

A GREENFIELD PROJECT IN INDIA

Col. Vinod George¹ and Jan Zandbergen²

ABSTRACT

In the early 90's, the economy of India underwent a major change; the centrally-planned economy, which was the norm after independence in 1947, changed into a market-oriented economy. This change in direction created opportunities for private entrepreneurs and the private sector started showing interest in infrastructural greenfield projects. Dredging industry has also attracted the attention of many private players now as opposed to the monopoly maintained earlier by Government organizations.

The state of Gujarat located in the North Western part of India has a very long coastline and is not only strategically located in relation to the large Northern and Western hinterland, but also to Western, Middle East and African markets. The all weather deep draft port of Mundra in the Gulf of Kutch in Gujarat, offered scope for Greenfield planned development of port and surroundings. The promoters started to investigate the possibilities for the best choices in order to create a modern port with storage facilities, having the advantage of a large back up area for development of port based industries and support services.

It was decided to develop in-house Dredging strength without being dependent on outside agencies. The plan to reclaim huge areas of land, to make them suitable for port activities and related industries including shipbuilding, and for development of a Special Economic Zone under the new National policy, resulted in the deployment of three medium-sized cutter suction dredgers. The deepening work for the port and reclamation of huge areas of land are being taken up to support this ambitious plan.

This paper will describe how a Greenfield port based project in India is under development in close cooperation with all stake holders. The emphasis is on the dredging and reclamation works under execution, selection and operation of the dredging equipment.

Keywords: Cutter suction dredger, booster station, economy of scale, hands on training, dredging costs.

INTRODUCTION

India with a coastline of 5600 km, with twelve major ports (called major since supported by the Government), 185 minor/intermediate ports and large inland rivers, has tremendous potential for dredging. Besides the maintenance dredging for the ports, there has been over the past years several capital dredging projects at Karwar, Ennore, Paradip and Mumbai. The prestigious Sethusamudram Shipping Channel project is at present the largest dredging project in India. The 167Km channel 300m wide in the Palk Bay between Sri Lanka and India, shall shorten the sailing time between West and East coast of India. The development of inland waterways has just started to get more attention in order to reduce the intense cargo traffic by road. Shore protection and beach nourishment is another dredging activity which mainly takes place on the South East coast of India. Erosion of this part of the coast is caused by the littoral drift from South into the Bay of Bengal.

¹ General Manager – Mundra (Adani) Port, Post Bag No.1, Mundra-370421, Gujarat, India, T: +91 9825000606, Email: vinod.george@pmcprojects.com

² Area Manager – IHC Holland Merwede BV, P.O. Box 204, 3360 AE Sliedrecht, The Netherlands, T: +31-184-411555, Email: j.zandbergen@ihcholland.com



(DCI). This company is a Government undertaking under the Ministry of Shipping owning 10 Trailer Suction Hopper Dredgers and 2 Cutter Suction Dredgers with a total annual dredging capacity of approx. 75 million m³. This capacity is augmented by that offered by the international contractors who opened their offices in Delhi and Mumbai after the liberalized policies introduced in 1992. The private Indian dredging contractors also woke up to the challenge in the early nineties and started to invest in small imported dredging equipment. Few of the twelve major ports have also invested in some dredging equipment for mainly maintenance of their own ports or entrance channels.



The private dredging sector started to develop in the early 90's, after the new global market economy was introduced in India. The present private dredging companies who invested in modern equipment are: Dredging and Desiltation Co Pvt Ltd. in Calcutta with 3 cutter dredgers, AB Cursetjee & Co. in Cochin with 3 cutter dredgers, Dharti Dredging with 10 dredging units, Sanghi Cement with one medium sized cutter dredger, and Madhava Marine works with one small cutter dredger. The first Indian private Owner with TSHD is Jaisu Shipping with two medium sized dredgers of 3250 m³ and 2957 m³ and a Bucket dredger of 770 Liters. Furthermore, there are approx 15 dredging companies who work with smaller and locally built equipment.

The policy of the Major Ports with regard to their owning dredging equipment has changed over the last ten years and at this moment only Mumbai has a Grab cum Trailing Suction Dredger (1998), Calcutta has a grab dredger (1999) and Chennai Port has a modern Trailing suction hopper dredger of 1700 m³ locally built in 2004.

Many of the major industrial houses in India have showed keen interest to develop new ports and are in the process of doing so. Thus there would be an exponential demand for capital dredging works in India in the near future. Major players are pooling in their resources and entering into joint ventures to form Dredging Companies to address the task in hand.

THE STATE OF GUJARAT

With growing demands for improvements in and development of the infrastructure, the private entrepreneurs went in search of Greenfield projects. These projects were offered by various Indian States, with attractive investment schemes and tax-reduction possibilities. The State of Gujarat took the lead in the development of their state, in collaboration with the private sector.



The strategic location of Gujarat in relation to the Northern and Western hinterland of India, and to the Western, Middle East and African markets, offers this state tremendous opportunities. Initiatives of various entrepreneurs are actively supported by the State of Gujarat itself. Gujarat is a preferred destination for discerning exporters and importers from India, as well as foreign companies. Gujarat has the longest coastline (1,600km) of all the Indian states, and is dotted with 41 ports: 1 major port, 11 intermediate ports and 29 minor ports.



The Adani Group founded in 1988, and today one of the fastest growing business houses in India, developed the Port of Mundra in the Gulf of Kutch. The Group's business canvas today includes Global Trading, Ports, Power, Coal, Oil & Gas exploration, Gas distribution, Special Economic Zones etc. The biggest advantage with the Port is the extensive waterfront of almost 15 Km with the large tracts of barren land available for back up areas owned by the promoters.

The Port of Mundra, which started operations in 1998 with 4 multi purpose berths, offer more than 15 meters of permissible draft, making it the deepest water port in India, at this moment. Mundra Port is an all-weather port presently with 10 berths, 8 of which are multipurpose berths and two container berths, capable of handling Super Post Panamax and Cape size vessels. For the landing of crude oil, a Single Point Mooring (SPM) is located 9km from the shore, which can handle VLCC and ULCC tankers, to collect and deliver crude oil, without actually entering the port itself. A fleet of 5 modern tugs provides navigational assistance to vessels during berthing and unberthing and 3 more tugs are to join the fleet within 3-4 months. Two more container berths are under construction and would be ready for operation by June end this year. The future construction plans are for another 13 container berths with breakwater protection, 4 exclusive liquid jetties and 6 more coal/liquid jetties with piled approach. Emphasis is being given on development of back up areas concentrating on advanced material handling systems, safe storage facilities and logistics. The port management has ambitious plans to increase capacity from 10 million tonnes to 50 million tonnes by 2010.

DREDGING REQUIREMENT FOR THE PORT

With very ambitious expansion plans for the Mundra Port to develop it into one of the largest ports in India, and considering the large volumes of capital dredging involved, it was natural for the management to decide on the most cost effective approach to achieve the objective. With large tracts of land to be also reclaimed which could be economically done using dredged material, capital dredging was a major factor in the whole development plan. After having outsourced the initial capital dredging work, the management thought it prudent to acquire cutter suction dredgers to undertake all capital dredging work in-house. The extent of the dredging and reclamation works was estimated to be 44 million cubic meters for the first phase and 80 million cubic meters for the second phase. The estimated budget for the total work was approximately 280 million Euro.

The Adani Group had no real experience in dredging and they had to decide: **how** to execute with **what** type of equipment, the related **costs**, and **when**. This started the interaction between Adani and IHC, Holland. And this interaction was specially required for Adani with limited experience in this field and the professional support from IHC was more than welcome. In this respect it has to be mentioned that the approach of Adani Group was very open

and progressive. There was tremendous interest shown in the latest developments and experience of dredging equipment.

Adani had to deal with aspects of the question **how** like: Nautical requirements, Selection of the equipment, Workability, Environmental effects, Dredging method, Alternatives, Reclamation of the dredged material, etc. And the aspects of **costs** like: Investment costs, Operational Costs, Market situation, Design of the equipment, Financing (and foreign exchange), Quantity calculation and measurement, Capacity and production ratio, Alternative solutions, etc.

The next very important decision had to be whether to import or locally construct. In the 150 years of the existence of the European dredge building industry there have been various collaborations with local yards for construction of dredging equipment in India. Such collaboration involved delivery of the major important components like dredge pump, gear box, hydraulics, electronics, cutter assemblies, and the overall design and technical assistance. Dredgers like "Vivek" for Mumbai Port Trust, Grab Hopper "Bagha Jatin" for Kolkata Port Trust and the 1700 m³ TSHD for Chennai Port Trust are recent examples in India. In terms of delivery time it appears that import is faster than local construction. In terms of costs, it appears that the initial (calculated) costs for local construction are sometimes lower. However, this advantage is often nullified during the building period due to the unquantified costs arising from the additional time required for construction. One of the reasons for this phenomenon is the fact that dredge building is totally different from shipbuilding and requires an absolutely different project-oriented approach and logistics. If the global market for dredge building is compared with shipbuilding, it may be clear that dredge building represents a very small market segment which is dominated by the specialized dredge building yards. These yards work with a team of sub-contractors who are in turn specialized with their products to fit into the technical requirements and logistics of dredge building. After considerable deliberations, Adani decided to initially order two medium sized cutter suction dredgers, both of 20 m dredging depth in Jan/Feb 2005 - one from IHC Holland and the other from a local yard in collaboration with Damen Shipyards, Holland.

THE WORK AT MUNDRA

Besides dredging to create depths required for the necessary navigational channels in line with the expansion plans of the port, the dredged material (mostly sand) was to be used for reclaiming huge areas of land, to make them suitable for port back up yard activities and development of a Special Economic Zone(SEZ). Mundra SEZ is one of the largest notified by the Government of India, to be developed across an estimated 100 sq km, for which land has already been acquired. The area makes it perfect for mega projects as large parcels of land is being developed and put out on offer which would house various production plants and with in-zone facilities could ship their products to overseas markets at reduced costs.

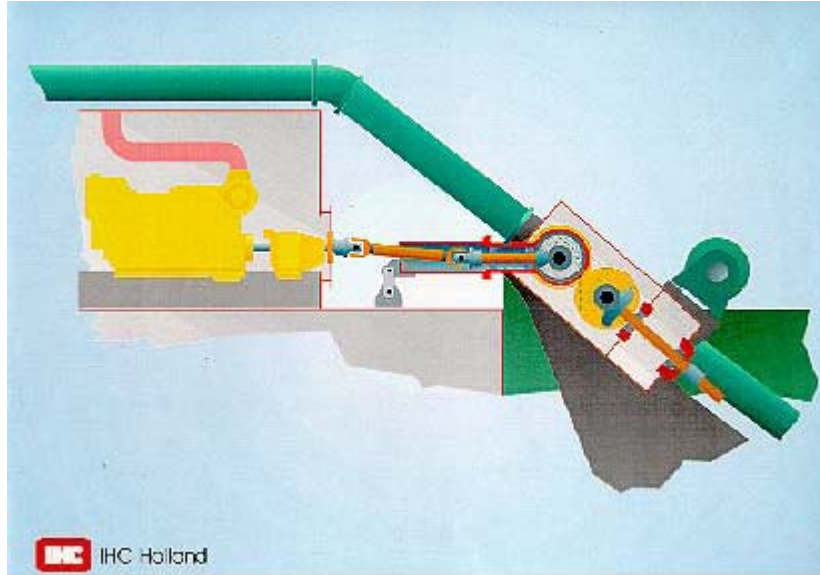
An airstrip 1800 m long has already constructed within the SEZ and is being further extended to accommodate commercial flights. This airstrip with additional rail links shall greatly improve connectivity. Power plants with capacity of 6000 MW is sanctioned and coming up in the vicinity, besides large crude oil tank farms to be connected to the Northern hinterland and plans for a shipyard and heavy engineering facility.

In this part of India, the tidal difference ranges between 7 and 10 metres, and at high tide large areas get flooded since the coastal areas of this land are low lying and are not protected by dykes. Thus, an additional 2 to 2.5 metres of soil must be filled to enable utilization and this can be best achieved through dredging and reclamation. Thus the two dredgers were ordered with additional booster pumps, to enable transportation of the material dredged, over greater distances. The dredged material is mainly sand, with some clay content, and to ensure efficient working, a high density mixture was required.

The total volumes to be dredged and reclaimed, based on the present development plans of the port, is estimated at 44.0 million m³ for the first phase. For reclamation, material has to be transported to a maximum distance of 6-7 Kms using the 650mm pipeline from dredging area. Reclamation is being done through hydraulic filling through extension of discharge pipe, and by containing the material at the discharge area using dykes constructed with the existing material at site. Water boxes (weir arrangement) are being installed across the dykes to regulate draining off the excess water. This process ensures adequate compaction without further engineering efforts at the reclamation site, enabling utilization for further construction.

THE IHC 6520C DREDGER AND BOOSTER

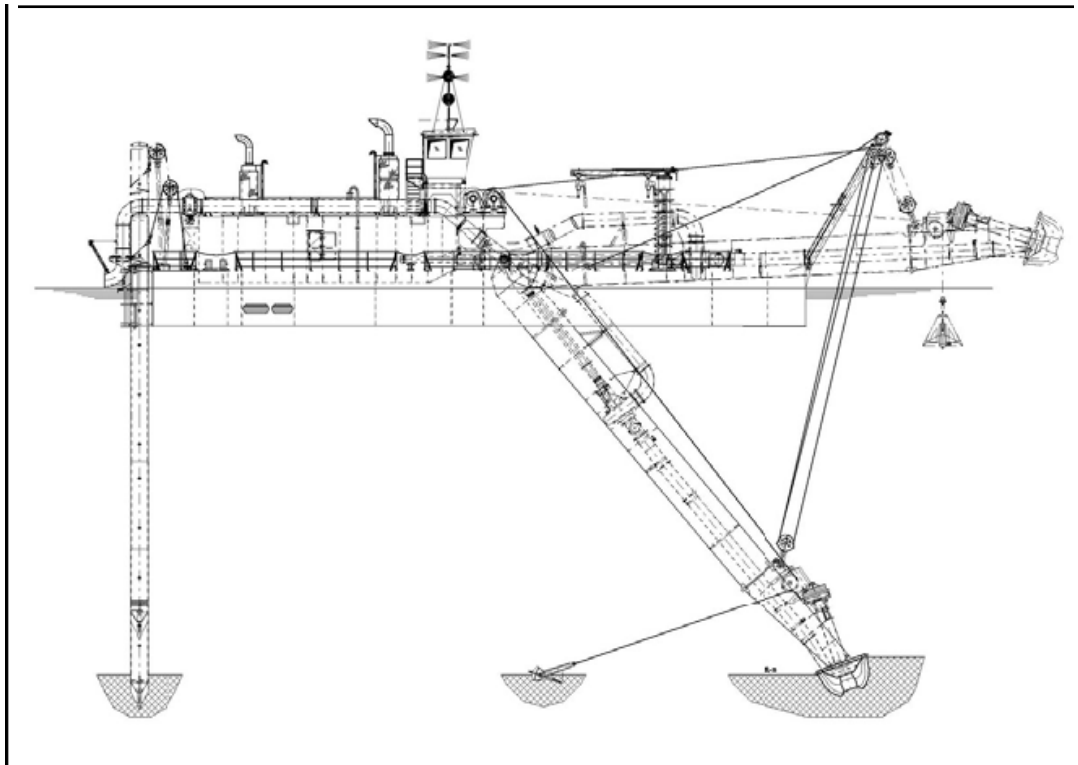
For dredging jobs of this kind, it appeared that the most suitable dredgers in terms of overall efficiency were the new generation cutter suction dredgers. The high efficiency underwater dredge pump, connected with the patented Pivoting Gear Box via a carbon shaft, and the fuel-efficient caterpillar diesel engine offer the ultimate in dredging efficiency, particularly at the dredging depths necessary for the Mundra Port works.

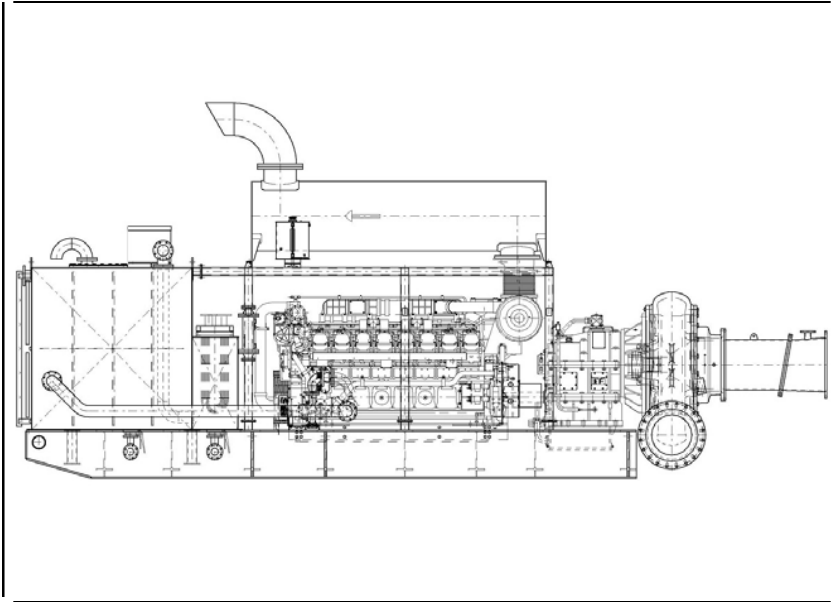


Nonetheless, Adani entrusted the initial dredging work to the tried and tested technology of conventional cutter suction dredgers. However, having visited the IHC yard in the Netherlands, and following a series of technical presentations in India, which demonstrated the advantages of high density and less fuel consumption, the decision was taken to procure a new generation IHC Beaver Cutter Suction Dredger. The contract for a single IHC Beaver 6520C and one booster station was signed on 12 January 2005. Adani opted for a land based booster station which gave greater flexibility for the large reclamation works on hand at varying distances from the dredging area.



On 1 August 2005 (just six and a half months later) the dredger and booster station arrived at the Port of Mundra. This extremely short construction and delivery time, and rapid shipping from Holland to Mundra Port amazed the customer. Additional work had to be hurriedly completed at site, to enable start of dredging operations.





WORK DONE WITH FIRST DREDGER IHC 6520C

Actual full time dredging work with this first dredger at the Mundra Port started on 27 September 2005. Adani has been working round the clock since then and as 31 January 2007 about 10.32 million m³ has been already dredged with an average production of about 0.65 million m³ per month. Adani management and the crew of the dredger are very satisfied with both production and ease of operations with this IHC Dredger. More importantly, the response of IHC whenever there was a need for expert technical input or advice has been very prompt and positive, contributing to minimum downtime during this period of work. A close one to one relationship has been established due to the frequent interaction between the dredger supplying and operating team at both ends. The physical large distance has been no barrier to speedy resolution of any of the issues that have come up during and after the mandatory warranty period. The serious interest and professional approach demonstrated by the dredging department at Adani and the positive support provided by the builder has clearly contributed to the success of this dredging and reclamation project, still has many more millions of cubic meters to go.



COST OF DREDGING WITH IHC 6520C

The cost of dredging and reclamation has been a big advantage with this new generation cutter suction dredger. This dredger has been able to dredge comfortably without a booster to about 3.0 Km with very high efficiency. The land based booster has been put to use for greater distances enabling good production up to 7 Km. The fuel consumption has been about 0.35 ltrs/cum without booster and about 0.65 lts/cum with booster. The other operational costs are also proportionately very much lesser due to the high production. With adequate spares support and proper timely maintenance, downtime has been kept to the minimum, ensuring higher long term production, and thus achieving better overall returns for the investments made. A detailed statistical analysis of the production, fuel consumption and working with the Dredger 6520 C is enclosed for ready reference.

Comparison fuel consumption of a conventional Beaver 1600 cutter suction dredger and a New Generation Beaver 5014C		
Items	Beaver 1600	Beaver 5014C
Sandpump diesel engine	Cat 3512 mechanical	Cat 3508 B
Power (kW)	954	746
Fuelconsumption (grams/kWh)	218	202
Auxiliary diesel engine	Cat 3406 IND	Cat 3406 MAR
Power (kW)	301	322
Fuelconsumption (grams/kWh)	208	208
Total fuelconsumption at 100% sandpump power and 75 % auxiliary power (kg/h)	255	201
Production in medium fine sand at 2500 m (m ³ /h)	550	550
Savings in fuel per m ³ of sand	-	21%
Production in medium fine sand at 200 m (m ³ /h)	820	1400
Savings in fuel per m ³ of sand	-	54%

OTHER DREDGERS BEING DEPLOYED AT MUNDRA

Adani is presently deploying 2 more dredgers with similar capacities at the Mundra Port to take on the large volume of dredging work identified. Similar capacity dredgers have been chosen keeping in mind utilization of same pipelines of 650 internal diameter, considering the long disposal distances and resultant available flexibility. Greater capacity dredgers were ruled out since the fill levels at the reclamation sites are less, and with higher capacities hydraulic fill would have been slow involving frequent advancement of discharge pipe end. One of the dredgers out of the two selected is again a similar new generation IHC Dredger but with 25 m dredging depth. The other was made at a local yard in India in collaboration with Damen Shipyards, Holland. With these 3 cutter suction dredgers, the annual capital dredging capacity at the Port would be more than 20 million M3 and all this material would be utilized for filling the adjacent low lying lands for the planned development of the Port.

TRAINING

As this was the first dredger supplied to Adani, an experienced dredge master to assist and train the crew in handling the vessel assisted the operational team. This assistance was spread over two separate periods of seven weeks. After the initial seven weeks of training, the crew was left to acquire their experience over a period of three months, before the second seven-week period started in January 2006. The hands-on training provided by an experienced dredge master was received very positively by the crew and operating staff of the dredger. This positive approach was also reflected in the performance and maintenance of the dredger- after all, an efficient dredger, well-crewed, is the best possible combination.



CONCLUSIONS

Where Governments do not directly get involved in developing infrastructure facilities by constructing and providing channels, ports, quays and jetties, the entrepreneur finds ways to execute the work. The interesting part in this case is the fact that a Company who was initially a port operator has now also become a dredge operator. Adani's had recruited and trained an in-house team to man and operate the dredgers and have managed to sustain their morale dedication and loyalty in the buoyant Indian dredging market. Besides the good operational team, prompt response and positive support provided by IHC Holland during this initial phase is laudable. The key to success was thus an excellent combination of the type of dredging work, a new generation type of dredger meeting exactly the requirements of the work at Mundra Port, the operational team around the dredger and the post delivery support and commitment. Thus this strategic decision to become also a dredge operator has paid off with excellent returns as amply demonstrated by the performance of the new generation dredger, manned and operated now for about 1,5 years at the Port, with the lowest costs per cubic meter of material dredged.

REFERENCES

- Elshout, J.van den. (1997.) Novel Techniques for Lowering Operational Costs of small Standardised Stationary Dredgers.
Zandbergen, J. (2003) Before Dredging Starts. EADA Mumbai.