



## DHI CASE STORY

# SUPPORTING DREDGING WORKS FOR THE EXPANSION OF A MERCHANDISE JETTY

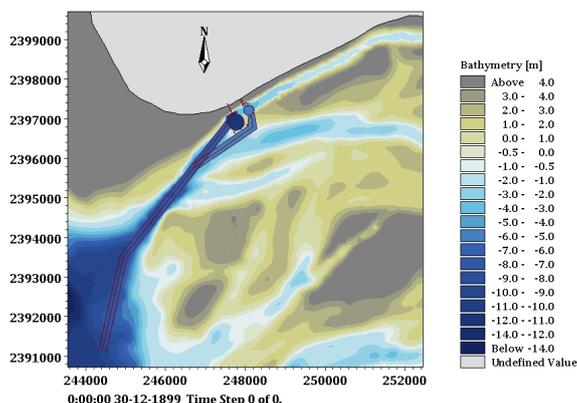
## Morphological impact assessment and navigational and manoeuvring study

Reliance Industries Ltd (RIL) wanted to increase the material handling capacity at its Reliance Dahej Marine Terminal (RDMT). Currently, RDMT operations are restricted due to heavy siltation especially at the berthing pocket of the jetty. The existing navigational channel depth only allows smaller vessels to manoeuvre due to available draft depth limitations. Thus, the need for intensive dredging works arose in order to revamp the jetty and permit larger ships to enter and exit the area. However, the project site boasts of complex hydrodynamics. It was necessary to accurately predict the infill rate of the dredged navigational channel. With our integrated hydraulic/hydrodynamic modelling and navigation/manoeuvring studies, we supported RIL with its dredging and expansion plans.

### NAVIGATIONAL AND MORPHOLOGICAL ASPECTS ALONG WITH DREDGING REQUIREMENTS DEMANDED THE NEED FOR AN EXTENSIVE STUDY

RDMT is located at the mouth of the Narmada River in the Gulf of Khambhat, India. It lies adjacent to RIL's Reliance Dahej Manufacturing Division (RDMD). RDMT handles shipments of raw material/products for petrochemical plants of RDMD and its existing jetty has been operational since 1996. However, gradual and excessive siltation has occurred in the RDMT berthing pocket. In order to manoeuvre larger vessels at the RDMT jetty, a higher draft is needed – in the navigational channel, berthing pocket as well as in the turning circle. As a result, an extensive capital dredging becomes necessary. The allocated disposal site for dredged material is close to the development site. Thus, an extensive study is required in order to assess the back filling rate and volume due to the complex hydrodynamic

conditions at the project site. a huge capital dredging exercise becomes necessary. The allocated disposal site for dredged material is close to the development site.



RDMT Proposed dredged channel bathymetry

### SUMMARY

#### CLIENT

Reliance Industries Limited (RIL)

#### CHALLENGE

- Complex hydrodynamics of dredging site
- Inability to accurately predict potential infill rate of dredged channel
- Suboptimal navigational and manoeuvring conditions for large vessels

#### SOLUTION

- Integrated hydraulic/hydrodynamic modelling for morphological assessment
- Navigational and manoeuvring simulations
- Assessments of mooring loads
- Desk-based risk assessment study

#### VALUE

- Reduced maintenance and operational costs
- Facilitation of optimal navigation & manoeuvring of ships
- Efficient future handling of more material

#### LOCATION / COUNTRY

Gulf of Khambhat, Gujarat, India

## PROVIDING SOLUTIONS TO A COMPLEX PROBLEM – ASSESSING MORPHOLOGICAL IMPACTS

At DHI, we can accurately estimate potential siltation rates, owing to our vast experience in hydrodynamics and morphological modelling. Our MIKE 21 MT model of MIKE by DHI software is well known in the industry for predicting potential infill rates of dredged navigational channels. With MIKE 21 MT, we can precisely simulate capital dredge volumes as well as annual maintenance dredging required for the same. Thus, the client approached us to conduct an in-depth morphological assessment of the impacts of the planned dredging operations in the channel.

The lack of good quality datasets was an impediment to our work. We used our in-house expert views to overcome the data deficiency and assess the outcome of model simulations. The Gulf of Khambhat – where the site is located – is famous for tidal amplification and turbidity maxima. It is a challenging environment for calibration of hydrodynamic and sediment transport models. We met these challenges successfully and provided the following services:

- Setup, calibration and optimisation of an integrated hydrodynamic mathematical model with measured tides, currents and flow conditions
- Evaluation of overall morphological changes/impacts in the channel
- Evaluation and recommendation of methods of dredging and disposal location of dredged materials



*Existing RDMT Jetty head*

- Evaluation of the frequency and impacts of siltation on jetty head and recommendation of necessary actions
- Identification of vulnerable areas for siltation/sand dunes in the channel by detailed analysis of the modelling studies

## NAVIGATIONAL AND MANOEUVRING STUDIES

Along with FORCE Technology, Denmark, we conducted several navigation and manoeuvring studies, simulations and mooring loads assessments. The services we provided included:

- Developing navigational simulation model and various safe scenarios of vessel manoeuvring
- Testing and harmonising the simulator to ensure accuracy
- Conducting a series of real-time simulation runs using professional pilots/master mariners to pilot the simulator
- Optimising location and size of turning circle in consideration
- Advising about the maximum number of vessels that can be manoeuvred through the approach channel
- Specifying threshold limit for wind, swell and currents for berthing and unberthing
- Evaluating and specifying bad weather criteria for cargo stoppage and casting off of vessels, tide permitting
- Recommending adequate area of anchorage for increased number of vessels

## WE BUILD CONFIDENCE AND HELP DRIVE THE DREDGING PROJECT FORWARD

Thanks to our global knowledge and vast experience, RDMT now has a thorough understanding of the complex hydrodynamics of the dredging site. This empowers them to conduct the dredging activity more efficiently, effectively reducing operational and maintenance costs. Moreover, RDMT's plans to expand cargo handling facilities and handle larger cargo ships in the future are on the road to realisation, thanks to our in-depth navigational and manoeuvring modelling studies.

Contact: Flemming Jakobsen - [fj@dhigroup.com](mailto:fj@dhigroup.com)  
For more information visit: [www.dhigroup.com](http://www.dhigroup.com)