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# THE INTERACTION BETWEEN THE SHIP REPAIR, SHIP CONVERSION AND SHIPBUILDING INDUSTRIES

*This report is referred for the consideration of the WP6 at its meeting on 3-4 July 2008.*



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**Summary**

This study of the interaction between the ship repair, conversion and shipbuilding sectors was largely undertaken by Mr. Özgur Umut Senturk, who has been seconded from the Government of Turkey to work on shipbuilding matters. We thank Turkey for this generous voluntary contribution, without which this project would not have been possible.

**Action**

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# THE INTERACTION BETWEEN THE SHIP REPAIR, SHIP CONVERSION AND SHIPBUILDING INDUSTRIES

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## INTRODUCTION

1. Basically, ship repair yards offer maintenance services to ship owners, so that the ships can be operated profitably and kept in proper condition in line with the regulations of the IMO (International Maritime Organization), their flag states requirements and the minimum standards of classification societies.

2. Importantly, ship repair does not necessarily imply the need for a dock, as work (even complex underwater work) can often be undertaken alongside at berths. This, of course, greatly increases the flexibility with which ship repair service can be delivered, and minimises the need for extensive (and expensive) fixed installations.

3. On the other hand, ship conversion services alter the structure and/or configuration of vessels in order to enable them to carry out a different purpose than was originally intended when the vessel was built. The conversion of tankers to operate as bulk carriers is an example of such a conversion. These conversions are generally substantial in nature, and require the availability of extensive facilities and labour skills that are often indistinguishable from those required for a new vessel.

4. Ship repair work is by nature labour intensive[1] and not prone to automation. This provides an immediate advantage to developing economies that have an abundant supply of low cost labour. On the other hand, as already noted, ship conversion work has significant common characteristics with shipbuilding, including automation and outsourcing and so this sector does not automatically share this natural advantage.

5. Traditional, big repair bases like Rotterdam, Hamburg, Singapore and Japan face increasingly strong competition in services ranging from "simple" activities (such as general repairs) to complex tasks such as extensive refits or conversions. This competition comes from yards Eastern Europe, China and Vietnam, which are actively entering the market.

## THE SHIP REPAIR MARKET

### *Different yards for different needs*

6. The technologies employed in ship repair have undergone major changes in recent years, resulting in a drastic reduction in docking and lay up time for repairs. Many yards have invested in sophisticated equipment to ensure high safety and environmental standards when carrying out maintenance and repairs, such as the replacement of steel plates, the cleaning of tanks and so on. In addition, modern vessels are increasingly complex, with automated systems that require constant attention as well as regular maintenance and rectification and this has also increased the need for greater sophistication and skills on the part of the service providers.

7. However, despite advances in technology (such as robotics, modular fabrication, advanced IT systems and procedures), ship-repair remains a labour intensive business, as virtually every job will be unique in some respect (e.g. the amount, nature and location of steel replacement) so automation is not always an available solution.

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[1] It is accepted that labour and steelwork related costs are the two main components of ship repair costs, and that labour accounts for between 50%-70% of total costs.

8. This labour intensity means that facilities that have access to ample skilled, low cost labour will have a cost advantage for less complex repair/maintenance work over their competitors in higher cost centres, even if they cannot match them in terms of technology.

9. This means that the selection of the appropriate ship repair centre has become crucially important to shipowners, who frequently must decide between the choice of a financially attractive low-cost centre with the need for a certain degree of reliability and technical sophistication. Therefore, while some owners will be drawn to lower cost yards in locations such as China (because of favourable steelwork replacement costs), others may choose yards elsewhere that might offer (albeit at higher cost) specialised vessel servicing and overhaul. For example, the Singapore based Keppel repair yard have a strong reputation for servicing LNG and LPG carriers, while some European and USA repair yards have established a significant niche in the cruise ship sector.

10. The availability of these different alternatives, give shipowners significant opportunities to select the service of their choice, but significantly they may not always be able to effectively exercise that choice.

***What drives demand for ship repair services?***

11. The main demand for ship repair work stems from pre-planned, scheduled routine maintenance for the vessels. These scheduled activities are necessary in order to ensure that vessels are seaworthy, and in optimum operating condition in order to maximise their earning capacity. These scheduled calls at ship yards for routine repair/maintenance (which may require dry-docking) are also driven by the need for regular class inspections by classification societies (normally every five years). The important common characteristic of these scheduled activities is that are pre-planned, and therefore the ship owner or operator has considerable freedom to choose the repair facility of their choice.

12. On the other hand, unscheduled repairs, whether through breakdowns or incidents, are clearly less predictable, and there may be little flexibility in the timing and choice of location to effect repairs. In these instances shipowners and operators may have no choice but to use local ship repair services, regardless of the cost or quality of those services.

13. Apart from breakdowns and incidents, unscheduled repairs are increasingly being dictated by PSC (Port State Control) authorities, which are targeting their inspections in order to maximise their chances of discovering defects. These targeted campaigns can be based on types of vessels, flags of registration and classifications societies, and frequently result in vessels with serious (and sometimes not so serious) defects being detained until those defects are rectified.

14. A further determinant of demand for unscheduled repairs is that arising from the conditions of sale of second ships, where transactions frequently require evidence of a recent dry-docking by the vessel. Consequently, the extent of the sale and purchase market can become a factor in the demand for dry dock use.

15. Also, the re-activation of vessels that are laid up (when demand for vessels is low) is another element affecting the inspection, maintenance and repair activities. While this has not been an issue for some time due to the very high level of world economic activity, from time to time it could be very significant as it was in the 1980s, and it remains a factor in assessing nominal demand for drydock use (Drewry 2001).

16. Assessing the future demand for ship repair services is difficult, not the least because (as mentioned above) a considerable amount of this demand is unscheduled, and will depend on exogenous drivers. The one thing that can be said about future demand is that its growth will have some relationship

with the growth of the world fleet; and based on current order books will be significant in the short to medium term (*eg.* to 2012).

***The growth of the world fleet***

17. During the course of 2007, the order book for the world merchant fleet grew to a record high level, four times bigger than what was recorded before the current cycle started in 2003 (see Table 1). The demand for new ships has exceeded the delivery capacity, and the shipyard order backlog have become increasingly longer, with shipowners placing orders now not expecting delivery until 2012 or beyond. This strong demand for new vessels will greatly increase the number of vessels in the world's commercial fleet, which will also (gradually and proportionately) increase the natural demand for ship repair and maintenance services.

**Table 1. Shipbuilding new orders in million cgt (2000-2007)**

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| CGT (mill.) | 42.90 | 48.20 | 48.90 | 70.80 | 92.80 | 107.2 | 138.0 | 177.7 |

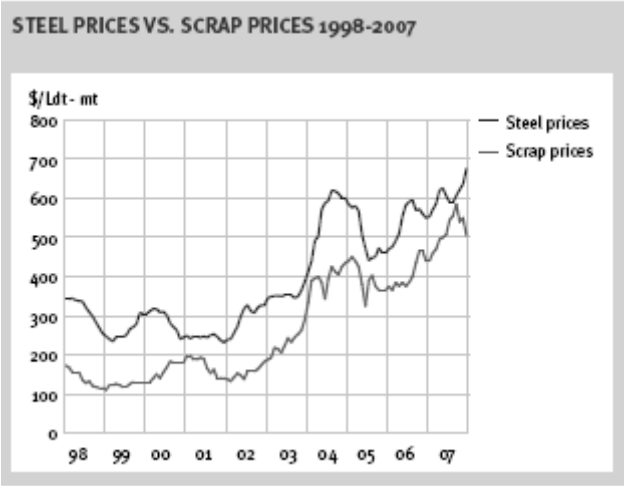
*Source*: Lloyd`s Register Fairplay (December 2007).

18. Just as there are additions to the fleet, there are also deletions, as vessels become uneconomic or unseaworthy and are recycled (or scrapped in earlier terminology). However, because of the very strong demand for shipping service, and the delays in delivery of new vessels, since 2003 demolition levels have been particularly low, at around 10% of new orders, compared to 70% during the previous cycle (BRS, 2008). Therefore, even as the world fleet is being renewed, the number of old ships is not commensurately decreasing, particularly in the dry bulk sector where charter rates have been particularly strong, and where owners have chosen to pass surveys for their older vessels and continue trading.[2]

19. As a different measure, recycling was down from 7.2 million dwt in 2006 to 5.7 million dwt in 2007, which is the lowest scrapping activity seen since the early 1990s, indication that until the global economy tightens (which may now be happening), or the value of scrap steel increases enough (see Figure 1 ) to make the continued operation of older vessels to become uneconomic, we can expect the size of the world's fleet (and therefore the demand for associated ship repair and maintenance services), will increase (Platou 2008).

[2] Only around 680,000 dwt of dry bulk capacity was sold for demolition in 2007, consisted mostly of handysizes and smaller units.

**Figure 1. Steel and scrap prices 1998-2007**




*Source*: Platou 2008.

20. The available evidence clearly points to the overall demand for ship repair and maintenance services increasing significantly in future years, as the maintenance cycles for the growing commercial fleet (including the newbuildings) come into operation.

21. While little can be said about the total demand for ship repair and maintenance services, it has been reported by Worldyards Research[3] that the demand for dock space to carry out the five year statutory drydock cycles for big ships[4] (which require dry-docking) is expected to rise rapidly through to 2015, as shown in Figure 2. Based on the steeply increasing demand for such services (more than 100% between 2007 to 2015), it might be possible to speculate that there will be pressure on repair yard capacity, especially if some of that capacity has been converted to either conversion or newbuilding work, to take advantage of the very high demand and high prices for those services.

3 *" Moving up the value chain or regression" - Worldyards research comment 31/10/07*

4 Ships longer than 300 m in length and wider than 36 m in beam

**Figure 2. Scheduled repair demand estimate (2007-2015)**

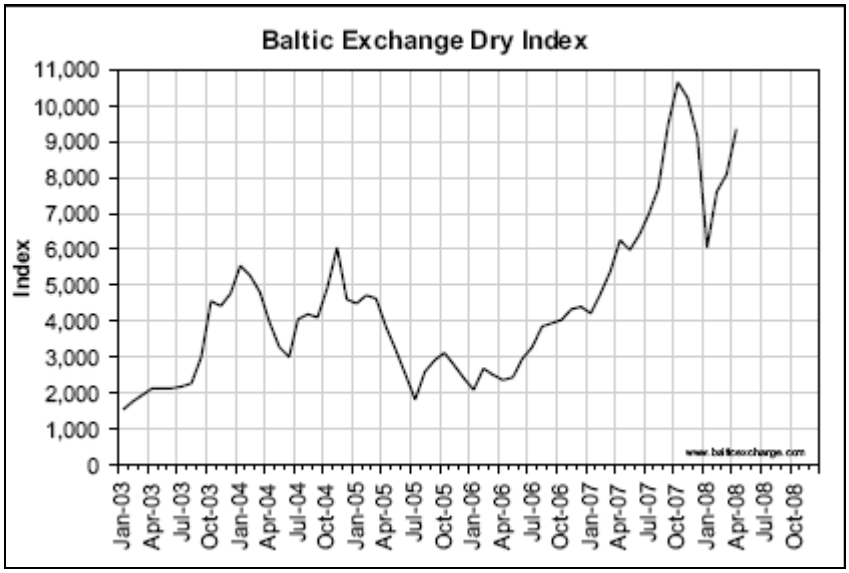
| Segment | Anniversaries (multiple of 5s) | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| Large Bulker | 5th | **34** | **23** | 33 | 44 | 54 | 65 | 57 | 39 | 107 | 161 |
| | 10th | **50** | **46** | 12 | 30 | 33 | 34 | 23 | 33 | 44 | 54 |
| | 15th | **19** | **23** | 31 | 29 | 39 | 50 | 46 | 12 | 30 | 33 |
| | 20th | **31** | **22** | 9 | 15 | 38 | 19 | 23 | 31 | 29 | 39 |
| | 25th | **28** | **30** | 9 | 17 | 20 | 31 | 22 | 9 | 15 | 38 |
| | *Total* | ***162*** | ***144*** | ***94*** | ***135*** | ***184*** | ***199*** | ***171*** | ***124*** | ***225*** | ***325*** |
| Large Container | 5th | **57** | **43** | 38 | 47 | 58 | 101 | 72 | 97 | 88 | 107 |
| | 10th | **20** | **21** | 17 | 14 | 35 | 57 | 43 | 38 | 47 | 58 |
| | 15th | **0** | **0** | 0 | 0 | 8 | 20 | 21 | 17 | 14 | 35 |
| | 20th | **0** | **0** | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| | 25th | **0** | **0** | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| | 30th | **0** | **0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | *Total* | ***77*** | ***64*** | ***60*** | ***61*** | ***101*** | ***178*** | ***136*** | ***157*** | ***149*** | ***208*** |
| Large Tanker | 5th | **58** | **95** | 139 | 109 | 120 | 98 | 117 | 125 | 239 | 155 |
| | 10th | **46** | **39** | 68 | 95 | 85 | 58 | 95 | 139 | 109 | 120 |
| | 15th | **64** | **82** | 77 | 49 | 46 | 46 | 39 | 68 | 95 | 85 |
| | 20th | **31** | **26** | 29 | 42 | 40 | 63 | 82 | 77 | 49 | 46 |
| | *Total* | ***199*** | ***242*** | ***313*** | ***295*** | ***291*** | ***265*** | ***333*** | ***409*** | ***492*** | ***406*** |
| LNG | 5th | **1** | **10** | 14 | 21 | 18 | 26 | 32 | 53 | 55 | 17 |
| | 10th | **6** | **5** | 3 | 6 | 12 | 1 | 10 | 14 | 21 | 18 |
| | 15th | **1** | **1** | 4 | 8 | 5 | 6 | 5 | 3 | 6 | 12 |
| | 20th | **0** | **0** | 0 | 3 | 2 | 1 | 1 | 4 | 8 | 5 |
| | 25th | **7** | **1** | 3 | 4 | 1 | 0 | 0 | 0 | 3 | 2 |
| | 30th | **3** | **8** | 6 | 5 | 3 | 7 | 1 | 3 | 4 | 1 |
| | 35th | **0** | **0** | 1 | 1 | 1 | 3 | 8 | 6 | 5 | 3 |
| | *Total* | ***18*** | ***25*** | ***31*** | ***48*** | ***42*** | ***44*** | ***57*** | ***83*** | ***102*** | ***58*** |
| **Grand Total** | | **456** | **475** | **498** | **539** | **618** | **686** | **697** | **773** | **968** | **997** |
| Annual Rate of Growth | | - | 4.17% | 4.84% | 8.23% | 14.66% | 11.00% | 1.60% | 10.90% | 25.23% | 3.00% |
| Accumulative Growth 2007-2015 | | | | | | | | | | | 109.89% |

*Source* Worldyards (2007)

## THE SHIP CONVERSION MARKET

22. Conversions are becoming increasingly popular as ship owners try to overcome high newbuild prices and long delivery times by adapting existing vessels for different roles, as the relatively short time required for a conversion is preferable in many cases to bulk carrier newbuilding lead times of up to four years. This has encouraged, for example, the conversion of single hull tankers (which are largely due to be forced out of service in 2010 by IMO regulations) to operate in the dry bulk trades, where there are fewer environmental concerns with their cargoes, and which are currently enjoying high freight rates (see Figure 3).

**Figure 3. Baltic Exchange Dry Index[5] 2003-2008**




*Source*: Monthly Shipping Review SSY – May 2008.

23. In practice, conversions differ significantly from routine ship repair and maintenance because of the complex, high value work that is associated with those conversion (with the commensurate need for higher order facilities and skills). In addition, the time required for the work to be carried out is generally greater, as conversion contracts might run for months, and in some cases for more than a year, rather than days or weeks. In these respects ship conversions have elements that are very similar to shipbuilding, and as such the sector could be considered as a bridge between the more routine ship repair/maintenance sector and the dedicated shipbuilding yards.

24. The demand for ship conversion services is driven by a variety of factors, none of them readily amenable to forecasting. In "normal" times, shipowners may elect to undertake a conversion in order to facilitate the entry of the vessels in a different market niche (for example, lengthening a tanker to increase its capacity). Such decisions are generally opportunistic, and impossible to predict. Generally, however, there would be few pressures to justify the expenditure of dry-docking such vessels over the alternative of simply letting them operate (as sunk costs) until they are totally uneconomic and are recycled.

25. However, this presumes that there is some normality in the shipping market, and that there are no exogenous pressures that make the effort of conversion worthwhile. In fact, over the years (and at present), there have been a number of relatively unique circumstances that have strengthened the demand for ship conversion services.

26. In our present period, the very rapid economic growth in recent years (principally generated by China) has placed extreme pressure on the world commercial shipping fleet, especially for dry bulk carriers. This demand has triggered a strong demand for new vessels that has exceeded the capacity of the world shipbuilding market to deliver those vessels, leading to lengthening order books and delivery periods. This in turn has led to a drying up of the normal recycling of older vessels, as shipowners keep them in service to capitalise on market opportunities.

[5] The Baltic Dry Index is an index covering dry bulk shipping rates and managed by the Baltic Exchange in London.

27. In turn this strong demand for all types of vessels has created particular shortages in some ship types, which can sometimes be met by converting some vessels to meet that demand. This has particularly been the case in the dry bulk market, where demand has been particularly strong, and where, as shown in Figure 4, increases in time charter rates have been dramatic.

28. There was a significant increase in 2007 in the number of contracts that were being placed for the conversion of single hull VLCCs into VLOCs,[6] to the extent that it is being reported that ship conversion yards have become saturated. At the end of the 2007, there were over fifty VLCCs scheduled to start a 'second life' as a bulk carrier in 2008 or 2009 as well as a number of Suezmax and Aframax vessels (BRS, 2008).

29. The volume of conversion work is expected to be substantial in the coming years, especially in Chinese yards such as the Cosco shipyard group[7]. For example, it was recently reported by Det Norske Veritas (DNV) that the conversion market is very active, and that it had classed about 40 re-deliveries[8] by the end of 2007, a trend it expects to continue into 2008.

30. These conversions are expected to contribute to quicker rebalancing of supply/demand in the tanker fleet (which is oversupplied), and which still counts a sizeable number of relatively young single-hull vessels that could remain in service beyond 2010. On the other hand, these conversions will hasten the imbalance in the large bulker fleet (vessels over 120 000 dwt) as the many newbuildings on the order books come into service, even though the majority of the newbuildings are not due to be delivers until 2009 (130 vessels) and 2010 (250 vessels). (BRS, 2008).

31. In addition to this pressure on the dry bulk market, there have been separate but parallel regulatory actions at the International Maritime Organization (IMO) that have impacted significantly on the market.

32. The loss of the tanker the "Erika" in December 1999 had a profound impact on the shipping industry. The IMO introduced new mandatory phase-out requirements which are contained within the new revised MARPOL Annex I Regulation 13G. Under this Single Hull Phase-Out Schedule, many of single hull tankers are due to exit the fleet as early as 2010, although some will be allowed to trade past 2010 depending on their Condition Assessment Scheme and flag state regulations. The expected single hull exits in 2010[9] shown in Figure 4 (MMA 2007).

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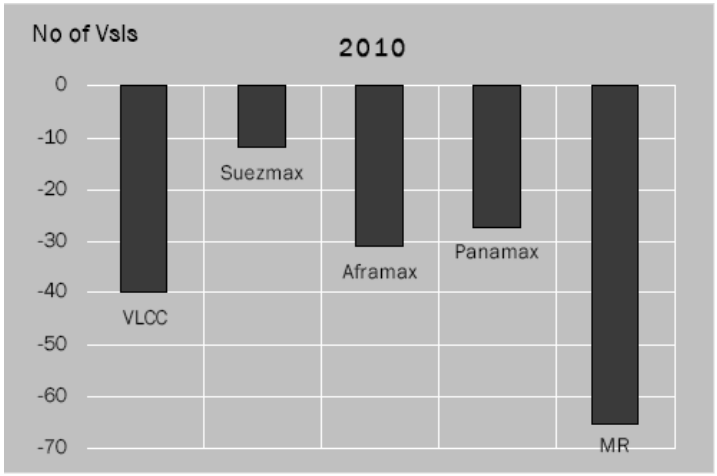
6 VLCC = Very Large Crude Carrier, VLOC = Very Large Ore Carrier

7 It operates a network of five yards in China and consolidates its position as the primary provider of ship conversion services.

8 *"DNV makes safety pledge on single hull conversions"* - Lloyd's List 14/11/07

9 It has been assumed by Mcquilling marine transport that approximately half of the vessels due to exit the fleet will pass the Condition Assessment Scheme (CAS), and trade beyond 2010.

**Figure 4. Expected single hull exits in 2010**




*Source*: Mcquilling Marine Advisors (MMA 2007).

33. This regulation has created a reservoir of single hulled tankers, capable of being converted for dry bulk operation, that represent a diminishing assett value to their owners, as well as incurring higher insurance costs. These tankers are prime candidates for conversion to bulk carrier operation.

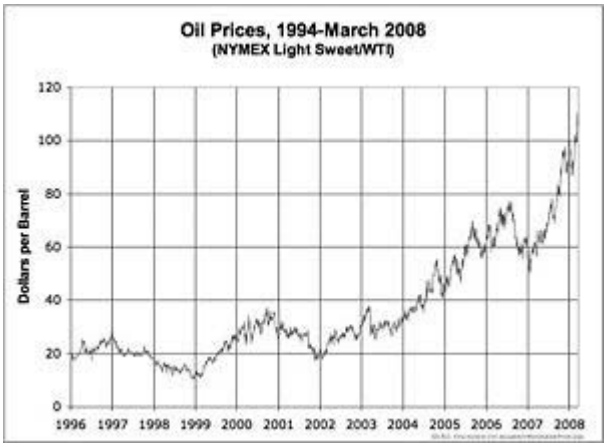
34. The second development that has triggered higher demand for conversion service is related to the rapidly increasing price of oil. High oil prices and strong demand for oil are triggers for the bringing on-line of marginal oilfields, as these become more financially attractive. However, because of the lack of permanent oil extraction and storage infrastructure (which may be uneconomic to provide in small oil fields) many of these marginal oil enterprises will utilise Floating Production, Storage and Offloading platforms (FPSOs)

35. These FPSO take place of fixed platforms and have the added advantage of being relocated relatively easily to take advantage of short term changes to the production opportunities and the oil market. These FPSOs can either be purpose built, or be converted oil tankers (generally the large vessels such as VLCCs – Very Large Crude Carriers).[10]

36. Since 2004, the world has experienced a period of high oil and gas prices as shown in Figure 5. This trend injected new life into the offshore industry during 2007 (BRS, 2008). The search for more and more oil is driving technology forwards, with much of the exploration and development work being undertaken in deep and ultra deep offshore waters. This has generated additional interest in FPSOs (dedicated and converted), as these are virtually the only method of producing, storing and offloading oil using a single unit from marginal fields in deep ocean sites.

[10] The world's first floating platform was a converted tanker installed in 1976 off Castellon in northern Spain. At that time off-shore technology was still in its infancy and the tanker market was struggling due to escalating oil costs caused by the Middle East conflict, which also shut the Suez Canal.

**Figure 5. Oil Prices 1994- 2008 (March)**

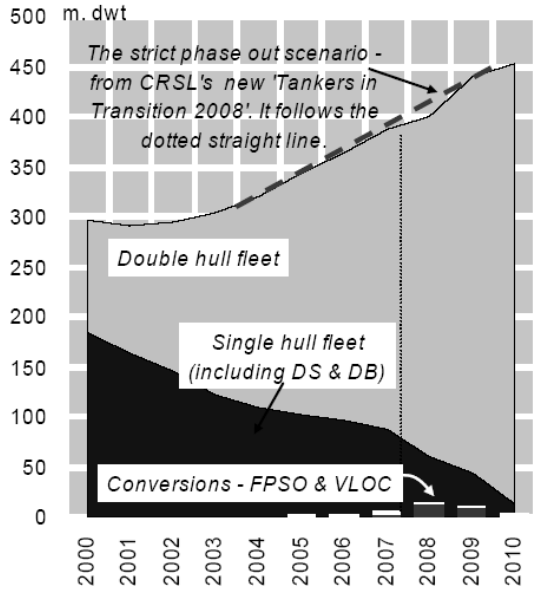



*Source*: The New York Mercantile Exchange, Inc (Nymex).

37. This has led to considerable interest in the conversion of single hull tankers to FPSOs or similar units for offshore environments. FPSO conversion contracts typically require in-dock periods of around 210-245 days per contract, considerably less than the newbuild alternative. It has been estimated that between two-thirds and three-quarters of the units operating as FPSOs, FSOs, etc. are conversions, and the existing fleet numbers around 110-115 vessels.

38. However, there is also a view that the FPSOs of the future will need to be larger and more sophisticated, in order to incorporate more innovative designs and the efficient integration of operational and marine functions, and this may mean that the "simple" conversion of tankers might not be viable in the longer term (Drewry 2002). Nevertheless, the conversion of single hull tankers into ore carriers and FPSOs is a significant development. In 2007, this absorbed 4 million dwt of tankers, but in 2008 it could be closer to 15 million dwt, and could drag supply below the demand trend line as shown in Figure 6 (CRSL, 2008).

**Figure 6. Conversion of single hull tankers**




*Source*: CRSL, 2008.

## INTERACTIONS BETWEEN SHIP REPAIR/CONVERSION AND SHIPBUILDING INDUSTRIES

39. While there are some significant differences between the activities of the shipbuilding, ship conversions and (particularly) ship repair sectors, there are nevertheless a number of similarities, and in many case all of these activities could be carried out in the same yard, as is the case, for example, at the Gdansk repair yard Remontowa.[11]

40. It is suggested that these similarities, rather than their differences are the dominant elements that need to be considered when looking at possible interactions between these otherwise separate sectors, and these are considered in more detail below.

### *Location*

41. In most cases the basic infrastructure required by the ship repair and ship conversion industries are generally similar to that of the shipbuilding industry, However, these are some special considerations between the sectors that may affect where those yards that specialise in one particular sector of the industry may locate their facilities.

42. Generally, shipbuilding has generally been regarded as the more capital intensive activity, and therefore higher in the value chain than ship repair. As such it has generally been the more attractive option for yards in the more developed economies, which made significant investments in major shipbuilding facilities. While this increasingly also been the case in the emerging economies, it is also true that their focus has been ship repair/conversion, which was more suitable for the large number of small yards in those emerging economies, which although not technically advanced could count on a significant supply of low cost, relatively skilled labour.

43. While yards that specialise in newbuilds or major conversions would not be so sensitive to location (because of the discretionary nature of the contracts and the length of time that the work would take), those yards that specialise in the ship repair sector would have a distinct advantage if they were located close to major sea lanes or key loading/discharge points. This is because such strategic locations will minimise the amount of vessels down-time experienced by shipowners, and would make those repair facilities more attractive than those that are situated in less convenient locations. Examples of such strategic locations are Singapore, the Arabian Gulf and the Mediterranean.

44. Further, in order to take advantage of economies of scale, there is usually a clustering of shipbuilding and ship repairs industries at some specific locations. Within the leading shipbuilding economies there are dedicated shipyard clusters for shipbuilding and ship repair activities in order to achieve a more focussed work force and extract production efficiencies. Although this is not a hard and fast rule, the effect of this can be seen in Japan, China and South Korea which are better known as shipbuilding economies, whereas Singapore, Dubai and Bahrain have emerged as ship repair centres.

### *Operational issues*

45. One of the other critical differences between ship construction and ship repair (but to a lesser degree ship conversions) is that in ship construction any change in work pattern or schedule is avoided if at all possible, whereas in ship repair the expectation is that there will be change.

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[11] The yard was established in 1952 and privatized in 2001. Remontowa S.A. specialises in ship repairs and conversions, design and construction of new ships, offshore units and steel structures.

46. A ship construction project, once the design is sufficiently advanced and assuming there is a well-organised production system in place, can be planned in detail with a high degree of certainty. This planning certainty means that in order to be as efficient as possible, newbuilding activities have become increasingly industrialised in their mode of operation, and have become more ship "assemblers" than ship "builders".

47. Therefore, the focus is increasingly on the control and management of all construction processes that are needed to maximise efficiency and reduce construction costs. This has brought to the fore crucial areas such as modularisation, information systems, logistics management, sub-contracting, working with external suppliers and adopting industrial rather than "workshop" methods of construction. As a consequence, the fabrication of components in shipbuilding is therefore increasingly outsourced.

48. However, such a rigid (albeit efficient) procedure cannot always be applied to ship conversions, largely due to the uncertainties that are inherent in such major vessel modifications; regardless of the pre-planning that may take place. Uncertainties about the condition of the existing structure and systems may mean that the conversion may need to be re-planned after the initial stages.

49. Therefore, by their very nature ship conversions will require considerably more internal flexibility to undertake a variety of tasks in-house, and the yard must retain many of the skilled workers and workshop facilities that shipbuilders are increasingly keen to outsource.

50. In many cases, conversion projects will affect the longitudinal strength, structural integrity and stability of the vessel. This will also require the yard to retain design and construction skills, as well as equipment and infrastructure, capable of dealing with significant structural changes to vessels.

51. The scale and complexity of many conversion projects means that these operations are very similar to the building and new ships, and in some cases could also justify the techniques used in newbuild yards; the outsourcing of a lengthening section of a hull, for example.

52. At the other end of the scale, for the ship repairer the operational challenges are far more complex. In the first instance, there are few routine jobs which can be used as a basis for productivity measurement. While work such as hull cleaning or painting can be based on the specification and area to be covered, the actual underwater hull condition, which is the starting point, may only be clear when the ship is docked. In addition, for many items the workload associated with the task is variable, so that once work commences there may be variations in the tasks, which result in significant variations in the man-hours needed.

53. This means than many "workshop" skills need to be kept in-house, which although making the yard more flexible (and therefore more able to respond quickly to unexpected circumstances) it also means that they would incur higher costs than their dedicated counterpart yards. Also, as dedicated repair yards they would have to keep a relatively high inventory of spare parts and components in order to minimise down time for shipowners who use their facilities.

54. Generally, it would seem that ship conversion activities are a bridge between pure shipbuilding and ship repair, although it seems to have much greater affinity with the former rather than the latter. It would also appear that it would be easier for shipbuilding yards to take on ship repairs than vice versa, but repair yards have been known to shift from ship repair[12] to shipbuilding, as they have acquired better skills

[12] On the other hand, developing economies like India and China have found that ship repairs are not only attractive, but also useful to generate employment and as a source of regular revenue.

and improved their infrastructure. Some of the shared characteristics between the sectors are explored in more detail below.

***Shared characteristics***

55. The similarities between ship repair/conversion, and shipbuilding, facilities mean that the conversion from one focus to the other, while complex in terms of repositioning the business, would not be impossible.

56. For example, shipbuilding yards take the opportunity of fluctuations in demand for new constructions by also offering repair and maintenance services. In some cases it also works the other way, as small and medium sized repair yards (in particular) might complement their repair activities by engaging in small-scale new-building activities; perhaps ferries, tugs and smaller commercial vessels, in order to cope with cyclical fluctuations in the repair and maintenance business. As an example, HMD-Vinashin[13] yard decided in 2007 to start building a series of Handymax bulkers in their yards, which until then had focused exclusively on repairs and conversions (BRS 2008).

57. This flexibility in the positioning of yards depends to a large degree on the availability of facilities and skills in the yards, and the type, magnitude and complexity of work that these facilities and skills would allow. As explored earlier, dedicated shipbuilding shipyards are moving more and more into assembly, with more and more parts/components being outsourced. This would reduce the ability of such "industrialised" yards to effectively compete in the more flexible repair market (but this would be unlikely to affect their ability to move into the conversion sector).

58. From the opposite direction, dedicated repair yards might lack the design and logistics management skills, and equipment/infrastructure to compete effectively against the dedicated shipbuilding yards, although they might be able to compensate for this through access to large amounts of low cost labour (and especially if the there is an excess of demand over capacity).

59. Table 2 shows the main facilities that might be common, or different, in two yards, one specialising in repair, and the other in shipbuilding. It indicates conceptually the areas where one or the other would find themselves uncompetitive (or at least inadequately prepared) if a decision were taken to move from one activity to the other. Because of its greater affinity to shipbuilding than to ship repair, a ship conversion facility would share the greatest commonality with shipbuilding yards (Chabane 2004).

[13] Hyundai Vinashin Shipyard Co., Ltd. (HVS), founded in 1999 as s service shipyard that serves multiple repairs, conversion.

**Table 2. Common facilities between ship repair and shipbuilding/conversion yards**

| | |
|---|---|
| **Facilities that are equally shared between two activities** | |
| 1. Paint shop | 6. Health and medical service |
| 2. Warehouse | 7. Training centre |
| 3. Lifting installations | 8. Transportation station and parking |
| 4. Administrative offices | 9. Catering services |
| 5. Technical services | |
| **Facilities that might be shared with predominance of one type of activity** | |
| 1. Pipe shop (shipbuilding) | 3. Berths (ship repair) |
| 2. Steel shop (ship repair) | |
| **Facilities that might be segregated and only dedicated to ship repair** | |
| 1. Docking area | 4. Carpenter shop |
| 2. Machine shop | 5. Afloat repair shop |
| 3. Electrical shop | 6. Treatment plan |
| **Facilities that might be segregated and only dedicated to shipbuilding** | |
| 1. Steel stockyard | 4. Units and blocks storage area |
| 2. Steelwork hall | 5. Erection area |
| 3. Outfitting centre | 6. Design centre |

*Source*: Compiled by the OECD secretariat.

60. What this table essentially shows is that there can be considerable differences between the yard facilities that could be expected to be found in yards that specialise in either construction (and probably conversion) or repair. This is not to suggest that this differentiation will be found in all yards, but that these differences are indicative of the kind of specialised "in-house" facilities that could expected to be found in (or absent from) such yards as they head towards their particular specialisation.

61. One important aspect of the inherent differences between these different types of facilities is that yards that specialise in repair, with little need for advanced design capability, would find it more difficult to enter the newbuilding market where such capabilities are essential.

62. Conversely a yard that. as part of specialising in newbuildings outsources smaller steel fabrications, might find it more difficult to move to ship repair work where such a capability would be in constant demand because of the type of work that ship repair would entail.

63. Therefore, from the above it would be possible to generally conclude that while both ship repair/conversion, and new building facilities share the same basic needs and characteristics, there are also some significant differences which means that they are not always totally technically, operationally and commercially interchangeable.

64. Like shipbuilding facilities, repair yards require a heavy financial investment. Dry docks are expensive, and most integrated repair yards also have two or more piers supplied with appropriate cranes, power, water and access which are a necessity for "alongside" repairs[14]. These items also need to be accessed by the dock or the shore position. The easiest and quickest means by which a repair facility can increase its capacity is through the acquisition of floating docks, which are inherently unsuitable for new constructions. Table 3 shows the basic specifications of dock systems (one of the most expensive

[14] In ship repair, it can be assumed that on average 70% of the work can be done when the ship is lying in the water, and that he ship has to be dry-docked for only 30% of the work.

infrastructure items in newbuild and repair yard investment), including their operation possibilities in both repair and new construction (Drewry 2002).

**Table 3. Main Ship repair dock systems**

| | Slipway System | Shiplift/Lift Dock System | Floating Dock | Graving (Dry) Dock |
|---|---|---|---|---|
| **Operational possibilities** | principally new construction | Repair/conversion & new construction | Normally, repairs and minor conversions only | Repair/conversion and new construction |
| **Docking times** | Approx. 1 hour | Approx. 30-45 min. | Approx. 1.5-2 hrs | Standard 6-10 hrs |
| **Operation** | Skilled personnel needed | Skilled personnel needed | Skilled personnel needed | Simple operation |
| **Maintenance** | Significant<br>Breakdown of rails after long period of corrosion. Servicing of winches | Minor<br>Limited corrosion of platform as submerged only during docking | Considerable<br>Protection of the steel structure against corrosion is necessary | Minor<br>Locking gates, pumps etc. |
| **Service Life** | 10-15 years | 25 years | 15-20 years<br>(if well serviced) | 30 years |

*Source*: OECD Secretariat , Drewry (2001)

65. While some the workshops in both shipbuilding and repair yards would be almost identical, in some instances workshop extent, layout and design would differ depending on the target vessel types for the facility. The optimum yard layout for any particular repair site is not something that can be drawn from a specific template, due to different sites and management strategies, geographical location and support industries.

66. In addition, repair yards must have a wider variety of tools than those required by shipbuilders, since each repair job can be unique. On the other hand ship repair yards do not need to invest as heavily in major capital equipment as shipbuilding yards, and any such investment that is undertaken is more directly connected with the prospect of using those facilities for ship construction when shipbuilding demands makes a shift in focus economically viable.

## REGIONAL ACTIVITIES IN SHIP REPAIR/CONVERSION

67. This paper is not intended to be an exhaustive analysis of the ship repair and conversion sectors, but is intended to be an overview of the interactions between these largely service sectors, and the shipbuilding industry. Nevertheless, an attempt has been made to lay out some of the major regional activities involving ship repair and conversions, in order to provide a basic understanding of where activities are focused, and what major groupings are functioning.

### *Europe*

68. European repairers, faced with strong competition from lower cost repairers in Singapore, China and the Middle East, have focused their attention on intra-regional markets, as well as more complex conversion and specialist activities. Privatization, restructuring, and a shift to more flexible work practices encompassing a greater degree of subcontracted work, have characterized European repair developments

since the 1990s (OSC 2002). Emphasis on quality, expertise, and tight scheduling has also helped bolster repair/conversion activity among some European yards.

69. Repair facilities based in the Mediterranean are also likely to face increased competition from expanding yards in the Black Sea, as well as yards in Asia. Whilst it is expected that general repair work will continue to form the core of Mediterranean yard activity, a number of those yards are expected to expand into more specialist services, such as the focus by the Italian Fincantieri group on repair/conversion (particularly for cruise vessels) at its dedicated yard in Palermo.

70. The opening up of Central and Eastern Europe since the early 1990s has added to the supply of repair/conversion facilities, especially as state owned facilities have been progressively privatised, thus enabling them to greatly increase the range of services offered. While these new yards brought a measure of low cost competition in the European scene it appears that some are already losing their cost advantages to newer entrants, and it has was recently reported in Lloyd`s List[15] that ship owners are now weighing up sailing times if they are considering Baltic or Polish yards, since it could be more economical to have maintenance and repairs done closer to their main trade routes.

***Middle East***

71. In the Middle East, particularly in the UAE and Bahrain, there has been considerable investment in facilities and the importation of labour from low cost regions such as India, Pakistan and the Philippines, to build up a competitive ship repair industry. The yards at Dubai and Bahrain are able to capture many of the tanker vessels that converge here, as well as ships supplying commodities to the Gulf States. On a percentile scale,[16] if the cost of ship repair in the Middle East is set at 100, costs are estimated to be 250 in Japan, 150 in Europe and 50 in China.

72. It has recently been reported by Lloyd's List that construction of the Ras Laffan shiprepair yard project[17] in Qatar is making tangible progress, with the 43ha repair yard primarily focusing on servicing LNG carriers. However, the intention is that it will also service and repair a wide range of vessels, as well as conversion of tankers to FPSO and FSOs.

***Asia (excluding China)***

73. ***South Korea***, perhaps benefiting from the restructuring that followed the Asian financial crisis in the second half of the 1990s (when the Won lost about 40 - 50% of its value in four months), has maintained a successful balance between ship repair and new building activity and continues to broaden its capability to handle a broad range of commercial vessels.

74. On the other hand, ***Japan's*** higher labour costs has made it less competitive in the repair market than the competition in China, Korea and Singapore, and it is understood that this has led Japanese repair yards to concentrate on domestic niche markets (see Table 4 ), where efficiency and automation, rather than simply low costs, can give them a competitive edge. By doing this Japan will maintain a strategic level of ship repair capability, even though the market share of its shipbuilding industry has declined following its dominance in the 1970s and 1980s.

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15 *"Shipdock at full speed with repair work"* - Lloyd's List 28/03/08.

16 Reported in Lloyd`s List 21\04\08 in the article '*Albwardy to benefit from its partnership with Damen*'.

17 *"Ras laffan shiprepair project is on course"* - Lloyd's List 23/04/08.

**Table 4. Japan shiprepair industry – domestic/foreign vessels**

| Year | Domestic vessels | | Foreign vessels | |
|---|---|---|---|---|
| | No. | Sales (mil JPY) | No. | Sales (mil JPY) |
| **1997** | 31,094 | 150,955 | 1,697 | 27,995 |
| **1998** | 29,494 | 162,105 | 1,598 | 25,860 |
| **1999** | 28,605 | 110,804 | 1,598 | 24,568 |
| **2000** | 26,821 | 101,960 | 1,460 | 19,714 |
| **2001** | 26,130 | 94,861 | 1,403 | 22,784 |
| **2002** | 23,477 | 87,220 | 1,145 | 23,194 |
| **2003** | 21,505 | 120,107 | 967 | 18,610 |
| **2004** | 20,353 | 135,724 | 1,135 | 23,728 |
| **2005** | 19,003 | 79,309 | 944 | 21,162 |
| **2006** | 18,681 | 78,251 | 823 | 26,152 |

*Source*: Japan Ministry of Land, Infrastructure and Transport.[18]

*75.* ***Singapore*** has traditionally been a very active ship repair and conversion centre, its dedicated yards benefiting from its strategic position in one of the busiest sea-lanes in the world and the popularity of its port (also one of the busiest in the world). Its reputation for high quality work and its unparalleled location are key factors for Singapore continuing as a significant repair/conversion centre in the future. In addition, there is evidence that Singapore yards are increasingly looking at newbuildings to diversify their activities.

76. Also, Singapore has sought to maintain its leading role in ship repair by entering into alliance agreements with major ship owners and operators, and attempting to retain its long-standing reputation as a relatively low cost centre by hiring labour from lower cost sources such as China, Malaysia, India and the Philippines.

77. A number of Singapore facilities which may be uncompetitive at basic ship repair activities are key players in specialist sectors. An example is Sembcorp Marine, which while probably being at a cost disadvantages in conventional repair work compared to rival yards in lower cost centres, has used its expertise in offshore conversion to retain a strong market presence.

*78.* ***Vietnam*** *i*s the most significant of the recent entrants in the world's shipbuilding market, and is attracting considerable investment from foreign investor into its yards because of the support from the Vietnamese government, the availability of infrastructure and its large pool of skilled, low-cost labour.

79. While it is understood that the majority of this foreign involvement is focused on newbuilding facilities, there will be an inevitable flow-on effect on other Vietnamese facilities; especially the older ones that may no longer be attractive for newbuilding construction, but which may find a niche by providing repair and conversion services.

[18] Vessels over 20 GT and 15 meter length counted.

80. While ***India*** has not traditionally been considered as a ship repair/conversion centre (except for domestic users) it has been published in the report "Working Group for Indian Shipbuilding and Ship Repair Industry for the Eleventh Five Year Plan (2007-2012)" by the Government of India, that the existing docking facilities had not grown to meet the requirements of modern tonnage. This meant that with the commencement of new refineries on the Indian coast, the number of VLCC's used on those trades is bound to increase, with growing potential for the docking of such vessels. Moreover, it has been reported in this report that the vicinity of Gujarat to the adjacent Middle East oil fields could also attract substantial tanker repair business (IMS 2007).

***China***

81. Since the opening up of the Chinese economy there has been considerable expansion in its repair and building capacity on account of low labour costs and investment incentives. Chinese yards are also continuously improving quality, expertise, and productivity and broadening the range of work that they can undertake.

82. During the last decade, there has been evidence of an increasing Chinese yard presence, with some FPSO conversion work also being undertaken. As far back as 1996, the Shanhaiguan yard was involved in FPSO conversion work, under sub-contract to Hyundai HI. This yard and others, such as Sembawang Bohai, Qingdao Beihai and Yantai Raffles, continue to operate successfully in the offshore sector for rig work and/or FPSO/FSO related work. (SRJ 2007).

83. Foreign investment in Chinese repair facilities is set to expand, with established repairers in Hong Kong, Singapore and Japan seeking joint-venture projects in order to establish facilities supported by a low cost base. Ongoing investment in facilities and skills is set to sustain long term growth, and increase the volume of higher value repairs and conversion contracts.

84. Nevertheless, despite this investment in both repair and newbuilding capacity, China's repair yards are all experiencing very high levels of utilisation and are also experiencing the shortages of skilled labour that is affecting the industry as a whole at the present time, and will need to reach further into its labour pool in order to find skilled employees.

85. Significantly, from a structural perspective, it has been recently reported by Lloyd's List that the COSCO Shipyard Group[19] is looking to acquire ship repair yards overseas in order to overcome rising costs in China, rather than develop new greenfield sites. However, it is not clear where such expansion in the repair area would take place. Recent experience involving other economies suggests that South-East Asia could be a target, as Hyundai has entered into a joint venture with Vinashin in Vietnam, and Singapore's Keppel Shipyard has ventured to the Philippines with investment in three yards in that economy.

86. In June 2007, a new 300,000 dwt dry dock was completed at Cosco Zhoushan yard in China, following the opening of a new 80,000 dwt dry dock that was commissioned in March 2007. As a result of these two projects, Cosco has picked up a series of major conversion contracts such as VLCC to VLOC and FPSO conversions. As a result of these investments the group's annual repair capacity increased to 1.7 million dwt, an increase of 28% compared with the position at the end of 2006.

87. Indeed, 2007 was a very significant year for China's ship repair and conversion industry, with the country's largest single repair yard now in operation on Mazhou Island in the Pearl River delta, near the growing port of Shenzen. Operated by the well-established Chinese ship repairer Yiu Lian Dockyards, the new USD 292 million repair facility, which covers an area of 700 000 square metres, opened in May 2007

[19] *"COSCO shipyard group looking to acquire overseas shiprepair yards"* - Lloyd's List 22/02/08

when its 3 000 metres of repair berths became operational. The facility's core business will be repair and conversion, primarily of VLCCs, as well as specialised containership repairs.

88. Moreover, it has been recently reported by COSCO Corp (Singapore),[20] a subsidiary of China's largest shipping group, that ship repair and conversion operations have started at its new joint venture shipyard Lianyungang in Jiangsu province. The yard comprises three 220 m long berths, an 80 000 dwt capacity floating dock and covers 220 000 sq m. A further eight berths will be developed in four phases by 2011 at Qidong in Jiangsu province, following a land purchase deal with COSCO Nantong Shipyard agreed in January 2008.

***Other geographic areas***

89. While there are other minor centres where ship repairs and conversions are undertaken, these tend to be either high cost, domestically oriented, or lack the technical expertise to attract significant outside contracts. Australia/NZ, Africa (especially South Africa) and central and South American facilities tend to fall into one of these categories.

90. In the US, the repair industry continues to be focused on captive Jones Act vessels (as is its newbuilding industry) as well as offshore and cruise ship work (the latter associated with the US and the Caribbean status as the world's largest cruise ship market).

**ROLE OF GOVERNMENTS**

91. Traditionally ship repair activities have been largely national rather than commercial in nature, with considerable public sector ownership of facilities which could be used or leased by one or several repair companies. However, in recent decades this picture has changed, due to the privatisation of state run operations, the possibility of establishing joint ventures to bring outside commercial capital and expertise into state facilities, and business consolidation.

92. Also, the more liberal investment rules and the opening up of access to lower cost locations has led the creation of wider and more complex business arrangements that have created a reach into regional and global markets.

93. While it was clearly governments that began this liberalising process, it is actually quite difficult to establish what their ongoing role is in the development of the ship repair and conversion sectors. It is known that while government support for the shipbuilding sector generally has decreased, there are still significant financial and other incentives provided to the industry (for details, see the OECD Inventory of Subsidies and other Support Measures).

94. However, the focus of data seems to be on the newbuilding sector, and it is virtually impossible to establish what proportion of this assistance (if any) is directly provided to the ship repair and conversion sectors. It may be that with many yards working in both sectors such distinctions may be difficult, or indeed impossible, but the point here is that this is unknown, and so too (by consequence) is the true role of governments in the sectors.

95. Governments may give assistance to ship repair industry and shipbuilders in a variety of ways such as direct subsidies, tax incentives, cheap credits and restructuring assistance. Governments also heavily support R&D and innovation programmes, and while these are probably mainly are related shipbuilding activities (where the benefits of such activities are more likely to accrue), some might also concern repair and conversion activities, due to the commonality of many processes and techniques.

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20 *"COSCO corp sees robust profit growth"* - Lloyd's List 02/05/08.

96. Governments should have considerable interest in ship repair and conversion activities because of their significant potential for direct and indirect employment of labour. Unlike shipbuilding where almost 70% of the equipment and materials (including steel) in terms of value are imported, the reverse is the case in ship repairs where almost 100% work is done locally. Therefore, in many economies governments apply some measures such as soft loans, exemption from service tax, relief from custom and excise duties and others in order to support those activities (see IMS 2007 for an example).

97. However, an intensive search for specific government objectives and targets for the ship repair and conversion sectors, as well as details of direct or indirect support provided to them, has failed to find any significant information sources. This could be because the shipbuilding sector is treated as a homogeneous activity, with no distinction between newbuildings, conversions and repairs, or that the repair/conversion sectors tend to be less visible and fail to be separately accounted for. While the former is more likely to be the case, it might be significant that even in the case of the extensive statistics collected and published commercially, most of them fail to provide regular data on their outputs – including quite significant conversion activities. This might be fertile ground for further investigation in the future.

## POSSIBLE FUTURE ISSUES IN THE REPAIR/CONVERSION SECTORS

98. Because it is so difficult to find information related specifically to these sectors of the broader shipbuilding industry, this section is necessarily brief and relatively speculative, and has been drawn from snippets of information collected in the course of preparing this analysis.

99. It has already been established that the demand for ship repair services is directly related to the size of the world's fleet (particularly for programmed maintenance), and that this is currently rapidly growing; a situation that is unlikely to be affected (at least in the short to medium term) by the present financial problems precipitated by the US sub-prime problems.

100. The choice faced by owners as to which repair facilities to use will remain broadly similar, and will centre around price, location or specific specialisation. However, it is understood that, since the introduction of tougher safety regulations by IMO and the introduction of the International Safety Management Code for the Safe Operation of Vessels,[21] many owners are now looking more seriously at the quality of repairs (NG 2003).

101. It is possible that ship repair yards could be asked to provide stronger guarantees of steel work in the near future, since steel quality and the need for guarantees of work for up to five years are early suggestions coming out of the IMO debate into goal-based standards. The issue of the quality of steelwork is also being discussed as part of a research project looking at the effects of repairs on tankers, which is considering how the effects of a repair can change over time, and how they may create unknown and unpredicted stresses on a ship's hull.[22]

102. Developments such as these, aimed at establishing minimum quality standards for ship repairs, could be a significant factor in the future, and may act to strengthen the appeal of some of the more traditional repair/conversion facilities in higher cost locations. At the very least, facilities that offer low cost repair/conversion services will have to ensure that they can meet these future requirements.

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21 This is known as the International Safety Management (ISM) Code and applies to all types of vessels of over 500 gross tons, including mobile offshore units.

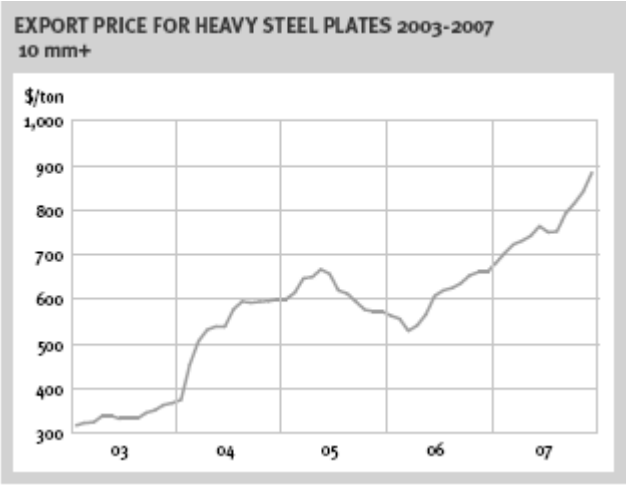
22 Reported in Lloyd's List 16/10/07 in the article "*Yards encouraged to guarantee standard of steel repair work*"

103. The conversion sector is less predictable, but it can be anticipated that once the 2010 target for the removal of most single hulled tankers has been reached, then the ready supply of vessels that would otherwise be approaching their shelf life will dry up. This will probably severely limit future demand for the conversion of tankers to bulk carriers.

104. As noted earlier in this report, there some issues are already being raised regarding the future suitability of FPSO conversions to meet expected the higher standards and capabilities demanded for their operation as floating oil platforms. In any event, as the demand for newbuildings slows, as it is doing right now, then this will free up newbuilding yards to undertake the work, and the falling demand, together with rapidly growing shipbuilding capacity, is likely to also bring down the cost of newbuilt FPSOs.

105. It has also pertinent that it has been reported by Lloyd's List[23] that owners of single-hull tankers are starting to review the economics behind conversions to very large ore carriers, due to rising cost of steel for the conversions (see Figure 7), and the higher prices being paid for vessels offered for demolition. As an example of the latter, the price paid by vessels recyclers in Bangladesh for tankers recently increased to USD 715 per ltd[24], around 25% more than the USD 500 per ltd price on offer at the start of the year.

**Figure 7. Heavy steel plate export price 2003-2007**




*Source*: Platou 2008.

106. Measuring future demand for ship repair services is difficult because while some maintenance and inspection activities are predictable, and can be programmed, others due to breakdowns or incidents are not, and need to be undertaken at short notice. Also demand for repairs is governed by the need to balance the laying up of vessels to keep it in a seaworthy condition, with the necessity of keeping it commercially operational to meet market demands. Crucially, all of these elements are subject to variation and tend to be in a state of flux. However, despite this unpredictability, in an aggregate sense demand for ship repair services is related with demand for shipping services and the development of the world fleet, and this permits some general trends to be drawn from developments in the markets.

107. The Shiprepair and Conversion Technology journal reported that 2007 saw a remarkable upsurge of underwater repair work globally, particularly in the commercial sector, which traditionally has been more reliant upon dry-docking. The range of repairs undertaken without dry-docking has also increased,

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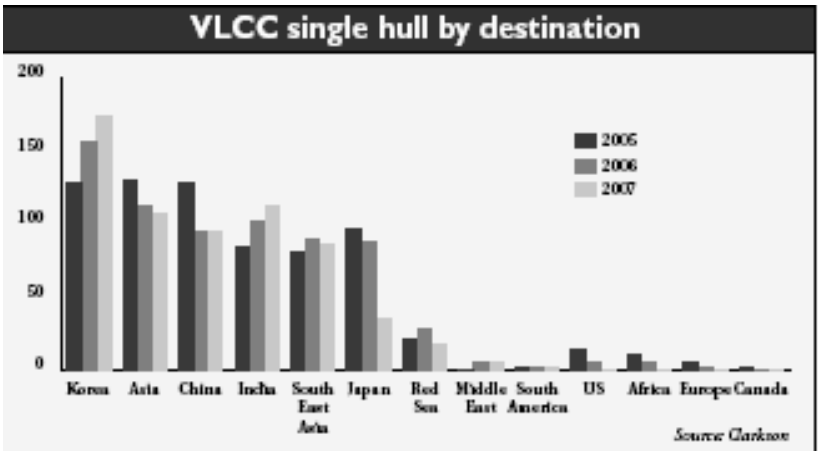
23 *"VLCCs head for breakers as demo prises soar"* - Lloyd's List 10/03/08.

24 LTD = light ton displacement , it is a general used measurement to calculate the scrap value of a vessel.

and has included work such as the fitting of anodes[25] and complete hull plate repairs by means of underwater welding, as well as hull cleaning of yachts, naval vessels, commercial ships of all sizes and FPSOs. These developments will have the effect of easing pressure on dry-dock facilities at times when high demand for the construction of new vessels tends to absorb these facilities; even those that tend to specialise in repair and maintenance work. The successful continuation of these innovative practices when pressure on dry-dock facilities ease (as they almost certainly will, as demand for newbuildings is falling) will depend on whether these specialised services can remain technically and economically attractive.

108. Citigroup Global Markets reported that Asia, in particular, is set to accelerate its phase-out of single hull tankers, which might cause an increase in conversion activities[26]. This is largely as a result of higher insurance costs and tighter regulations following the recent Hebei Spirit oil spill in South Korea, as well as to the high volume of soon-to-be-retired single hull VLCCs operating in the region (see Figure 8).

**Figure 8. Single hull VLCC vessels**




*Source*: Clarkson[27].

## THE TRANSITION OF REPAIR/CONVERSION YARDS INTO NEWBUILDING WORK

109. A dilemma faced by shipbuilders when demand falls is what to do with underused facilities. Many will take on smaller work or use them as repair facilities in order to keep them operational until demand for newbuildings picks up.

110. Of course, when the opposite happens (that is, demand picks up, placing pressure on production facilities), many of these transient yards would quickly revert back to their prime objective of building new vessels. If the increase in demand is significant enough this would also place pressure on those yards largely dedicated to ship repair and conversion to change their focus in order to participate in meeting the excess demand. There is every indication that this effect has indeed operated in the present, extended period of high demand pressure.

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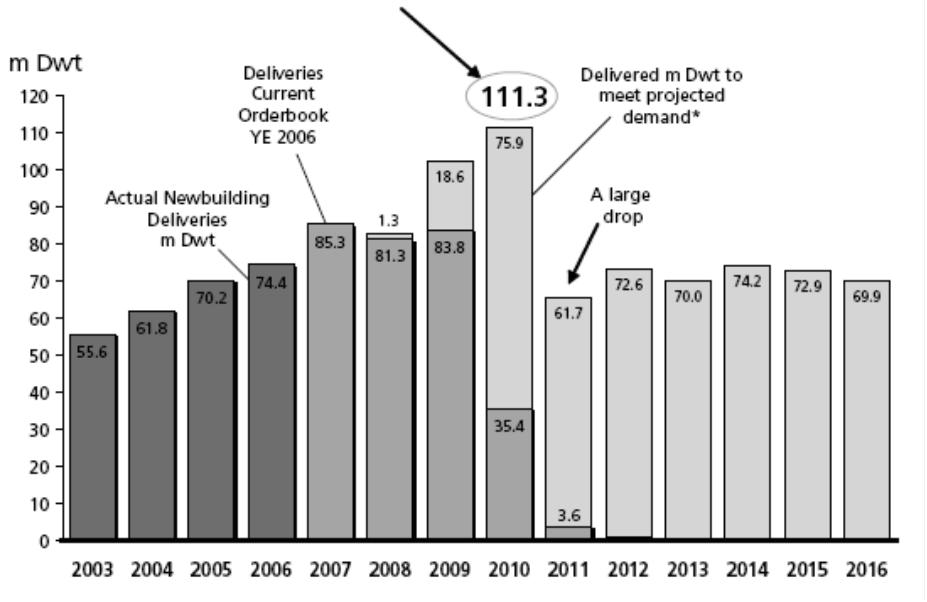
25 Anodes are fitted under water hull area for the external cathodic protection of vessels.

26 South Korea and India are the only countries to have increased the number of single hull, very large crude carriers on charter in the last two years, and nearly 96% of single hull VLCCs now trade in Asia, due to tighter rules in USA and Europe.

27 "Asia to sound death knell for single hull tankers" Lloyd's list 12/12/2007

111. The latest shipbuilding boom has now extended for most of this decade, and as postulated in Figure 9 has virtually doubles the rate of deliveries per year between 2003 and 2010 (although demand is expected to soften – to a still historically high level – from 2011 onwards) and represents an almost ten-fold increase in demand since the late 1980s (ABS 2007).

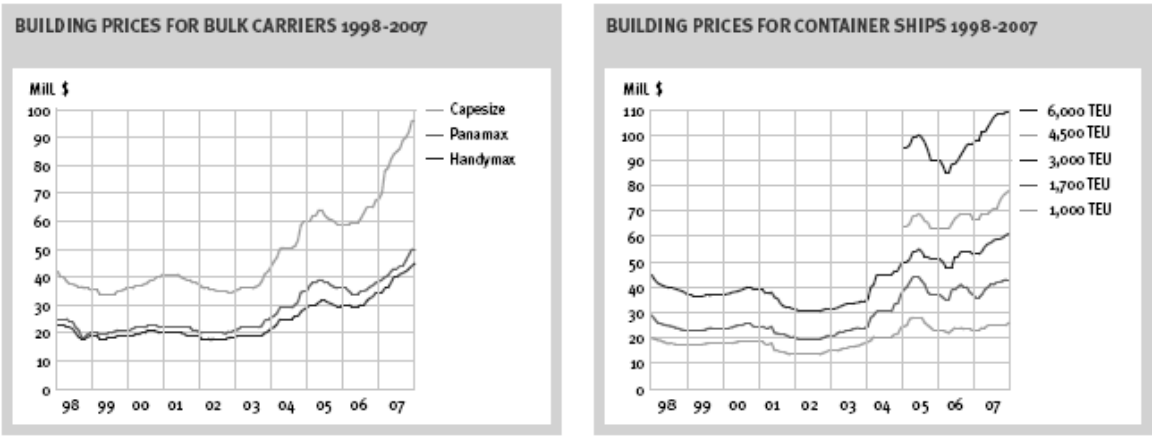
**Figure 9. Historic and projected deliveries – mdwt**




*Source*: ABS (2007)

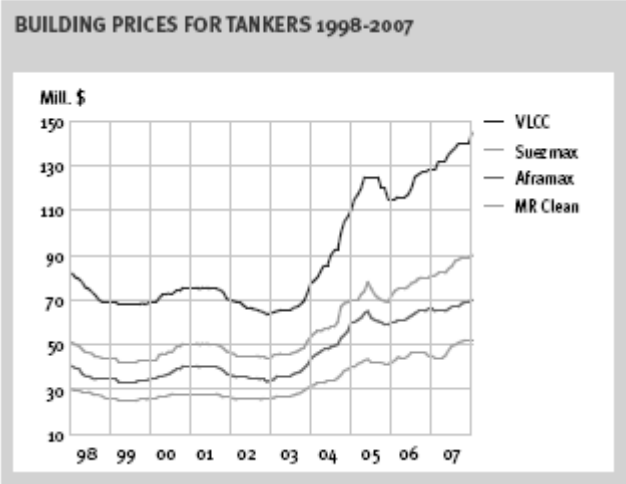
112. As a result of this sustained high demand for newbuildings, prices have also climbed significantly, making the entry into the construction of new vessels more attractive (Figures 10, and 11).

**Figure 10. Bulk carrier and container ships building prices**




*Source*: Platou 2008.

**Figure 11. Tanker building prices**




*Source*: Platou 2008.

113. Shipyards responded to this market opportunity by expanding their facilities, investing in new greenfield sites, and increasingly moving from ship repair/conversion to construction, in order to add to their building capacity. In turn this has had the effect of tightening the market for those types of services, and there is concern that the level of transition by ship repair/conversion yards into the new building market is seriously affecting the ship repair market.

114. The most visible sign of the shipbuilding boom is the rush to expand facilities, convert ship repair yards and build new yards in China, which has rapidly increased its order books to the extent that it expects to challenge becoming the largest shipbuilding economy within the next decade, if recent trends continue.

115. New shipyards have been opening up in China almost on a monthly basis in order to offer early deliveries of bulk carriers. Based on the delivery dates in its orderbook, China will deliver 25.3 million dwt in 2008; 45.9 million dwt in 2009 and 58.3 million dwt in 2010, which if achieved would propel China to the top of the shipbuilding league (Figure 12) (Stopford 2007).

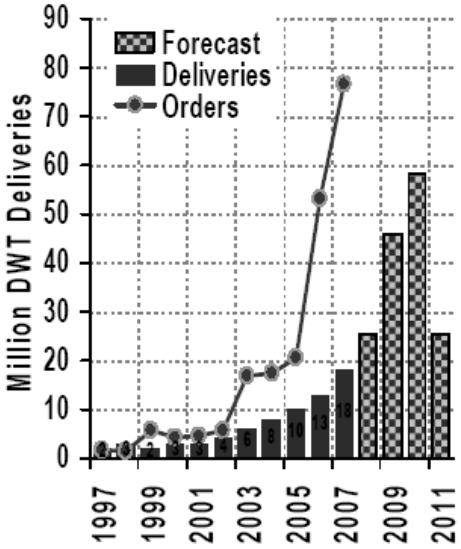
116. As an example of this, Cosco Shipyard Group (CSG), which until recently specialised in repair and conversion, has decided to move heavily into the newbuilding market,[28] with the group envisaging the opening of several construction sites at Dalian, Zhoushan and Guangzhou.

117. Also since 2002, as one of the signs of Chinese repair yard transformation into newbuilding activities, there have been 29 VLCC[29] docks either created or planned for construction by 2010, whereas there were only 3 docks built before 2002 as shown in Table 5. (BRS 2008)

[28] Reported in Lloyd's List 22/02/08 in the article *"COSCO shipyard group looking to acquire overseas shiprepair yards"*

[29] VLCC = very large crude carriers

**Figure 12. China Shipbuilding deliveries 1997-2011**




*Source*: (Stopford 2007).

**Table 5. VLCC docks in China**

| Yard name | Before year 2002 | Year 2002-2007 | Planned | Ownership |
|---|---|---|---|---|
| **Behai** | - | - | 2 (2008) | State owned |
| **Bohai** | - | 1 | 1 | State owned |
| **Cosco Dalian** | - | 1 | - | State owned |
| **Cosco Zhoushan** | | 1 | 1 (2008) | State owned |
| **Dalian New yard** | 1 | 2 | - | State owned |
| **Dalian yard** | - | 1 | - | State owned |
| **Guangzhou Long Xue** | - | 2 | - | State owned |
| **Jiangnan Changxing** | - | 4 | - | State owned |
| **Jinhaiwan** | - | 2 | - | Private |
| **NACKS** | 1 | 1 | - | Private |
| **Nantong Rongsheng** | - | 3 | 1 (2008) | Private |
| **New Century** | - | 2 | | Provincial |
| **Hudong Zonghua** | - | 1 | - | State owned |
| **Qingdao Beihai** | - | 2 | - | State owned |
| **SWS** | - | 2 | - | State owned |
| **Yantai Raffles** | 1 | - | - | Private |
| **Total** | **3** | **25** | **4** | |

*Source*: BRS 2008.

118. There are some significant signs that, especially in China, there is concern that significant bottlenecks will appear in ship repair activities, and some specific remedial action has begun to be put in place. For example, Chinese Titan Quanzhou is currently active in the shipbuilding sector only, but the yard is building a major new repair facility which should be operational by 2009. It is expected to be capable of carrying out VLCC repairs and FPSO conversion projects. (SRJ 2007)

119. It has also been reported by CSG (COSCO Shipyard Group) that the Lianyungang yard in China will boost the group's ship repair and conversion capacity, which has been reduced during the past year as it shifted into the shipbuilding business. Following its move into shipbuilding at the beginning of 2007, CSG has captured some USD 3.4 billion worth of orders for 84 newbuildings during the year, taking up a good portion of its shiprepair capacity. Some owners have confirmed fears that there could be a shortage of ship repair capacity as more and more yards opt for higher value newbuilding work.

120. Another example for the movement of yards from ship repair to shipbuilding is Hong Kong based IMC (International Maritime Carriers) Group, which is expanding its shipyard business in China with two new yards,[30] one focusing on ship repair and the other on shipbuilding. IMC is already in the ship repair business in Thailand with Unithai Shipyard and in China with Zhoushan IMC-Yongue Shipyard.

121. However, as a final point, the dramatic increase in world shipbuilding capacity may turn out to be excessive if demand softens in 2011 as is widely expected, which will almost certainly mean that many of those repair yards that progressed to shipbuilding may start reverting back to their core functions at about that time.

**SUMMARY AND CONCLUSIONS**

122. The principal purpose of this paper was to explore the interaction between the ship repair, ship conversion and shipbuilding industries, and was not intended to be an in-depth analysis of the ship repair and conversion sectors themselves.

123. While the differentiation between the ship repair and conversion is somewhat fuzzy and artificial, because of the ability of dedicated yards to move from one activity to the other, or even undertake the different activities simultaneously, there are nevertheless some observations that can be made about them.

124. For ship repair (including scheduled maintenance activities), the rapidly growing fleet will provide the foundations of an on-going base work load providing services for that fleet.

125. This strong demand may encourage yards to retain skills and operational flexibility to continue to specialise in the repair market, but it can also be expected to attract conversion and construction yards to enter the repair market if demand for conversions and new buildings declines (as it is expected to after about 2011).

126. On the other hand, on current trends, the ship conversion sector has a somewhat uncertain future. First, the availability of single hull tankers (which have formed the mainstay of ship conversion activities) is likely to dry up as the IMO deadline for their being taken out of service approaches. In addition, the continuing high price of steel may also sentice owners to recycle their old vessels rather than risk a conversion.

[30] These two new yards will be located in Zhoushan and Dalian Chengxing.

127. Second, even if some availability remains there are indications that the bulk carrier fleet (which has absorbed many conversions) is likely to become saturated, especially if newbuilding slots become more freely available as newbuilding demand falls.

128. Third, even the conversion to FPSO may diminish in the near future, as more marginal fields come on stream that will require more sophisticated and versatile FPSOs than can be economically provided through the conversion of old tankers.

129. This may also place considerable pressure on yards that are largely dedicated to conversion work to consider their future, and the decision to remain in conversion, or switch at least some of their capacity to newbuilding or repair, will not be easy.

130. The transition of repair/conversion yards to newbuilding work to take advantage of the very high demand in recent years has been covered in the report. Whether such transitions can survive in the longer term is a significant issue, but not one that could be examined in detail in this paper.

131. However, the implications of this; that repair, conversion and newbuilding yards have sufficient similarities that enable them to move from one sector to the other, opens up another interesting area, which is what does such flexibility do for overall shipbuilding capacity?

132. While dedicated shipbuilding facilities are clearly the most important in establishing the magnitude of shipbuilding capacity, it would seem that the ability of other yards to move in and out of newbuilding activities would have some impact on the overall capacity of the shipbuilding sector, and should not be ignored.

133. One particular area where this concept might be particularly important is negotiations on a new Shipbuilding Agreement, which were paused in September 2005. In those negotiations the issue of whether the ship repair sector should be covered by the Agreement (as it was in the 1994 Agreement) was unresolved, and perhaps this analysis will provide some additional material and viewpoints for consideration when those negotiations resume (presuming they do).

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