations with greater erosion selectively. Further, there has been no disruption to container shipping or idle time of the dredger.

This methodology had been effective for nearly three years resulting in all round benefit. However, the Tsunami during Dec.2004 made DCI – Vizag Port to think of alternative methods of nourishment as the rocks that got exposed due to massive transportation of sand from the sea bed along the beach damaged the dredgers bottom shell at 8m contour. The alternative method consisted of pumping material by anchoring / mooring the dredger at around 10m depth contour with a 200 m self float line and a Rainbow pontoon. The material is pumped directly into the Littoral zone between 4 to 6 m through this Rainbow pontoon. This method proved to be quite successful in not only pumping the material to an area adjoining the existing beach but also ensured that the operations are absolutely safe.



Fig.5 - Floating pipeline arrangement for shore pumping



Fig.6 - Beach Nourishment through a Rainbow pontoon

Major results

- Siltation control of approach channels
- Continuation of expansion plans / progress
- Preservation of beach from further erosion
- Pumping of material selectively in areas of maximum erosion by Rainbowing technique
- Cost savings due to Rainbowing – no maintenance of pipeline
- Reduced time frame of the Project

Conclusions

This article highlights the successful efforts of the Port over the years in tackling the siltation and preserving the beach from erosion simultaneously and also, the effectiveness and cost saving in the Project due to Rainbowing technique by DCI dredgers. This technique not only enabled the Port to dispense with the laying and maintenance of the pipeline but also reduced the time frame of the Project. The article further brings to light as to how two Government bodies DCI – Vizag Port acted in a very responsible manner to use innovative methods over the years to preserve the beach.