Adani Ports and Special Economic Zone

The Adani Group started as a trading house in 1988, operated by only one man with a great vision, Gautam Adani. Since then it has grown to become one of India’s most trusted and fastest growing conglomerates with diverse ventures spanning commodity trading, the development of infrastructure and energy. Its businesses include coal trading, coal mining, oil and gas exploration, ports, multi-modal logistics, power generation and transmission, and gas distribution.

The Adani Group is India’s leading private coal importer, ports operator, thermal power producer and edible oil producer – the latter activity is through a joint venture with Singapore’s Wilmar. Over the years, the group has moved from trading to infrastructure to integration of resources, logistics and energy. Adani’s integrated model is well adapted to the infrastructure challenges of rapidly developing countries such as India. It offers security of supply for coal and other essential imports, while mitigating price and political risk. Integration multiplies the benefits for synergies and economies of scale, both for Adani and its customers.

Some of the Adani Group’s key statistics for 2011 include: approximately 36mm t of coal imported; 54mm t of cargo handled; and 4,660MW of generation capacity. Revenues amounted over $4 billion and the company employs approximately 8,000 people. All these figures are expected to experience double-digit increases by 2020, due to, among other factors, global expansion. The company’s growth has always been accompanied by a sense of responsibility. So it takes care to reinvest in protecting and developing the communities within which it operates.

For the purpose of IFC Merewether Insight, the Adani Group’s most interesting activity is the Adani Ports and Special Economic Zone Ltd (APSEZ), former Mundra Port and Special Economic Zone Ltd, on the west coast of India. In this zone, the group is the sole developer and operator. A total of 95% of India’s international trade comes through its ports. Mundra benefits from deep draft, first-class infrastructure and SEZ status. It is connected via road, railway and pipelines to the economic heartlands of north and west India. Adani is planning five other ports in India and Australia, aiming to increase annual cargo handling capacity from 64mm t to 208mm t by 2020.

In the SEZ, the company encourages a walk-to-work culture and is trying to enhance the quality of life for the growing middle-class of the area, with amenities like a shopping mall, community centre, library, swimming pool, sports arena, resorts, golf course, eateries, hotels, etc [1].

As the main developer and operator of such a large port, the Adani Group faces the challenge of dredging. After surveying the market, it opted for IFC Beam® dredgers with their high production rates and benefits at the lowest energy consumption levels and the lowest cost per cubic metre of sand reclaimed.
Innovative vessels

The IHC Beavers manufactured for the Adani Group meet some specific requirements. They are suitable for different dredging depths and discharge distances, for example, and they can cope with densely compacted sand and high abrasiveness associated with the presence of silt and very hard soil spots. By 2011, Adani had no fewer than eight IHC Beaver® 65s, one IHC Beaver® 75 and four IHC Beaver® 1,000 Kw booster stations in successful operation (figure 1) [2].

The appropriate dredger
Since 2010 the plans to further develop the West Port of Munsta have gradually come into realisation (figure 2). The West Port will be developed as a break bulk cargo port for material like coal and iron ore. Three berth pockets have already been constructed at the right side of the harbour. Six berths need to be constructed on this side within the next three years where presently the first two berths are operational.

The basin of the first two berths has already been dredged to an average of -14.7m chart datum (CD). At the third berth, the water depth is still -12.5m CD. The plan is to dredge the basin near the first three berths up to a depth of -15m CD and -21m CD at the berth pockets. The water depth at the first two berths is already -18m CD. The total surface to be dredged is about 1,180 x 900m.

Analysis of soil reports suggested that the intended depths and the existence of a consistent and thick layer of sandstone and clay would make working with the existing fleet less effective.

Therefore, Adani will benefit from its new dredger (figure 2), which was ordered from IHC Merwede in June 2010. The SHANTI SAGAR XVI was built at the IHC Beaver Dredgers yard in Sliedrecht, launched 6 December 2011 (figures 4-5) and delivered May 2012. Delivery was accomplished by the supply of a substantial length of IHC Ports & Services’ newly developed floating pipelines (see page 26 in this issue) and a TID training programme for key personnel.

The SHANTI SAGAR XVI is a member of the successful IHC Beaver® 9029 family (figure 4). Similar vessels have previously been supplied to Chinese dredging contractor Sinotrans and to the Panama Canal Authorities (see references [3, 4] for more details). The principal features of these versatile dredgers can be summarised as follows:

• non-propelled mono pontoon vessel with well-balanced cutter power versus pump power for multipurpose dredging and extremely competitive high soil production figures
• high efficiency, good fuel consumption figures, easy maintenance, high availability
• electrically driven cutter and high-efficiency submerged dredge pump on the cutter ladder
• two diesel-direct high-efficiency driven double-walled inboard dredge pumps, located on deck for easy maintenance and to prevent the risk of flooding
• isomastic suction and discharge pipes, inner diameter 900mm
• electrically driven swing winches, anchor hoisting winches and anchor boom winches
• hydraulically operated spuds, tiltable by own means: fixed auxiliary spud, main spud in spud carriage
• equipped with high-level dredging instrumentation and automation
• application of proven modern materials
• completely tested and attested dredging performance before delivery.

Electric installation
IHC Drives & Automation (IHC D&A) has standardised and integrated all electrical equipment provided internally by IHC Merwede, such as generators, main switchboard, electric control of the cutter, submerged pump and winch drive motors by air-cooled and water-cooled variable frequency drives (VFD), as well as the alarm and monitoring system. IHC D&A visibility in particular distinguish themselves (figure 7) from the competition by:

• proven electronic switching (IGBT) units
• integration of the sophisticated water cooling system in the vessel’s cooling system
• modular layout for the entire frequency drives series
• seamless interface with the dredging automation makes available all relevant drive and machine data throughout the vessel
• dust-proof housing – the drives can be located in ‘dirty’ rooms
• possibility to install in warm locations because of internal cabinet cooling
• integration in the construction process of the vessel, ITER delivery of plug-in modules, making expensive cleaning operations before commissioning superfluous.

All systems were fully integrated with the dredging automation and control system, and the complete electric installation.

Dredging automation
The SHANTI SAGAR XVI has been equipped with an extensive dredging instrumentation and automation package from IHC Systems. Not only the usual depth and position measurements (DPM function) were installed, but also a dredge track presentation system (DTPS) and an Automatic Cutter Controller (ACC®).
Innovative vessels

DPM collects the signals of the position measurements of the ladder, ladder trunnion, spud carrier and DSS’s gms. DTPS is used to enable the dredger operator to see the dredger and cutting tool in side, back and plan view, in the profile to be dredged, related to actual geographic coordinates. The bathymetric electronic is updated by the cuts the cutter has actually made. The system uses the on-board position measurements and couples it to positioning information from DGPS and sophisticated presentation techniques.

As to the IHC Systems ACC® operators of cutter suction dredgers continuously juggle numerous operators, such as the swing movements in relation to the anchor positions and the desired dredging depth/profile, the cutting and pumping processes and the field of forces around the spud carrier. In addition to managing all of these factors, the operators have to maintain high production rates throughout the shift. And on top of managing this ‘technical’ interchange, they also need eyes in the back of their heads to watch out for passing traffic. It’s a daunting challenge.

The ACC® relieves at least three of these headaches (Figure 2). It includes an array of instrumentation, hard- and software, presentations, functional and operational facilities that allow operators to divert their attention from the stressful – and sometimes monotonous – tasks and to concentrate on the efficient functioning of the dredger and the output of the process as a whole.

So the ACC® is a practical tool for less experienced operators, allowing them to make a success of the job. More experienced operators can achieve major yield improvements with the ACC®, as much as 30% in optimum circumstances. The corresponding reduction in mental pressure helps to facilitate the easy monitoring of traffic, which results in improved safety.

The ACC® monitors and controls the individual processes and the links between them unerringly. It establishes the best combination using conventional control methods and – even more importantly – Artificial Intelligence (AI) and Model Based Control (MBC).

The soil mechanics expertise supplied by IHC Merweva’s research institute MFI Holland, and the operational and technical experience with IHC Systems’ dynamic CSD training simulators, were also called upon to maximise dredger performance and optimise dredger processes at the lowest possible cost. Installing the ACC® results in major reductions in fuel costs, subsequent emissions, and wear and tear.

Finally...

SHANTI SAGAR, the common name of all Adani Group dredgers, is derived from words in the Sanskrit language of the classical Indian civilization. Shanti (a sanskrit) can mean ‘tranquility’, ‘peace’ or ‘bliss’; a state of satisfaction, happiness and joy; and sagar is the word for ‘sea’. SHANTI SAGAR subsequently denotes ideas of tranquility at sea, peace at sea, sea-peace, sea-bles, happiness at sea, calmness at sea (Figure 3). It is an inspiring name.

<table>
<thead>
<tr>
<th>Principal characteristics SHANTI SAGAR II</th>
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<tbody>
<tr>
<td>Rail</td>
<td>IHC Bower Design, Netherlands</td>
</tr>
<tr>
<td>Length overall</td>
<td>600.0 ft</td>
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<tr>
<td>Beam overall</td>
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<tr>
<td>Length overall (cut)</td>
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<tr>
<td>Length beam</td>
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<tr>
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<td>Max draught</td>
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<tr>
<td>Depth draft</td>
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<td>Self propulsion</td>
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<td>Self propulsion (cut)</td>
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<td>Generator</td>
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<td>Main propulsion (cut)</td>
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<td>Unit of fuel</td>
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<tr>
<td>Total accommodation</td>
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