NANYANG TECHNOLOGICAL UNIVERSITY
Nanyang Business School

ASIACASE.COM
THE ASIAN BUSINESS CASE CENTRE

# KEPPEL OFFSHORE & MARINE – RIDING THE WAVES OF CHANGE

Publication No: ABCC-2007-007
Print copy version: 12 Oct 2007

*Wee Beng Geok and Ivy Buche*

*As offshore oil exploration and production raced ahead to meet rising global demand for oil, Keppel Offshore & Marine (Keppel O&M) – a Singapore-based marine engineering group was the leader in the global market for construction of offshore drilling platforms and vessels.*

*Keppel O&M's fortunes over the last four decades had been characterised by high-velocity and unpredictable changes. The ongoing challenge was to stay flexible, continually adapting its strategies and reinventing itself to manage the disruptive changes in the business environment. However, as more international competitors moved in to carve their share of the offshore construction market, the race was on as to whether the group could hold on to its leadership position.*



*Associate Professor Wee Beng Geok and Ivy Buche prepared this case. This case is based on public sources. As the case is not intended to illustrate either effective or ineffective practices or policies, the information presented reflects the authors' interpretation of events and serves merely to provide opportunities for classroom discussions.*



For copies, please write to The Asian Business Case Centre, Nanyang Business School, Nanyang Technological University, Nanyang Avenue, Singapore 639798
Phone: +65-6790-4864/5706, Fax: +65-6791-6207, E-mail: asiacasecentre@ntu.edu.sg

## INTRODUCTION

In mid-2006, the search for new oil reserves in the world's ocean beds continued unabated as crude oil prices rose to US$60 per barrel from US$25 per barrel in September 2003. Oil drilling companies raced to acquire new equipment and facilities for offshore exploration and production. Keppel Offshore and Marine Ltd (Keppel O&M) – a Singapore-based marine engineering group was a major beneficiary of this boom. As the world's leading builder of jack-up rigs, semi-submersible rigs and floating production facilities, its orderbooks were full till 2010, with new building projects totalling S$7.3 billion.[1]

Keppel O&M was well-positioned to meet this demand with its range of marine engineering and project management capabilities as well as a suite of proprietary offshore engineering technology. It was a pioneer in the conversion of tankers into floating production and storage facilities (FPSOs).[2] These special floating structures were considered as cost-effective alternatives to laying undersea pipelines to transport crude oil to shore. In the current offshore oil boom, FPSOs emerged as the main method of producing, storing and offloading oil from deep ocean sites.

The marine engineering group had a network of 17 shipyards, spanning major oil-producing areas in the world, from Singapore to United States (US), Brazil, the Netherlands, Norway, UAE, Azerbaijan, Kazakhstan, Philippines and China. It was a global leader in the design and construction of offshore rigs, building 48 percent of global jack-up rigs and 39 percent of semi-submersible drilling platforms worldwide.[3] It also had a well-established division in ship conversion and repairs. As a specialised shipbuilder of small customised vessels, it built ice-class floating support platforms, anchor handling tugs, ice-breaker ships, cable ships and other multi-purpose support vessels used in offshore oil search and production.

However, high oil prices had resulted in an increase in speculative orders for new rigs and Keppel O&M's Chairman & CEO, Choo Chiau Beng, noted:

> *We have experienced huge cycles in rig building before and the downturn will come again. These super-high oil prices are the froth; they create a lot of speculative activity which is not very good for a long-term player like us. As a longer-term player, we like oil prices to be stable, maybe around OPEC's target of US$40-US$50 per barrel is a good price. We don't like huge oil price jumps to US$70-US$80; we don't get any benefit, only the speculators benefit.*[4]

## THE GLOBAL MARINE ENGINEERING BUSINESS IN 2006

After almost two decades of decline or limited growth, the global marine engineering business picked up in the early years of the 21st century. This was due to an unprecedented surge in international maritime trade driven by China's and India's developing economies, as well as increased demand for manufactured goods in developed countries. The biggest impact was attributed to rise in oil prices in response to the growth in global energy needs.[5]

Spiralling oil prices resulted in a massive increase in global oil and gas exploration and production activities. Increasingly, such activities were moving into deeper waters of the world in search of new sources of energy. Although in 2006, deepwater oil production accounted for only 10 percent of total offshore production, this was expected to increase to 25 percent by 2015. Furthermore, expenditure on drilling vessels/systems was expected to reach US$20 billion per year by 2010:[6]

> *We're seeing quite an increase in the last year in exploration activity. And that will definitely lead to more FPSO developments, especially in West Africa, but also in Southeast Asia. Especially, in deepwater areas and in areas where you don't really have any infrastructure, any pipelines on the seabed…you will*

1 Chairman's Statement. Keppel Corporation Ltd. *Report to Shareholders 2006*.
2 In 1981, Keppel Shipyard was the first shipyard in the region to handle the conversion of a ship into a FPSO facility.
3 Behrmann, N. (2006, November 16*).* Keppel steaming ahead with confidence. *Business Times*, Singapore.
4 Urquhart, D. (2006, November 27). Keppel O&M eyes more deals with Gulf Drilling. *The Shipping Times*, Singapore.
5 For example, crude oil imports to China were expected to treble within the next decade.
6 Singh, G. (2006, May). Ramp-up in Asia-Pacific E&P fuels Keppel's strategy. *Offshore.* International Report (p. 50). PennWell Publishing Company. Retrieved December 13, 2006, from http://web.lexis-nexis.com

*see the FPSO being wanted as a production concept.*[7]

*Arne Austreid, President and CEO, Prosafe (2006)*

The demand for floating production facilities (such as FPSO vessels, production semi-submersibles, tension leg platforms and spars) was growing rapidly. Orders for new "floaters" jumped to an all-time high and by November 2006, there were 108 such projects in the pipeline. (See **Exhibit 1** for worldwide orders of Production Floaters.)

Another group of mobile offshore drilling units (MODU), jack-up rigs, had undergone years of under-investment following the building boom in 1982. Rig demand began creeping up in early 2000s, and strengthened in 2006, with overall utilization for the entire worldwide rig fleet (comprising drill ships, semi-submersibles and jack-up rigs) at 88.5 percent[8], an improvement from 87.3 percent in 2005. In early November 2006, there were 105 new MODUs on order worldwide. These included 10 drill ships, 30 semi-submersibles and more than 60 jack-ups. In addition, another 46 MODUs (as at June 2006) were in shipyards, being readied for upgrades or re-building of varying magnitudes.[9] (See **Exhibit 2** for MODU orders including jack-up rigs and semi-submersibles worldwide.) The increase in overall demand for offshore drilling vessels was also fuelled by the need to replace ageing rigs built in the 1970s and 1980s with new, sophisticated, technically advanced and more efficient units.

## COMPANY BACKGROUND

Keppel O&M began in 1968 as Keppel Shipyard Pte Ltd (Keppel Shipyard), a commercial company set up by the Government of Singapore. An outcome of Singapore's transition from British colonial rule to a politically independent state, Keppel Shipyard took over the assets of the British-run Dockyard Department of the colonial port authority.[10] (See **Exhibit 3** for Keppel O&M's early beginnings.)

The Singapore Government's brief for the management of the newly formed company was *"to reorganise, rationalise and expand [or hive off] facilities to meet the target which any private investor would expect in a dynamic industry*."[11]

During its first four years, boosted by a growing port, Keppel Shipyard's revenues grew from S$33 million in 1969 to S$44 million in 1970.

In the early 1970s, very large crude carriers (VLCC) were introduced to transport crude oil from the Arabian Gulf to the Far East, Western Europe and the US. With its strategic location at mid-point of many tanker routes, Singapore became a convenient stopover point for VLCC repairs which became a mainstay of the local shipyard operators, including Keppel Shipyard.

In 1973, a local management team took over the reins at Keppel Shipyard. With its dockyard facilities sandwiched between growing port facilities, there was very little room for expansion. Without larger drydock space, Keppel Shipyard would find it increasingly difficult to service the growing (both in size and numbers) VLCC fleet. To address this, the management commenced building a 360,000 dead weight tonnes (dwt) drydock on the western end of Singapore, at a cost of S$90 million.

Keppel Shipyard also acquired a majority stake in a local company, Far East Levingston Shipyard (FELS), a pioneer of Singapore's then nascent offshore construction business which serviced the offshore oil exploration and production operators in the region.

### Oil Shocks

In October 1973, as part of a political strategy, OPEC cut oil production and placed an embargo on shipments of crude oil to the west[12]. The price of oil quadrupled to nearly US$12 per barrel in 1974. The shock triggered a severe global recession and the shipping and tanker charter markets collapsed. By 1976, hundreds of oil tankers were laid up or "sent to the breakers" without ever carrying any cargo.

---

7 Wong, J. (2007, January 9). Dip in crude oil prices not hurting orders: Keppel. *Channel NewsAsia*, Singapore.
8 Within this average, drill ship utilisation was at 79.4 percent, semi-submersibles at 91.6 percent and jack-ups at 94.4 percent.
9 MODU construction boom continues. (2006, July). *Offshore*.
10 The Singapore Harbour Board.
11 Spoken by Hon Sui Sen, the first chairman of Keppel Shipyard Pte Ltd.
12 As a result of the ongoing Yom Kippur War, OPEC (Organisation of Arab Petroleum Exporting Countries) declared that they would no longer ship petroleum to nations (United States, its allies in Western Europe, and Japan) that had supported Israel in its conflict with Syria and Egypt.

The opening of Keppel Shipyard's new drydock facility coincided with the drop in demand for tanker repairs and servicing. Together with other drydock investments by Singapore shipyards, an additional two million dwt of dry dock capacity had poured into the market during this time (1975) and shipyards in Singapore struggled to find jobs to fill their facilities. A price war ensued and many of the smaller shipyards were forced to close.

Keppel Shipyard went on an acquisition path, buying up smaller private shipyards and other marine-related companies. It also ventured abroad, setting up a shipyard in the Philippines, funding these investments through the issue of company bonds in 1975, 1976 and 1977, with the first two issues guaranteed by the Singapore Government.

By the end of the 1970s, the shipping industry seemed to be on the uptrend as many economies came out of recession. The ship repair industry recovered in tandem and demand for ship repair work grew, especially for VLCCs. To comply with international anti-pollution measures, shipyards were retrofitting tankers according to the new standards.

In 1979, another oil shock was building up. The political fallout from the Iranian Revolution caused oil prices to reach US$39 per barrel in 1980. With Iraq's invasion of Iran, oil production was severely affected. This accelerated the pace of offshore oil exploration elsewhere and drilling contractors seized the opportunity to invest in new rigs and other exploration and production vessels. By then, a cluster of offshore construction companies, both international (French and the US) and locally-owned, were busy building rigs and other offshore construction facilities in Singapore. A total of 65 jack-up rigs (out of 300 worldwide) built by these companies during this period established Singapore as a global jack-up rig building centre. The marine industry in Singapore hit new revenue highs of $2.4 billion in 1981.[13]

FELS, the rig building arm of Keppel Shipyard, was not spared the effects of the oil crisis. After it had incurred heavy losses in 1978 and 1979, Keppel Shipyard moved to assume management and operational control of FELS in 1980.

Rising oil prices triggered a worldwide economic recession, dragging down world trade. The global shipping market began slowing down in 1981 and by the following year, a worldwide shipping recession lasting five years, dealt a severe blow to shipyards around the world. The global marine industry entered its worst slump ever and many shipyards around the world, particularly in high-cost European centres, ceased operations. In Singapore, it caused a hollowing out of the industry.

Offshore oil exploration and production activities slowed to a trickle. As demand for drilling services fell, so did rig utilization and consequently, many of the global drilling contractors went bust. With little prospects of new rig building work and empty orderbooks, only eight out of the 82 rig building yards worldwide were left at the end of the recession.[14]

With almost S$100 million raised from an initial public offering on the Singapore Stock Exchange in 1980, Keppel Shipyard's response to the shipping slump was a diversification strategy out of the shipbuilding and repair business. In 1983, in a major acquisition exercise, it acquired Straits Steamship Group, an established company based in Singapore and Malaysia with a strong property business, traditional shipping services and oilfield engineering services.

However, the deep recession affected the overall Singapore economy including the property sector. The acquisition of Straits Steamship saddled Keppel Shipyard with S$845 million debt and the prospects of an annual interest bill of about S$75 million. It was a crucial turning point for the shipyard and this brought about a major reassessment of its operations and business model. It embarked on a major organizational rationalization plan to increase productivity and efficiency.

**New Strategies**

To compete with new low-cost repair centres emerging in Asia and the Middle East, the shipyard turned to higher value-added work. The ship repair division focused on developing and marketing its capabilities in complex repair and retrofitting work including the conversion of older ships into FPSOs for offshore oil drilling, ship jumboisation and other specialised modifications.

When international rig builder Marathon Le Torneau closed its Singapore operations in 1985, FELS signed a licensing agreement to build Marathon rigs

13 A Chapter in Singapore's History. *Singapore Marine Industries Directory 1991/1992*. Singapore: ASMI.
14 *Rig Building In Singapore: A Success Story*. (2006, June 21). Presentation by T.K. Ong, Managing Director, PPL Shipyard Pte Ltd.

in Singapore, stepping beyond its previous role as an offshore contractor to take on turnkey projects (which required more complex engineering and design works). In another move, when Mitsubishi Shipyard of Japan decided to close its Singapore operations, FELS took over its shipyard land lease which included a 400,000 dwt drydock, then the largest in Singapore. It converted the facility for rig building at a fraction of the cost that it would have to pay for a new one.

Further in 1983, Keppel Shipyard moved into the industrial engineering business, tapping on excess engineering manpower caused by the marine slump and upgraded its steel workshop infrastructure. By 1985, the new division had secured local public works contracts worth S$100 million as well as overseas engineering projects. This business unit grew into the group's industrial engineering core business by the early 1990s.

It also forged ahead into the financial services business, obtaining a licence to operate a finance company as well as acquiring stakes in a local bank and a finance company in 1983.

Weighed down by oversupply, oil prices fell to US$13 per barrel in 1986 (from US$39 per barrel in 1980) and the world economy recovered. A mini-boom in tanker repairs followed, aided by an ageing oil tanker fleet worldwide. Keeping an eye on costs, Keppel Shipyard continued its overseas expansion to lower cost regions, buying another shipyard in the Philippines in 1988.

In 1990, another oil crisis hit the world as a result of the first Gulf War. As oil fields of Kuwait were set on fire, oil output fell and oil prices hit US$40 per barrel.

**Shipyard in the Doldrums**

Consequently by 1992, another downturn swept across the global shipping industry, including the tanker charter markets. Keppel Shipyard, still highly dependent on VLCCs repairs, was caught in a downward spiral of jobs and customers. Operating costs climbed due to new environmental pollution control regulations and rising wages in Singapore's fast growing economy. A strong Singapore dollar further eroded Keppel Shipyard's price competitiveness.

By then, the shipyard division was only one part of the Keppel Corporation Ltd, a conglomerate that it had spawned. FELS remained as the offshore construction division while two new core businesses started in the previous decade, Property Development (under Straits Steamship) and Financial Services grew steadily. By the end of the 1990s, the combined contribution from these two businesses eclipsed that from marine, offshore construction and engineering. [See **Table 1**]

**Table 1**
**Keppel Corporation: Contribution of Core Businesses to Revenue**

| Contribution to revenue / Core Business | % | | | |
|---|---|---|---|---|
| | 1990 | 1999 | 2002 | 2006 |
| Shiprepair | 41 | 16 | 35 | 76 |
| Offshore Construction | 25 | 20 | | |
| Engineering/ Infrastructure | 9 | | 12 | 7 |
| Property | 5 | 25 | 6 | 15 |
| Financial Services | 14 | 34 | - | - |
| Investment and Others | 6 | 5 | 47 | 2 |

Source: Keppel Corporation Ltd. *Annual Reports 1990, 1999, 2002 and 2006.*

In the offshore construction division, FELS began setting up operations in major oil-producing regions in the world in a new move to reach out to customers in the global offshore oil drilling industry. In 1990, it acquired a stake in a US-based rig builder in Texas, giving it access to drilling contractors and oil companies operating in the Gulf of Mexico. In 1994, it set up a design and engineering base in Bulgaria to serve the Black Sea region. Further in 1997, it moved to the Caspian Sea region, setting up a shipyard in Baku, Azerbaijan. In 2000, it set up a joint venture – FELS Setal in Brazil which revived operations of two abandoned shipyards, thus setting up its first operations base in South America. Subsequently, it bought over the shares of its Brazilian partner in 2004 and the 100 percent-owned subsidiary was renamed Keppel FELS Brazil.

With the global offshore construction business contingent on oil prices, the parent company sought to buffer the irregular revenue streams in public listed FELS. In 1999, in an organizational restructure, Keppel FELS[15] was integrated with the group's land-based engineering units, to form Keppel FELS Energy and Infrastructure (KFEI), comprising offshore and industrial engineering as well as petroleum refining and distribution.

In the same year, the group's ship repair operations merged with Japanese-owned Hitachi Zosen Singapore, creating Keppel Hitachi Zosen Ltd (KHZ), the second largest shipyard group in Singapore.

## BOOM TIME IN THE NEW MILLENNIUM

Up till the end of 1990s, the two marine engineering businesses - offshore construction and ship repair, had been regarded worldwide as two distinct businesses, with different markets and customers. However, as advances in offshore technology and the economics of oil exploration and production moved in favour of floating solutions in offshore drilling, the lines between the two market segments blurred. For the Keppel group, a rationalization of the marine engineering business would increase operational flexibility, allowing effective leverage of complementary engineering capabilities, facilities and infrastructure. The challenge was to merge the two public listed companies (KFEI and KHZ) that operated the two businesses.

In 2001, as a result of the Singapore Government's decision to restructure the local banking industry, Keppel Corporation divested its Financial Services division to a local bank for S$5.2 billion in cash.[16] With the proceeds, it privatised KFEI and KHZ, and merged the shipyard and offshore construction business into a new entity - Keppel Offshore & Marine Pte Ltd (Keppel O&M) as a wholly-owned division of Keppel Corporation.

Keppel O&M leveraged Keppel FELS's capabilities in rig building and design, including its own suite of production design solutions. It tapped on Keppel Shipyard's in-house capabilities in re-building older vessels into dependable workhorses for offshore oil-drilling and extraction activities. The project management capabilities from both and an overarching organizational culture also contributed to its ability to respond and change directions quickly.

As an enlarged entity, Keppel O&M was able to enhance its global footprint. In 2002, Keppel O&M commenced operations in Europe with the acquisition of Dutch shipyard Verolme Botlek, gaining strategic capability in the North Sea area. In 2003, it established an offshore construction and engineering facility in the oil-rich Central Asian state of Kazakhstan. In 2005, Keppel O&M acquired a shipyard in Nantong, China for S$9 million. [See **Table 2**.] The 100 percent-owned company, renamed Keppel Nantong Shipyard, focused on specialist shipbuilding, servicing the support vessel needs of the growing offshore development market as well as the liquefied natural gas (LNG) terminal and maritime port markets. The acquisition freed up the group's shipbuilding facilities in Singapore for offshore construction projects.

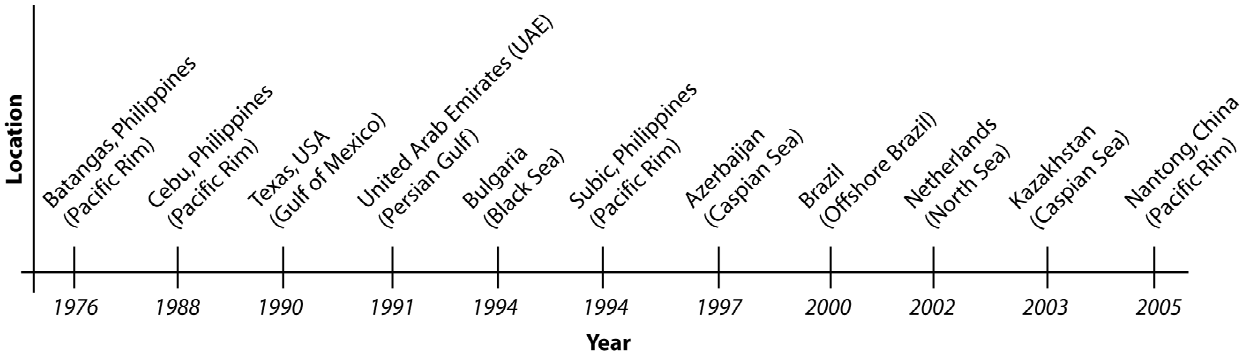
With this, Keppel O&M could implement its strategy of capacity maximisation based on innovative and opportunistic allocations of work among its facilities across the world. Hence, a rig could be designed, cut and put together in different locations, freeing the group from the capacity limitations faced by dedicated rig building yards:

> *By bringing 17 yards in one centrally controlled and yet locally managed system, we have been able to respond swiftly to changing market conditions….*

15 In 1997, FELS was renamed Keppel FELS.
16 OCBC Bank Annual Report 2001 (p.10).

**Table 2**

**KEPPEL O&M: OVERSEAS OPERATIONS (1976-2006)**




*Protecting market share is important, and we will continue to do that, but our real challenge lies in how we continue to differentiate ourselves from others to be the best in the industry.*[17]

*Tong Chong Heong*
*MD & COO, Keppel O&M*

With operations across the globe, Keppel O&M doubled its orderbooks to S$7.3 billion of new orders for the year 2006, bringing net orderbooks to S$10.5 billion by year end. Keppel FELS (Brazil) secured S$1.16 billion, AMFELS (US) won S$326 million, Keppel Verolme (Netherlands) won S$94 million and Caspian Shipyard Company (Azerbaijan) won S$96 million of new orders. US drillers were responsible for one-third of the number of rig orders placed with the group. New exploration and production activities by major oil companies in US as well as the destruction of production facilities by hurricanes (Katrina and Rita)[18] in the Gulf of Mexico increased US demand for new rigs.

At the same time, Europe and India had become increasingly important components of Keppel O&M's customer base. In 2006, the group won four jack-up orders from India, comprising two-thirds of the fast growing Indian market for jack-up rigs. It was also awarded contracts by Russian customers for the construction of offshore facilities as well as specialised vessels, including ice-class FSO, anchor handling tugs and icebreaker vessels. In the ship repair market, the group was also the largest LNG ship repair yard in Asia outside Japan and was poised to tap the sharp growth in the global LNG carrier fleet.

Within five years, Keppel O&M's revenue tripled from S$1.9 billion in 2002 to S$5.75 billion in 2006, which accounted for 76 percent of Keppel Corporation's 2006 revenue of S$7.6 billion.[19] Keppel O&M also contributed S$450 million (nearly double the S$236 million in 2005) to the group attributable profit of S$751 million. (See **Exhibit 4** for Consolidated Profit and Loss Accounts and Balance Sheet of Keppel O&M and **Exhibit 5** for Keppel O&M's Corporate Structure.)

**Technology Strategy**[20]

*In-house Technology, Design and Engineering Expertise:* As a total solutions provider, Keppel O&M's competitive edge was derived by investing in and developing technology. Its technology strategy was guided by commercial viability, customer needs, knowledge building and process improvement. The three technology groups carrying out in-house research and development initiatives were:

- Offshore Technology Development (OTD) – to develop technology in the design of new generation jack-up rigs and their critical systems.

17 Keppel Offshore & Marine. *Report to Stakeholders 2005*.
18 According to Rigzone in 2005, Hurricane Katrina and Hurricane Rita had damaged 58 and 24 mobile offshore drilling rigs respectively, in the US Gulf (Gulf of Mexico).
19 Chairman's Statement. Keppel Corporation Ltd. *Report to Shareholders 2006.*
20 Keppel Offshore and Marine. *Technology Companies.* Retrieved September 17, 2007, from http://www.keppelom.com/omgroup/techco.asp

- Deepwater Technology Group (DTG) – to develop and design deepwater semi-submersibles and other floating structures.

- Marine Technology Development (MTD) – to design and develop offshore support and maintenance vessels.

A global network of over 600 engineers worked round-the-clock seamlessly in US (Houston), Bulgaria, India and China, bringing together their combined expertise in detailed engineering, design analysis and development of proprietary designs. TRIBON CAD/CAM was a major area of expertise. This state-of-the-art three-dimensional modelling and design software enabled rigs and ships to be built virtually before actual construction, thereby allowing early detection and prevention of construction challenges.[21]

*Strategic partnerships:* Most business breakthroughs in the offshore and marine industry came from partnerships and collaborations amongst operators, drilling companies, shipyards and designers. Keppel O&M collaborated with offshore drilling contractors such as ENSCO and Diamond Offshore, semi-submersible and FPSO operators such as Prosafe and Frontline, to develop rig designs that would add value to the customers' operations. The well- received KFELS B Class and KFELS N Class series of jack-up designs, and the SSDTTM and MSC-DTG DSSTM series of semi-submersible designs were outcomes of such collaborations.

**Enterprise Risk Management**[22]

Introduced in 2002, Keppel O&M's Enterprise Risk Management (ERM) framework provided a holistic and systematic process for identifying, evaluating and managing significant risks. In this ongoing process, significant risks and appropriate mitigating actions associated with various value drivers were identified and cascaded down from top management to the individual business units and departments. Rigbuilding, a complex process, involved numerous interfaces such as design, construction, material, equipment and Class certification. Hence, contracts had to be carefully negotiated with customers to ensure that the pricing reflected the risks involved.

During the annual strategy meeting in Singapore, top management of Keppel O&M reviewed risk profiles in relation to corporate strategies. At the operational level, the risk management process was incorporated in day-to-day operating procedures for all its significant projects. A large proportion of its operations were project-based and extended over a period of time. The management monitored major risks for each significant project at tender and execution stages using a standard risk template. At the tender stage, the risk template consisted of various risk factors grouped under pre-tendering, competition, project, contract, execution, people and safety. At the execution stage, the risk template consisted of risk factors involving on-time, on-budget delivery, quality control and meeting customer's specifications.

With a record order book, the main challenge was the execution of projects to ensure on-time and on-budget delivery while meeting quality standards. The major risks would mainly be related to execution risks with stretched resources. A template had been developed for monitoring schedule risk, cost risk and quality risk of all major work-in-progress. A sub-risk template for execution risks had also been developed, to report the progress of work on a periodical basis.

**Manpower**

Keppel O&M had to enlarge and develop[23] its talent pool rapidly while setting systems in place for effective management of worldwide operations. Keppel O&M's global direct workforce was 24,613 in 2006 of which 44 percent was based in Singapore.[24] Besides its direct workforce, Keppel O&M, like other shipyards in Singapore, relied heavily on subcontract labour. These were employees of contracting firms that supplied both skilled and unskilled labour such as marine mechanics, welding, steel work and pipe work, blasting, painting, material handling and rigging. The presence of a large contract workforce (sometimes as high as one direct employee to three or four subcontract workers) allowed the shipyards to fine-tune labour needs according to projects at hand. In addition, some specialised engineering works were outsourced to other marine engineering

21 Keppel Offshore and Marine. *Design and engineering expertise.* Retrieved September 17, 2007, from http://www.keppelom.com/products/enggdesignexpert.asp
22 Keppel Offshore and Marine. (2006). Corporate Review. Enterprise Risk Management. *Report to Stakeholders*.
23 Keppel O&M's investment in training and development was S$17 million in 2006 with S$11 million in Singapore (compared to S$3.6 million in 2005).
24 Keppel Offshore and Marine. (2006). Corporate Review. Nurturing People. *Report to Stakeholders*.

firms. Such outsourced projects ranged from specialised jobs to complete turnkey projects such as construction of production modules of oil rigs. (See **Exhibit 6** for Keppel O&M's manpower distribution by country.)

## COMPETITIVE ENVIRONMENT

In 2005, there were more than 40 shipyards in Singapore engaged in a wide range of ship repair and building as well as offshore marine construction operations. The industry turned in its best year ever in 2006, with total revenues increasing by 40 percent to $9.8 billion.[25] This record-breaking performance was led by the industry's offshore sector which continued to see strong growth in 2005 and 2006. Apart from the offshore sector, the ship repair and conversion as well as shipbuilding sectors also strengthened and contributed to an overall increase in total turnover in 2005 and 2006.

In Singapore, Keppel O&M's closest competitor was SembCorp Marine Ltd (SembMarine), the world's second-largest builder of offshore structures. SembMarine was the product of a merger (1997) between two major shipyard groups in Singapore, Sembawang Shipyard Pte Ltd (Sembawang) and Jurong Shipyard to form the largest shipyard group in Singapore at the time, with docking capacity of about 1.7 million dwt - about half of the total available docking space in Singapore. SembCorp Industries Ltd, Singapore's third-largest conglomerate by market capitalisation (in November 2006) owned 63 percent of SembMarine.[26] SembMarine operated five shipyards in Singapore, two in Indonesia and one in Texas, US. In 2006, the group had investments in two major overseas shipyard joint ventures: 30 percent of COSCO Shipyard Group in China with five shipyards in the key coastal cities of Dalian, Nantong, Shanghai, Zhoushan and Guangzhou, and 35 percent of Maua Jurong, Brazil.

Close on the heels of Keppel O&M, the SembMarine group had secured contracts worth S$3.1 billion and had a strong order book of S$5.47 billion as at end 2006, with project completion and deliveries running up till 2010. In and around Singapore, it had seven major marine engineering operations: Jurong Shipyard, Sembawang Shipyard, Jurong SML Shipyard, SMOE Pte Ltd, PPL Shipyard, PT Karimun Sembawang Shipyard and PT SMOE in Indonesia. Unlike Keppel O&M, these operated as seven distinct brands.

SembMarine benefited from the burgeoning demand for rigs; 41 percent of the contracts secured in 2006 were for jack-up rigs and 40 percent were for semi-submersibles. This was a significant swing for the group whose turnover had long been dependant upon shipbuilding, ship repair and conversion. In 2005, it was the rig business that grew the fastest, tripling to S$381.3 million (from S$118.2 million in 2004) and further to S$1,728.9 million in 2006, contributing 49 percent of the total revenue. (See **Exhibit 7** for SembMarine's and Keppel O&M's five-year financial highlights.)

### Foreign Sources of Shipyard Manpower

By the early 1980s, with the success of Singapore's industralisation programme, the wider Singapore economy was powered by new and growing industries such as electronics, disk drives, pharmaceuticals and plastics. With more job vacancies than workers, the shipyards found themselves unable to compete given the higher wages and less demanding work environments offered by these new industries. With growing labour shortfalls and a business model based, to a considerable extent on low-cost labour, foreign workers were brought in, first from Malaysia, and then from Philippines, India, Bangladesh and Thailand. Despite government levies on foreign workers, the shipyards continued to rely on lower-cost foreign workers. As labour cost continued to be a source of competitive advantage in the global shipbuilding and repair industry, foreign sources of labour supply became a permanent feature of the industry in Singapore.

25 Urquhart, D. (2007, April 24). Marine sector sees explosive 40 percent growth. *The Business Times*, Singapore.
26 In 2006, Temasek Holdings (Pte) Ltd, the Singapore Government's investment arm, held more than 60 percent of SembMarine.

With the frenetic pace of demand for MODU and FPSO/FSO, many conventional shipyards were moving into offshore construction. As demand for rig building remained strong (with high charter rates, near 100 percent utilisation rates and an ageing fleet worldwide), the rig building business continued to command attractive margins.

While Singapore shipyards ruled the jack-up rig market, there was increasing competition in semi-submersibles from South Korean shipyards. In the past, Korean shipyards had not been players in the rig and platform market. However by 2006, they were steadily increasing their share of the world market in this sector by garnering contracts from US companies for rigs and platforms for use in the Gulf of Mexico.

Major South Korean yards such as Daewoo Shipbuilding and Marine Engineering Co Ltd (DSME) and Samsung Heavy Industries (SHI) were making aggressive moves in this segment. Given their resources and capabilities, they could be formidable competitors for Keppel O&M.

DSME was the world's second largest shipbuilder and the largest builder of LNG carriers. With its comprehensive infrastructure such as 900-ton Goliath Crane and a dry dock that could build hulls up to 120 metres in width, it could build floating offshore products such as FPSOs and FPUs. By 2005, it had built 14 semi-submersible drilling rigs and two jack-up rigs.

SHI, the world's third-largest shipbuilder and a core affiliate of Korea's largest group - Samsung, had an extensive global network of eight overseas facilities including a ship block factory in China. Based on extensive experience in shipbuilding, SHI had secured design and construction capabilities for topside, a core part in offshore platform construction, and focused its efforts on turnkey orders. In 2003, it received an order for the world's largest fixed sea platform from the Dutch-Japanese joint venture Sakhalin Energy Investment Co. By April 2006, it had received orders for US$1.8 billion including 14 FPSOs, three drill ships and one platform.

China was also positioning itself as a strong competitor. It had the competitive advantages of lower raw material cost, abundance of unskilled workers, cheaper labour costs, proximity to major offshore and marine markets, as well as its own oil and gas resources that were being developed. One such competitor was COSCO Corporation (Singapore) Limited, subsidiary of China's state-owned China Ocean Shipping Company. COSCO Singapore, which was originally set up as a shipping company, moved into the ship repair business, and more recently, into the rig building market, hiring experienced technical staff from shipyards in Japan, Korea and Singapore. By 2006, it had secured a second building contract for semi-submersible rig. Another competitor was Yantai Raffles Shipyard in Shantung, China. Brian Chang[27] set up this shipyard in 1994 and held an 80 percent stake. Initially building tugboats, FPSOs and other vessels for the offshore industry, Yantai Raffles made a breakthrough in 2006 when it secured its first jack-up drilling rig construction project as well as five deep sea semi-submersibles, bringing its order book to US$1.44 billion.[28]

Drilling contractors generally preferred established offshore builders with proven records for timely completion/delivery of rigs but in 2006 with many orderbooks full, they were placing orders with the newcomers.

## LOOKING INTO THE FUTURE

As a resource-intensive business in terms of facilities, funding and capabilities, offshore construction firms faced severe capacity challenges which could affect revenue growth. Investments in new capacity needed several years in lead time before coming on-stream. Furthermore, such new investments had to be weighed against the continuous and disruptive changes that were regular features of the industry. In the past, the glut in vessels and rigs due to overbuilding had aggravated downturns in the shipping cycles. The ongoing challenge for Keppel O&M was to exploit current business opportunities while managing the long-term growth prospects in the industry.

Over the last four decades, Keppel O&M had continually reinvented its business model, responding to abrupt changes in an uncertain environment shaped by OPEC's oil policies, political upheaval in oil-producing countries as well as global shipping cycles. With a business philosophy based on innovative market and product

27 Chang was the founder of Promet shipyard, one of the pioneers of the offshore construction industry in Singapore in the 1970s.
28 Raj, C. (2006, December 7). Raffles Yantai wins jack-up rig deal worth US$135m. *The Business Times*, Singapore.

development solutions, and a strong focus on project execution, the group had positioned itself to take full advantage of rising oil prices since 2004.

Its "Near Market, Near Customer" strategy not only involved progressive and opportunistic development overseas but also, building up international engineering capabilities and continuing re-configuration of the various components of its marine engineering businesses. This gave Keppel O&M a first-mover advantage in its competitive environment.

Looking ahead, Choo Chiau Beng remarked:

> *There are increasing numbers of entrants, while new oil and gas fields are being developed, particularly in harsher environments. National oil companies are expanding their roles. The challenges include environmental considerations, rapid development of new technologies, rising costs of infrastructure and services and a shortage of skilled manpower.*[29]

29 Keppel O&M celebrates five years with 300 percent increase in revenue. (2007, May 2). *Keppel Corporation – Press Release*.

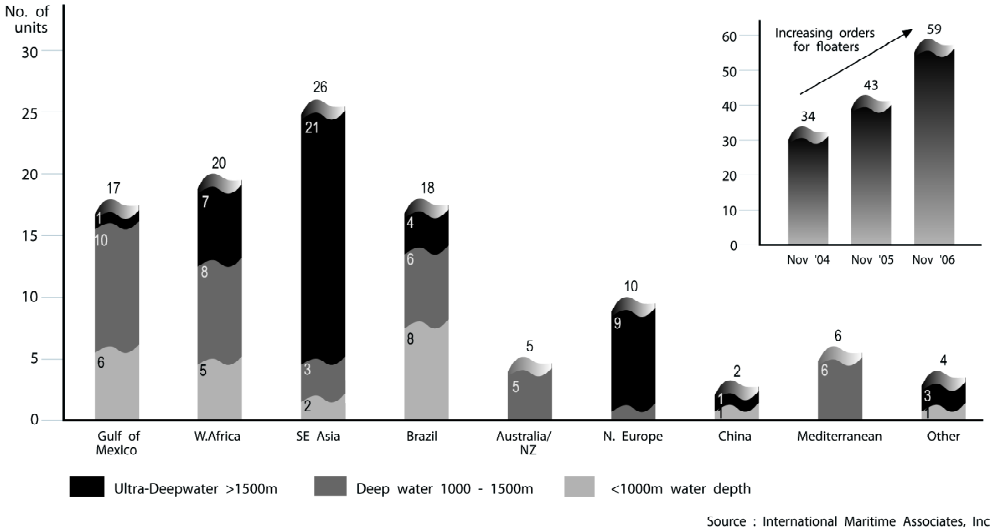
## Glossary

| | |
|---|---|
| **Degassing** | The removal of oil and gas from the drilling mud which may then be used again. |
| **Drill Ship** | A ship-shaped vessel for drilling and completing wells in medium to deepwater applications. It uses a conventional anchoring system or dynamic positioning. |
| **dwt** | Deadweight (often abbreviated as DWT for deadweight tonnes) is the displacement at any loaded condition minus the lightship weight. It includes the combined weight of crew, passengers, cargo, fuel, water, and stores. |
| **FPSO** | Floating Production, Storage and Offloading vessel. Usually out-of-service tankers are utilised as FPSO's. |
| **FSO** | Floating Storage and Offloading vessel. |
| **Jack-up** | A mobile drilling unit, which can elevate itself well above the sea surface on three or more legs to become a stable seabed supported drilling platform. Drilling jack-ups can operate in water depths up to 150 metres. |
| **Jumboisation** | Extending the size/capacity of a vessel. |
| **Semi-submersible** | Mobile offshore drilling platform with floats or pontoons submerged to give stability while operating in deep water up to 10,000ft. It is kept in position by anchors or dynamic positioning. |
| **Spar** | Large cylinder supporting a typical rig platform. It uses cables and chains to anchor rig to seafloor (up to 8,000ft). |
| **Tension Leg Platform** | A floating production unit anchored to the seabed by taut vertical cables, which considerably restrict its heave motion, making it possible to have the wellheads on the platform. Tension leg platforms are used for drilling and production in deep water up to 6,000ft. |
| **TEU** | A unit of cargo capacity, especially for container ships. TEU is an abbreviation for "twenty-foot equivalent unit". One TEU represents the cargo capacity of a standard container 20 feet long, 8 feet wide, and (usually) a little over 8 feet high. |
| **ULCC** | Ultra Large Crude Carriers larger than 300,000 dwt. |
| **VLCC** | Very Large Crude Carriers: Tankers between 200,000 and 300,000 dwt. |

## EXHIBIT 1

## PRODUCTION FLOATERS ORDERS

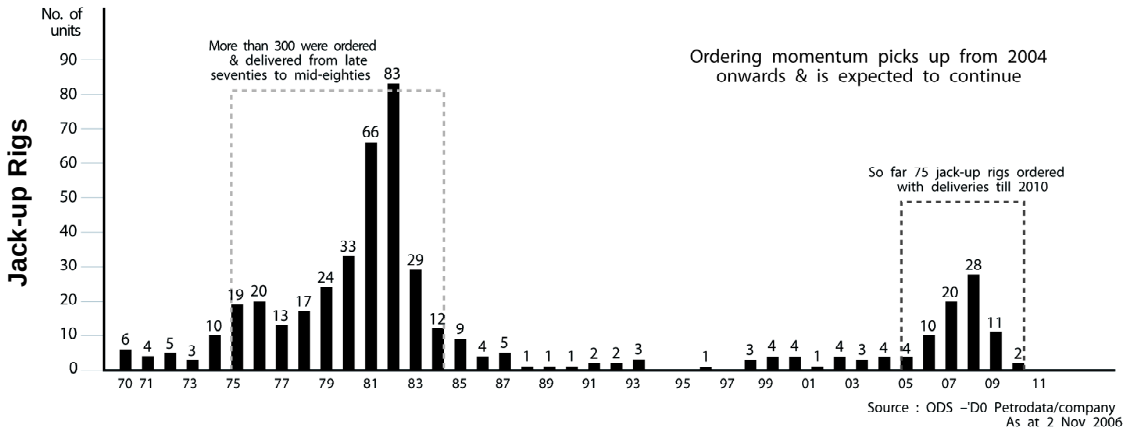
### 108 Production Floaters Planned/Under Study as of November 2006



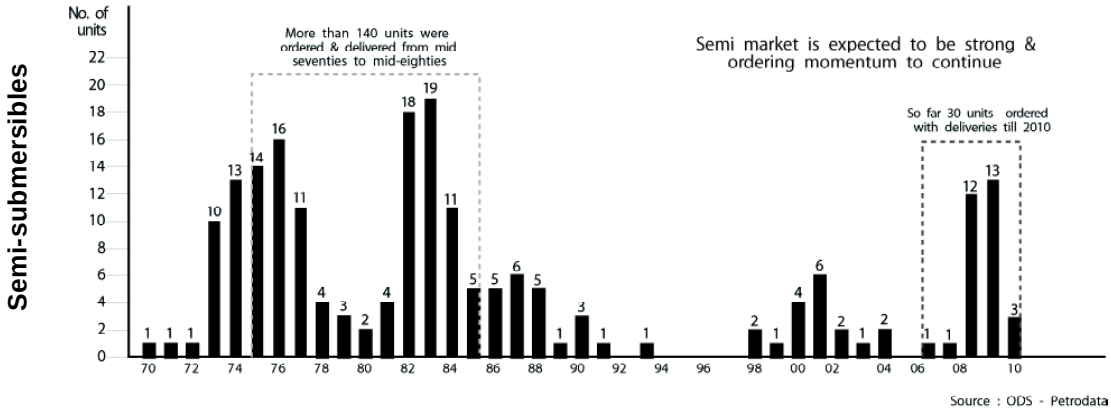

Source : International Maritime Associates, Inc

## EXHIBIT 2

## MOBILE OFFSHORE DRILLING UNIT ORDERS




Source : ODS –'D0 Petrodata/company
As at 2 Nov 2006




Source : ODS - Petrodata

## EXHIBIT 3

## KEPPEL O&M: EARLY BEGINNINGS

### Reinventing a Colonial Legacy

The emergence of Keppel O&M could be traced back to the 1960s, a transitional decade in the political and economic history of Singapore. The British colonial administration in Singapore operated two dockyards: The Dockyard Department of the Singapore Harbour Board (the precursor of the Port of Singapore Authority or PSA) located in southern part of Singapore, and H.M. Naval Dockyard, part of the British Far East Naval Base located to the north of the island.

In January 1968, the British Government announced its intention to withdraw its forces east of the Suez by 1971, including the closure of the British Far East Naval Base. The withdrawal meant that about 70,000 jobs directly or indirectly linked with the British naval presence would be lost. This would also affect approximately 20 percent of Singapore's Gross Domestic Product (GDP) which was then derived from British military expenditure. Earlier in 1967, the first Prime Minister of Singapore, Lee Kuan Yew, visited the British dockyard in Malta to observe how they had coped with the run-down of British forces there. He was shocked to find the dockyard closed:

> *…..but dock workers on full pay were playing water polo in the drydock which they had filled with water! I was shaken by their aid dependency, banking on continuing charity from the British.*[1]

He was determined that this would not happen in Singapore:

> *If we set about it intelligently and in good heart, there will be a bigger and economically more reliant Singapore after the bases have been run-down.*[2]

Hon Sui Sen, then permanent secretary in Singapore's Finance Ministry, was tasked to lead a newly formed department - the Bases Economic Conversion Department, which would "retrain and redeploy redundant workers, take possession of land and other assets that the British were vacating, put them to the best use, and negotiate mitigatory aid".[3] On his agenda was the conversion of both dockyards into competitive commercial enterprises and the promotion of a shipyard industry as part of the nation's first economic development strategy.

In 1968, a new entity, Keppel Shipyard Pte Ltd (Keppel Shipyard), with its shareholdings wholly owned by the Government of Singapore, was incorporated to take over the Dockyard Department (ship repair operations) of the Singapore Harbour Board (SHB). To assist the transition into a viable profit-driven business enterprise, the Singapore Government appointed a leading British-based shipyard group - Swan Hunter, to develop markets and commercial networks as well as local managerial and technical talent in the shipyard.

Even during colonial days, the Dockyard Department of SHB was a commercial ship repairer. The immediate business proposition that the shipyard could offer to customers was cost advantage, with focus on labour-intensive repair works utilising abundant cheap labour, and dock facilities conveniently located at a strategic position on many international maritime trade and tanker routes. Keppel Shipyard's main activities were building of tugboats and barges, and repair of small and medium-sized ships.

1 Lee, K. Y. (2000). *From Third World To First. The Singapore Story: 1965 – 2000*. Singapore: Times Media Ptrivate Limited.
2 ibid.
3 ibid.

**EXHIBIT 3**
**(CONTINUED)**

**KEPPEL O&M: EARLY BEGINNINGS**

Within a year of its privatisation, Keppel Shipyard's turnover increased from S$33 million in 1969 to S$44 million in 1970.[4] Buoyed by this success and confident of their abilities, Keppel Shipyard's core of local managers and engineers prepared a blueprint for "the localisation of the yard", and actively lobbied for a local management team to replace the Swan Hunter team when the latter's five-year contract expired in 1972.

The growth of the Port of Singapore Authority (PSA formed in 1964) during this period was a significant boost to the fortunes of the emerging shipyards. In 1972, Singapore became the first port in Southeast Asia to accommodate a third-generation container vessel (M.V. Nihon), making PSA an important link in the new chain of global container ports. Another development in the early 1970s was the advent of the supertankers - the Very Large Crude Carriers (VLCCs). These were tankers between 200,000 and 300,000 dwt, used to transport crude oil in long-haul trades, mainly from the Arabian Gulf to the Far East, Western Europe and United States. Repair of VLCCs became the mainstay of local shipyards, including Keppel Shipyard. By the mid-1970s, Singapore was firmly established as a major international repair centre between Europe and Japan, particularly for large oil tankers which found it a convenient first stop for drydocking and hot-work repairs after degassing on the return trip to the Middle East.

At Keppel Shipyard, with its legacy facilities at Keppel Harbour and Tanjong Pagar wharves sandwiched between busy and growing port facilities, there was very little room for expansion. Hence in 1973, the new management embarked on plans to build a 360,000 dwt drydock, Temasek Dock at Tuas, on the western end of Singapore at a cost of S$90 million.[5]

**The Emerging Offshore Rig Construction Business**

The naval infrastructure left by the British Military provided a ready-made base for the oil search boom in the region in the early 1970s and led to the growth of offshore rig building activities in Singapore. Several offshore rig building operations were established by foreign firms such as Marathon Le Tournea and Bethlehem Steel Corporation of US. These firms fabricated rigs in Singapore which were built to proprietary designs.[6] Some local entrepreneurs were quick to move into this segment.

In 1969, two years after Lee Khim Chai (KC Lee) started Far East Shipbuilding Industries Limited (FESL), the firm won a bid to build an offshore jack-up rig for a Houston-based drill rig services company. In the same year, FESL became the first shipyard operator to raise capital in the Singapore Stock Exchange. In 1970, after the firm entered into a technical agreement with Texas-based Levingston Shipbuilding Company (a leader in offshore drilling design and construction); KC Lee renamed the firm Far East Levingston Shipyard (FELS).

In 1971, Keppel acquired a 39% stake in FELS which was increased to 61% as KC Lee sought to bolster FELS' financial resources. In 1980, Keppel Shipyard took over the management of FELS.

4 Sabhlok, A. (2001). The evolution of Singapore business: A case study approach. *IPS Working Papers*, No 10, Vol 2. Retrieved February 6, 2006, from http://www.ips.org.sg/pub/wp10b.pdf
5 This drydock became operational in 1977.
6 Lim, J. (1993). *Anchored in Singapore's History: The Story of the Marine Industry* (p. 68). Singapore: Association of Singapore Marine Industries.

## EXHIBIT 4

## KEPPEL OFFSHORE AND MARINE

### Group Financial Highlights
### Consolidated Profit and Loss Account

| | 2006 S$'000 | 2005 S$'000 | Change % |
|---|---|---|---|
| Revenue | 5,743,398 | 4,068,029 | +41 |
| Operating Profit | 554,477 | 306,809 | +81 |
| Net Interest/Investment Income | 72,133 | 24,068 | +200 |
| Share of Results of Associates | 13,006 | 8,376 | +55 |
| Profit before Tax | 639,616 | 339,253 | +89 |
| Taxation | (148,626) | (73,517) | +102 |
| Profit after Tax | 490,990 | 265,736 | +85 |
| Minority Interests | (26,907) | (34,237) | -21 |
| Profit before Exceptional Items | 464,083 | 231,499 | +100 |
| Exceptional Items | (5,257) | (3,138) | +68 |
| Attributable Profit | 458,826 | 228,361 | +101 |
| Economic Value Added | 420,143 | 182,649 | +130 |

Source: Keppel Offshore & Marine. *Report to Stakeholders 2006*.

**EXHIBIT 4**
**(CONTINUED)**

**KEPPEL OFFSHORE AND MARINE**

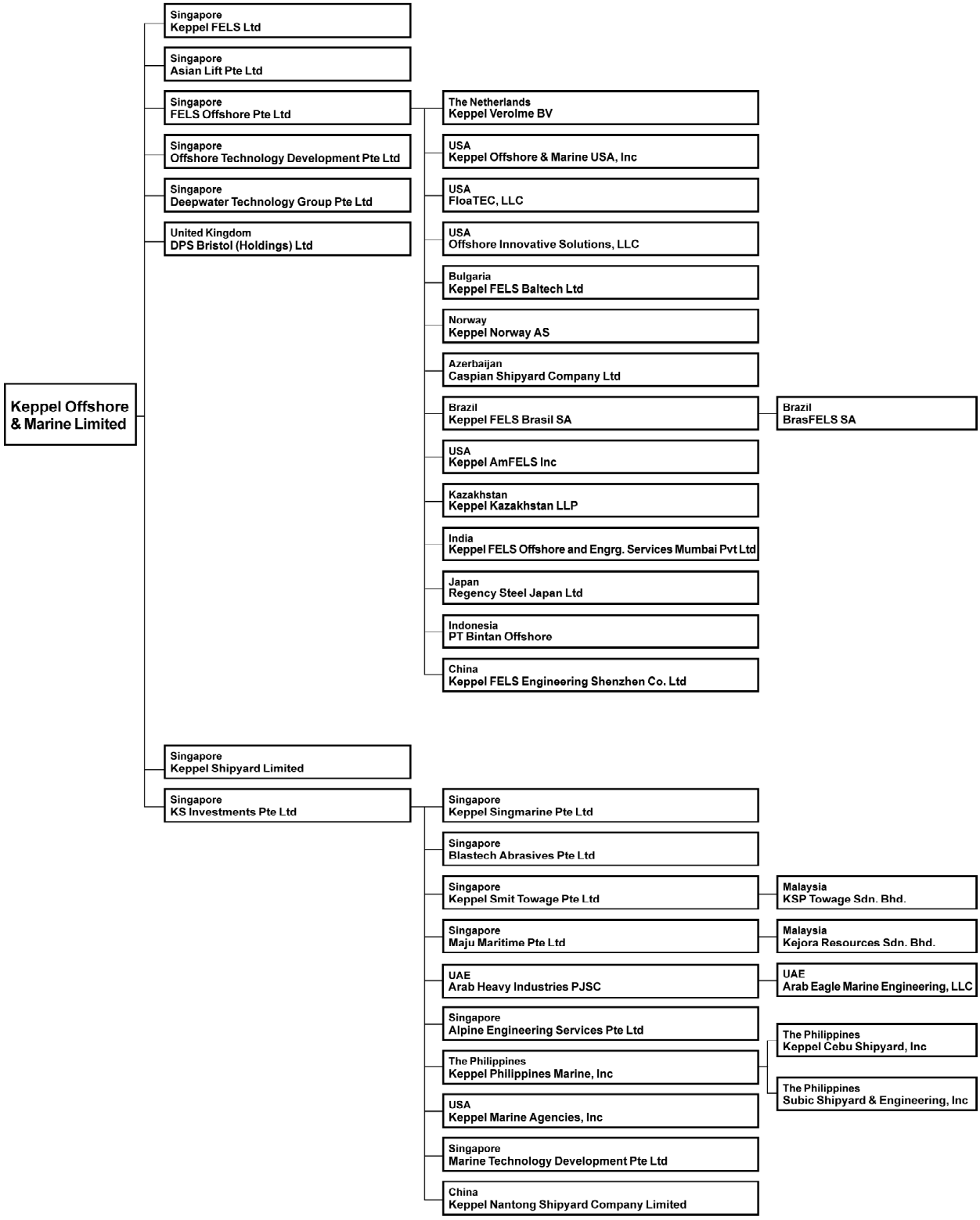
**Group Financial Highlights**
**Consolidated Balance Sheet**

| | 2006 S$'000 | 2005 S$'000 |
|---|---|---|
| Share Capital | 339,716 | 332,277 |
| Reserves | 816,795 | 346,814 |
| Shareholders' Funds | 1,156,511 | 679,091 |
| Minority Interests | 85,492 | 76,808 |
| Capital Employed | 1,242,003 | 755,899 |
| Represented By: | | |
| Fixed Assets | 802,702 | 724,328 |
| Associates | 68,423 | 58,538 |
| Loans Receivable | 2,460 | 4,411 |
| Goodwill | 109,588 | 112,205 |
| Investments | 217,350 | 29,595 |
| Other Assets | 165 | 22,546 |
| | 1,200,688 | 951,623 |
| Current assets | | |
| Stocks | 116,513 | 80,031 |
| Work-in-progress (Cost > Billings) | 261,315 | 208,583 |
| Related Companies & Associates | 143,531 | 56,229 |
| Investments | 5,855 | 3,464 |
| Other Assets | 66,174 | 20,356 |
| Debtors | 835,679 | 760,422 |
| Bank Balances, Deposits & Cash | 2,492,493 | 1,553,392 |
| | 3,921,560 | 2,682,477 |
| Current liabilities | | |
| Creditors | 1,325,402 | 836,293 |
| Work-in-progress (Billings > Cost) | 2,223,677 | 1,471,808 |
| Short-Term Loans | 50,760 | 330,053 |
| Taxation | 153,565 | 90,825 |
| | 3,753,404 | 2,728,979 |
| Net Current Assets | 168,1561 | (46,502) |
| Non-current liabilities | | |
| Long-Term Loans | 29,568 | 44,757 |
| Deferred Taxation | 95,980 | 102,922 |
| Deferred Liabilities | 1,293 | 1,543 |
| | 126,841 | 149,222 |
| Net Assets | 1,242,003 | 755,899 |

Source: Keppel Offshore & Marine. *Report to Stakeholders 2006*.

## EXHIBIT 5

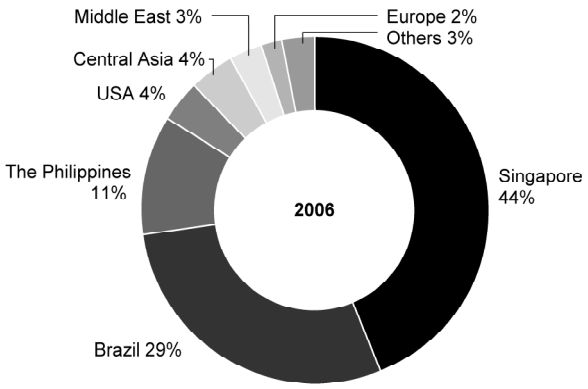
## KEPPEL O&M CORPORATE STRUCTURE




Source: Keppel Offshore and Marine. (2006). Corporate Structure. *Report to stakeholders*.

## EXHIBIT 6

## MANPOWER DISTRIBUTION BY COUNTRY




Source: Keppel Offshore and Marine. (2006). Corporate Review. Nurturing People. *Report to Stakeholders*.

## EXHIBIT 7

## SEMBMARINE'S FINANCIAL HIGHLIGHTS

| | S$million | |
|---|---|---|
| **Year** | **Revenue** | **PATMI*** |
| 2002 | 1011 | 92 |
| 2003 | 1067 | 78 |
| 2004 | 1362 | 94 |
| 2005 | 2119 | 121 |
| 2006 | 3545 | 238 |

Source: SembCorp Marine Ltd. (2006). Group five year summary. *Annual Report.*

## KEPPEL O&M'S FINANCIAL HIGHLIGHTS

| | S$million | |
|---|---|---|
| **Year** | **Revenue** | **PATMI*** |
| 2002 | 1911 | 183 |
| 2003 | 1460 | 143 |
| 2004 | 2430 | 194 |
| 2005 | 4112 | 239 |
| 2006 | 5755 | 448 |

Source: Segment data in Keppel Corporation Ltd. *Annual Reports 2002, 2004 and 2006*.

* Profit After Tax and Minority Interest