THE DUQM NAVAL DOCKYARD – A NAVAL YARD FOR OMAN

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Synopsis

The creation of the Duqm Naval Dockyard (DND) Joint Venture between Babcock International Group and the Oman Drydock Company (ODC) in November 2016 was quickly followed by company incorporation in June 2017.

DND combines the well-honed skill sets of ODC and Babcock to establish a focussed warship repair and maintenance facility within the broader commercial Port of Duqm. The latter serves as a secure logistics and supply hub in a deep water port adjacent to the dockyard. Thus, in one location, Duqm provides the facilities of both a naval base and a naval dockyard. This combination has been successfully tested through a number of contracts to date, and the UK-Omani bilateral defence exercise, Saif Sareea, in the autumn of 2018, successfully tested the UK's concept of 'Defence Hub Duqm'.

In the last 6 months, both the UK , and the US Governments have signed Defence and Strategic agreements with the Sultanate which specifically mention the importance of a repair and logistics hub at Duqm.

The dockyard has state of the art infrastructure, with two graving docks capable of docking Ultra Large Crude Carriers and Warships. Since June 2017, DND has completed a number of successful and complex repairs on warships and auxiliaries from both the USN and the RN, including the complex drydocking and repair of a US Military Sealift Command aluminium catamaran.

DND is now being looked at by a number of navies as an ideal maintenance and repair hub for their operations in the Middle East and beyond. A deep-water, purpose built facility, Duqm sits astride the 'Global Energy Interstate' of the Indian Ocean and Gulf. Ships utilising Duqm can access the Straits of Hormuz, the Bab El Mendaab and Gulf of Aden, and the East African seaboard with ease. Equally, ships at Duqm have easy access to the Gulf of Arabia without being tied to maintenance and repair facilities within the Gulf itself. The location of the port also offers unrivalled force protection and security for visiting warships.

Looking ahead, the intention for both ODC and DND is to embark on a shipbuilding programme at the repair yard, to include the construction of offshore support vessels and warships. This will be the first such facility in the Sultanate, and aligns with the latter's Five Pillars of Economic Diversification , in which Duqm (and SEZAD) will play such an important part.

1. Background

Fig 1: Oman Drydock (viewed from the west)(Courtesy of ODC)

ODC, a government owned commercial dockyard company stood up for operations in 2011, the first entity to achieve operational capability at Duqm. It has therefore been in the van of the Sultanate's drive to establish an economic zone under the auspices of SEZAD.

With two of the largest graving docks in the Middle East, supported by a full suite of workshops, the

 http://doi.org/10.24868/icmet.oman.2019.021

company was in a good position to exploit the commercial ship repair market demand in the region. Notwithstanding the remote location of the dockyard, the geo-strategic advantages of sitting outside the Gulf of Arabia quickly proved themselves. The company has undertaken over 600 repair contracts to date.

However, it also became apparent that, with the geostrategic location already referred to, the company could also tap into the significant market, both in numbers and value, represented by the large international naval presence in the Middle East, notably that of the US.

In order to do this, ODC needed an established naval engineering company, with a strong pedigree of international warship and naval auxiliary maintenance, repair and overhaul (MRO). Talks between ODC and Babcock International Group commenced in 2015, leading to the signing of a UK-Omani government endorsed MOUi in March 2016. The MOU established a Joint Venture between the two companies, named the Duqm Naval Dockyard (DND). In June 2017 DND was formally incorporated as an Omani company, winning its first contract with the US Navy only two months later.

The DND JV sets out the terms of the relationship between the two parent companies and the modus operandi for DND's operations. DND subcontracts ODC and Babcock to provide labour, materials, engineering support, and other resources to enable the company to pursue the addressable naval market in the region with the 3 core customers being the US Navy, the Royal Navy of Oman and the Royal Navy .

The DND programme and engineering management team is a small entity in terms of personnel. There are, effectively, 5 personnel directly employed: Programme Manager, Project Manager, Supply Chain Manager, Bid Manager and BD Manager. This 'light footprint' is achievable through both the utilisation of ODC's resources, as well as the engineering, survey and design expertise provided by Babcock. The latter, a 35,000 strong UK-based, international engineering company, has a strong pedigree of major warship and engineering contracts with the UK MOD and has an annual turnover of circa $5BN.

2. The Utility of Duqm

Fig 2: Duqm's strategic location showing Sea Lines of Communication

If one looks at a map of the Middle East, focussing on the key sea lines of communication along which much of the world's oil and gas is transported, it becomes immediately obvious that there are several key strategic and navigational choke points, the most notable being the Straits of Hormuz.

Given that the freedom of navigation of these sea lines of communication has for long been high on the list of many countries' security priorities, it is no surprise that a significant number of warship and support ships are present in the area, operating under a national mandate or as part of a coalition. Such ships are complex, but are expected to spend significant periods at sea. Inevitably, engineering and dockyard support to these vessels is key to their operational capability, and finding the right dockyard to match the ship's operating area is not always easy. Prior to the establishment of Duqm, the key dockyards able to support international navies all resided in the Gulf of Arabia, thus requiring ships to transit through the Straits of Hormuz. With Duqm, navies are no longer required to do this, and both the UK and the US have recognised this and have established Defence and Strategic agreements with the Sultanate, in part to tap into the geostrategic benefits of Duqm's location.

As stated in the introduction, Duqm is in a remote location, but in reality it is well-served by reliable daily flights, new road links, and obviously the Port itself, ensuring a credible and efficient supply chain. For militaries, the remote location offers unrivalled security and force protection, particularly when contrasted with the highly urbanised location of dockyards inside the Gulf.

Duqm therefore provides an up-to-date, complex engineering support base, outside the Gulf, offering freedom of manoeuvre and flexibility within a secure location – highly attractive to international navies.

3. Operating Principles

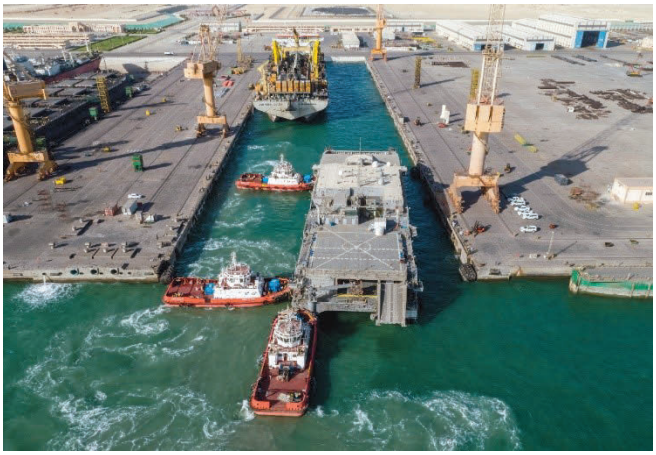

Fig 3: USNS Choctaw County enters No 2 Dock, ODC (April 2019)(Courtesy of ODC and US Navy 5th Fleet)

3.1 Commercial v Naval Project Management

There are some key differences between Commercial Project Management and Naval Project Management when undertaking Maintenance, Repair and Overhaul (MRO) contracts. Commercial MRO, less constrained by complex multi-path scheduling, seeks to achieve swift throughput, and often with the number of work instructions diminishing over the course of the repair as the owners seek early completion to return the ship to core tasking.

Warship MRO tends to take longer, is more complex, is subject to higher levels of customer oversight and scrutiny, and can often result in work instruction growth (variation orders) over the course of the repair period. Dockings are longer, and more demanding.

The other big difference is the crew. There are relatively few members of a commercial crew to worry about but a warship can have several hundred crew members all requiring ventilation, lighting, power, habitability systems, food, etc.

3.2 Estimation

Familiarity with naval estimating is crucial as this area diverges markedly from its commercial counterpart. Commercial vessels rarely have to account for tight enclosed access, difficult shipping routes (movement of large pieces of kit within the hull), strict HSSE rules, crew interaction and the imposition of naval standards required in every task. Experience and detailed knowledge are required to correctly estimate each and every move that will be required. Like for like commercial and Naval projects will differ by at least +50% on a warship because of this.

3.3. Procurement

Commercial projects often bring the basic materials or equipment needed over a repair period but they leave the rest of the repair to the yard to source and supply. This can often result in reduced quality or delayed arrival of equipment. It may also need system modifications to fully integrate a new piece of equipment into the old system. Configuration management becomes a constant battle. However, early letting of a contract that aligns with the commercial activities of the vessel will usually result in materials being located, procured and delivered on time to the shipyard.

Naval vessels bring complexity. Government operational and planning entities cannot tell you for sure when they will be arriving, but there's invariably an assumption that it will be soon, and that their MRO package will be given the highest priority. This means that the yard's Sales and Operational Planning process needs to be agile in response to last minute supply chain demands, as well as accepting the need for dockyard storage of items with a long-lead time to procure.

Navies have very strict configuration control, demanding a specific type of spare and no other. They will specify where you can obtain these spares or services, which in turn might infringe ISO 900 guidelines, which require the contractor to obtain additional quotes. There will, for example, be security considerations to factor in, as well as stringent certification and vetting procedures. Due diligence procedures to prepare for a naval customer can be demanding.

Some vessels require complete magnetic hygiene to be observed in both spares and equipment supplied and in the tooling used by contractors; all this adds to the expense and complexity.

3.4 Scheduling

Although a 200,000 ton vessel looks big, its work package may consist of just 3 core work items, which might cover underwater hull maintenance such as blasting, painting, and inspecting, and repairing underwater valves. There may be other minor repair or inspection items planned but a vessel this size can normally be fully completed within 14 to 18 days. The owner may have a superintendent on site to ensure the yard completes

all tasks to his satisfaction. Scheduling a project of this size is relatively easy with so few resource departments involved and materials being supplied early. A schedule of circa 80 lines may be produced.

Naval vessel mid-sized projects tend to have several hundred lines that all interlink. The crew considerations limit working times, the difficulties in delivery of spares or services with such short lead times is always a challenge. Access to the vessel is not always guaranteed due to security considerations. Crew inspection and sign off of every task is a coordination juggling act.

The only way to maintain control of this type of project is for the Project manager to meet with all resource department managers, the crew and the Port Engineers every morning to discuss the plan of the day. Constant shifting of items must be tracked, logic interactions must be known, logic and human conflicts mitigated and total timelines assessed. A relatively small MRO package will have circa 450 lines.

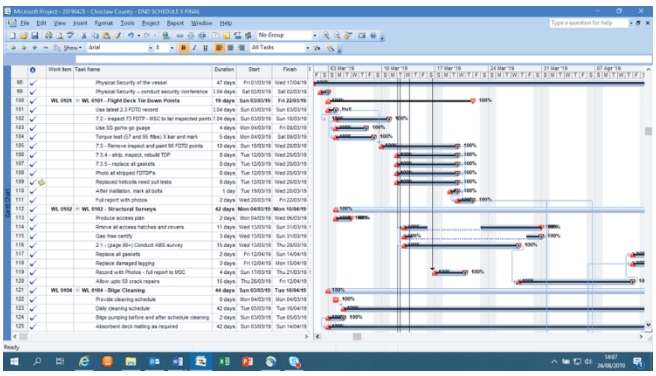

Fig 4: Extract from a Logic Linked Workflow for typical project

Walk through a "simple" task. Let's say we have a defective system valve on the Heating Ventilation and Air Conditioning (HVAC) sea cooling water system. Take it out, mend it, and put it back in - simple, right?

1. Have you got the spare parts and are they onsite ready to be used?
2. The crew must isolate the HVAC plant.
3. Is there enough cooling around the ship to keep the crew comfortable? If not, hire in a temporary plant and rig it to the ships system?
4. How do you ensure essential and temperature-sensitive combat systems are cooled?
5. When the sea water system is isolated (how many valves does that take?), does it really stop water coming in?
6. Can the underwater inlets safely be blocked by divers? If not, can the ship be docked down? If it can, where are you going to put the crew as there will be no services inside the ship (sewage A/C etc.)? Can the operational commander sanction a vessel being out of operational use for a docked period?
7. If the water has stopped coming through the vent, start to remove the valve.
8. There will be a further 8 tasks and inspections to itemise if all goes well.

You can see that what started out as a simple task could quickly escalate to docking the vessel down. The Project manager will anticipate all these questions and logic interactions as he starts to plan a complex project like this.

Commercial dockings rarely exceed the scheduled docking periods, enabling the dockyard to prepare its docking schedule months in advance. The additional complexity inherent in a warship docking can lead to 'growth' and thus the need for flexible dock planning and an acceptance of occasional disruption to scheduled docking periods. By way of example, a recent MRO package on a US Naval vessel encountered hull plating defects in 2 consecutive docking periods, which resulted in it extending from 14 planned days in dock to 56 days. That could be significantly disruptive to a busy yard's 'normal' dock cycle.

Unlike a commercial project, the naval project must provide a myriad of reports for every single task completed. Each task is recorded with the work spec, initial survey reports, yard and port engineer recommendations, close up reports, testing reports, certificates of origin, certificates of conformity, certificates of calibration, certificates of qualification and a completion certificate. All of these must be checked for potential breaches of International Traffic in Arms Regulations (ITAR) and Export Administration Regulations (EAR) as well as against one's own Business Management System. All this admin must be costed into the project estimation, that goes back to a naval estimators experience.

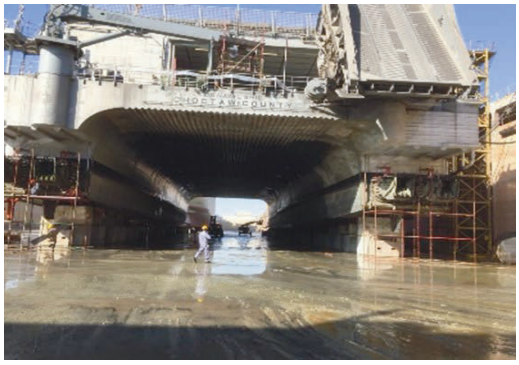

Fig 5: USNS Choctaw County in No. 2 Dock, ODC (courtesy of ODC and US Navy, 5th Fleet)

4. Working in a Joint Venture

With any JV there needs to be sufficient underlining mutual benefit to both parties, a common aim, and unity of purpose. Equally, both parties need to accept an inevitable bedding in period, particularly when a JV takes either or both of the parties outside their normal operating envelope. Each party will have views on business process, commercial practice and resource allocation. DND was lucky that, from the outset, there was not only mutual agreement on the form of the JV, but significant governmental endorsement from both the Sultanate and from the UK's MOD and Department for International Trade.

For both sides, the DND JV has taken them out of their comfort zones. ODC has entered into the hitherto less well understood world of military contracting, with all the additional checks and controls that come with it. Babcock has entered a commercial yard and has had to adjust to a commercial tempo, used as it normally is to longer term, warship-specific contracting in its two 'military' dockyards in the UK (Devonport and Rosyth).

ODC work with a supply chain (estimation, procurement, warehousing, transportation etc.) best suited to their core business with commercial vessels. DND need a tight, information heavy supply chain so as to manage complex schedules effectively. Alongside ODC's commercial imperative, DND needs total quality assurance of every item or service, regardless of cost. The JV staff (DND) must at all times be sensitive to both cultures, the ultimate aim being to deliver a quality product, keep the customers happy, and bring in revenue for both parent companies.

5. The Future

Fig 6: Build yard for the Irish OPV project, UK (courtesy of Babcock)

DND, having established itself with a core customer base, and with a 60% win rate on bidded contracts, must now look to the next step in its business plan for growth, namely shipbuilding. ODC is also keen to embark on commercial small ship building and the two markets need to be catered for in one facility. Within both SEZAD and the wider Sultanate, under the auspices of the Five Pillars of Economic Diversification, there is much interest in establishing a manufacturing base at Duqm. The advantages are obvious:

In-country value: if you build your own warships (and other vessels), the investment stays in Oman. For example, a 4 Corvette replacement programme could cost anything between $300 – $600 million. Spending that amount of money offshore makes little sense if the same product can be built indigenously.

Upskilling of trades. The Oman government is rightly focussed on enhancing the technical skill base of its population, and a ship manufacturing industry is an obvious and beneficial way of achieving this.

A build facility gives Oman the potential to tap into a wide addressable market of not only warships, but offshore support vessels, tugs, fishing vessels, coastguard cutters and offshore oil and gas installations.

Undoubtedly there will be challenges – there is no build facility at ODC as yet, and installing one will take time and will involve substantial capital expenditure. But there is significant experience of shipbuilding already available to DND via Babcock's build yards in the UK. It is timely that, with the recent preferred bidder announcement that the UK's Type 31 Frigate will be built by Babcock at its Rosyth facility in Scotland, there will be a build model that can be relatively easily replicated

at Duqm. DND can tap into a huge team of design engineers, programming and scheduling experts and marine consultants, effectively 'in-house'.

3. Conclusion

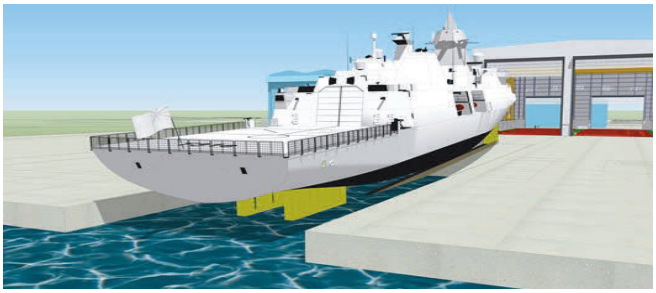

Fig 7: Slipway Build

The JV described is now embarking on its third year of operations. Its future success will depend on a number of factors, including continuance of the addressable warship market, continued shared understanding between the parties, the success of SEZAD, growth within the Omani economy, the proper application of tight business process, and learning from experience. In no particular order, here are some of the lessons:

Forming a specialist naval repair entity within a commercial yard takes time, flexibility and full recognition of both parties' issues, strengths and weaknesses. Early predictions of growth were over-estimated, and there was, perhaps, an over-optimistic assessment of how quickly military v commercial working practices could be integrated. It's taken longer than expected, but studies of other JVs suggest that this is not uncommon.

Docking contracts and repair periods, as well as the amount of hands on programme management, vary significantly between commercial and military contracts. Supply chain, OEM and subcon stipulations and caveats from a military customer look bureaucratic and complex to a commercial operator. But there's a reason for it, and the customers' requirements have to be met if the yard hopes to capture a meaningful percentage of the addressable market.

Dock usage and dock programming between military and commercial projects can introduce healthy friction into the business: the commercial yard wants high turnover and maximum sweating of the drydocks. The military element may often demand docking periods that conflict with the rapid turnover required by their commercial partner. And the military customer is not always as forthcoming on when ship arrival might be. Neither can 'growth' within a naval contract be ruled out – invariably it's a given, and must be factored in. But with proper transparency and shared ownership of the docking conundrum, scheduling conflicts can be overcome (e.g. is the military costumer prepared to share the dock with a commercial ship?).

Flexibility in the application of business process. What might be normal practice with one partner might seem unnecessary or nugatory to the other. Regular exposure of requirements and clear recognition of what is essential and what is not are important to achieve unity of purpose.

DND is a slow burn project but has successfully combined the skillsets and resources of two companies to achieve steady growth in its first two years of operation and a positive outlook. Operationally it has achieved much in two years from a standing start. From a governance perspective it inevitably takes time for the parties involved to achieve a seamless unity of purpose that spans both commercial and government/military contracting. Politically, there is much riding on its success - despite the current small scale nature of the enterprise, both the UK and the Omani governments see significant benefits: foreign direct investment, upskilling of the workforce, and a secure and reliable repair hub for their warships. The US government also has significant interest in the dockyard and port complex and will undoubtedly be looking to enhance Duqm's facilities following the signing of the US-Omani Strategic Framework Agreement earlier this year.

Having competed successfully for US and UK naval contracts, and having proven the business process and the ability to deliver complex engineering projects on time and to cost, DND is now addressing the prospect of a build capacity at Duqm. The opportunity of offering a manufacturing capability in warship construction within Oman is beginning to gain traction with Ministries charged with the implementation of the Sultanate's Five Pillars of Economic Diversification.

The main body of the text should end with a concluding section to bring the main text to a close. This should summarize the results/major findings of the work reported in the paper in a logical manner and should include any recommendations made by the author.

Acknowledgments

Figure 1: with approval of Oman Drydock Company

Figure 2: with approval of Babcock International Group, Graphics

Figure 3: with approval of Oman Drydock Company and US Navy

Figure 4: with approval of Duqm Naval Dockyard

Figure 5: with approval of Oman Drydock Company and US Navy

Figure 6: with approval of Babcock International Group, Graphics

Figure 7: with approval of Babcock International Group, Graphics

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