Crane prices - Boom, Bust or Bonanza ?

Presented at TOC ASIA 1998

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Introduction

Contrary to what the title says - Boom, Bust or Bonanza, in the 20 years that I have been involved with the crane industry, I have yet to see a Boom in crane prices !

The shipping industry is full of sorry tales of excess capacity, non-existent margins, and alliances / mergers / acquisition for greater economies of scale. I am sure we all feel great sympathy for our colleagues in the shipping business. However, they are not the only ones suffering. Many others in related industries are also in similar dire straits - they had been suffering in silence.

Crane prices are crashing to new lows!! China's SPMP (Shanghai Port Mahcinery Plant) delivered one unit Panamax container quay crane to Quanzhou port at an unbelievable price of USD 2.8 million. Bangkok Port reportedly purchased 12 RTGs at a unit price of USD 800,000. Liebherr Ireland won a contract from Felixstowe at 3.1 million pound (USD 5.1 m) per unit in an order for three super post-Panamax cranes with 55 m boom / 70 m ton under spreader. How much lower will prices have to go ?

Summary

This paper looks at the various issues related to the container crane industry today. It first examines the world wide demand for container cranes on the one hand, and the crane manufacturing capacity on the other. It then reports on recent crane prices, which are followed by an analysis of the factors affecting crane prices. The impact of Asian economic crisis cannot be ignored and is dealt with in the paper. Finally the paper looks at the implications of falling crane prices on the crane owners/purchasers and the crane manufacturers. Some suggestions are offered for both terminal operators and crane manufacturers on how to avoid pitfalls in their investment and business decisions.

Definitions

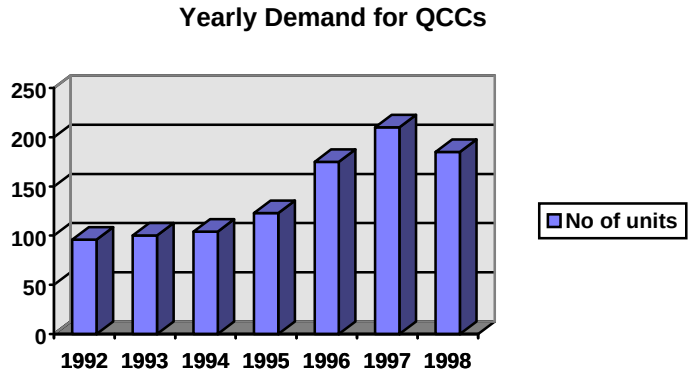
- This paper limits its coverage to Quay side Container Cranes (QCCs), Rubber Tyre Gantry cranes (RTGs), and Rail Mounted yard Gantry cranes (RMGs) which also includes Overhead Bridge Cranes (OHBC).
- Panamax QCCs refer to cranes with outreach less than 44 m. Post Panamax QCCs refer to cranes with 44m to 48 m outreach. Super Post Panamax QCCs refer to cranes with more 48 m to 57 m outreach.

Crane Demand

Demand for QCCs

World wide demand for QCCs in recent years is illustrated as follows:

Year	1992	1993	1994	1995	1996	1997	1998
No of units	96	100	104	123	175	210	185

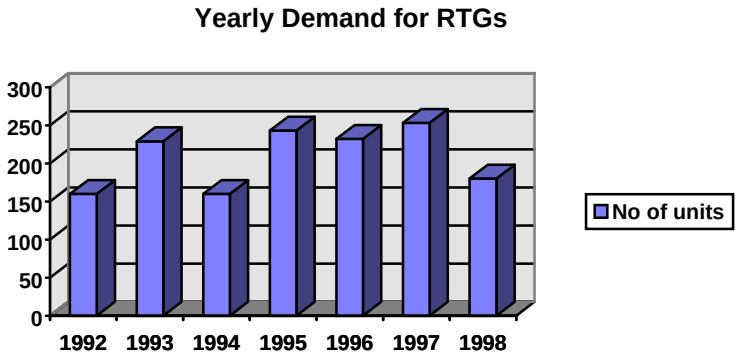


The table shows that crane delivery peaked at 210 units in 1997, having risen from 175 units in 1996 and forecast to fall to estimated 185 units in 1998. At an average price of USD 5.0 m, the QCC business is worth about USD 1.0 billion per year.

As reported in various publications, over 60% of QCC delivered since 1995 are either Post-Panamax or Super Post-Panamax cranes. Asian market accounts for about 50 % of the deliveries.

Demand for RTGs

Year	1992	1993	1994	1995	1996	1997	1998
No of units	160	229	160	243	232	253	180

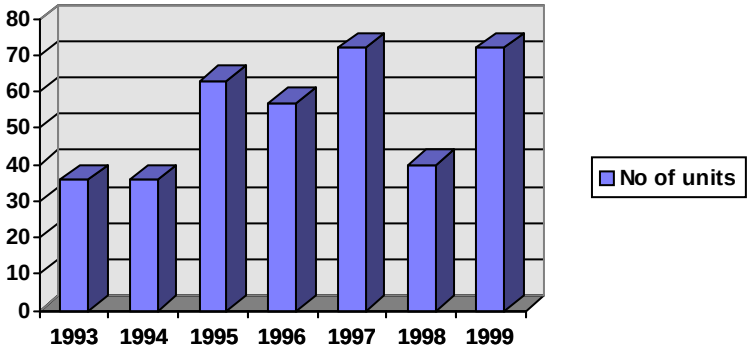


Again RTG deliveries peaked in 1997 at 253 units, although deliveries in 1994 and 1995 were relatively high at the 230 to 240 level. For 1998, deliveries will decline below 200 units.

Unlike the QCCs, RTGs dimensions tend to be standardised around 6 + 1 wide and 1 over 4 or 5 high. Asian market accounts for more than 60 % of the present deliveries since Asian terminals tend to favour RTGs over straddle carriers. At an average price of USD 1.0 m each, the RTG business was worth USD 250 m each year.

Demand for RMGs

Year	1993	1994	1995	1996	1997	1998	1999
No of units	36	36	63	57	72	40	72



World wide annual demand for RMGs has risen from 30-40 units about 5 years ago to 60-70 units presently. This refers to machines meant for container handling and excludes those industrial type found in the factories for general handling purposes. Most RMGs are used in inland depots or rail terminals, which are simpler machines compared to those

delivered to marine terminals. The period 1995 to 1997 saw some unusually high levels of 60 to 70 units a year, primarily because of large deliveries going into Singapore (33 RMGs and 44 OHBCs) and Hongkong (24 RMGs). Such wide span RMGs average about USD 3 to 4 million each. Therefore the RMG market is probably worth about USD 160 million a year presently. Market for RMG is set to grow gradually in view of growing importance of intermodal rail traffic and potential conversion from RTG operation to RMG operation at some seaports.

From the above, you can see that demand for container cranes is healthy and has been growing steadily year by year. But what about crane manufacturing capacity ?

Crane Manufacturing Capacity

There are now roughly 50 manufacturers of QCCs and RTGs respectively. Many of these manufacturers have added enormous capacity in recent years. Following is a sampling of production capacity of the larger manufacturers:

	Manufacturer	QCC (units)	RTGs (units)
1	Mitsubishi Heavy	28	50
2	Samsung Heavy	15	50
3	ZPMC	20	40
4	Noell Preusagg Group	25	50
5	Impsa Group	12	0
6	Mitsui Engineering	12	50
7	Hyundai Heavy	14	50

ZPMC (Shanghai Zhenhua Port Machineries) though a relative new comer, have built up tremendous capacity in response to the buoyant domestic and export market. Samsung Heavy Industries, having geared up for several years of large orders from Port of Singapore, are left with a substantial idle capacity. The world's leading producer, Mitsubishi Heavy Industries (MHI) is able to deliver more than 30 QCCs and 50 RTGs a year. MHI has in recent years captured 14% of the world market for QCCs. Noell Preusagg, already among the top three producers of QCCs had recently established a manufacturing facility in Xiamen, which is said to have a capacity of 17 QCCs and 27 RTGs when fully operational. Similarly, Impsa Malaysia has recently established own manufacturing plant in Kemaman, Malaysia with a capacity of at least a dozen units a year.

Based on numerous interviews with various manufacturers, I have estimated the global manufacturing capacities as follows:

Crane type	Annual capacity (units)
QCCs	350
RTGs	520
RMGs	100

From the above, we can see that the supply exceeds demand by almost 100 %. Further more, above capacity does not include those of subcontractors', which if considered will worsen overcapacity.

Assuming an annual demand of 200 QCCs to be spread over 50 manufacturers, this average out to only 4 QCCs per manufacturer per year. In actual fact, the top 6 producers secured close to 100 cranes in 1997, leaving the remaining 100 units to shared by the reamining say 44 producers, which works out to be only about 2 units per producer on an average, clearly an unsustainable volume to enable everyone to remain in business.

Factors affecting Capacity:

- Determination of players - Determination of manufacturers play an important part behind their intention to increase or maintain existing capacity. Such determination propel them to be strong players in certain regional markets or in the global market. This determination could arise from nationalistic considerations such as the need to provide employment, or from bureaucratic decision making governed by market share thinking or glory seeking motives or simply from miscalculation and false economies.
- New and aggressive entrants in low cost countries such as Korea initially and now China.
- Proliferation of licensee manufacturers, and sub-contract fabricators who often underestimate the complexity of crane structure fabrication.
- Stubborn refusal of loss making companies to exit business. Failed businesses are taken over by new owners and managements and capacity remains in the industry. Recent examples: Reggiane being taken over by OFM Fantuzzi; MGM's mutation into OMG Malta Gantry Mfg; Figee and Boomse merging into Boomse-BM Titan; Vulkan Kocks transforming into Kocks Krane etc.

Crane Prices:

With supply exceeding demand, crane prices have only one way to go: south !

Crane prices vary widely from one contract to another. Comparing crane prices over a period of time and across different parts of the world by converting local currency prices into USD at the respective prevailing exchange rates introduces distortions from

exchange rate volatility. For example, three years ago, an RTG may cost 125 million Yen in Japan (which @ 90 Yen / USD 1.0 = USD 1.388 m) whereas today the same RTG though may cost less at 100 m Yen, but when translated to USD at 130 Yen to the dollar, would work out to be a shocking price of only USD 769,000.

Besides exchange rate distortion, it is also difficult to compare prices because of differences in specifications, size of order, etc. Still, it is instructive to look at some recent price levels as a benchmark:

QCC Prices:

Following tables show the extent to which prices have declined:

Current Price Levels

Port / Manufacturer / Year	Order size	Unit price in local currency	Unit price in m USD	Crane specifications
Felixstowe / Liebherr / 1997	3	Stg Pd 3.1 m	5.1	Super post Panamax, 55 m outreach
Charleston / Paceco Esp / 1997	2	5.3 m USD	5.3	Post Panamax
Singapore / Mitsubishi / 1995	12+12	S$ 7.4 m	5.3	Super post-Panamax, 55.5 m outreach, automation
Quanzhou / SPMP / 1997	1	2.8 m USD	2.8 m	Panamax
Shanghai / Hanjung / 1998	2	3.7 m USD	3.7 m	Post Panamax twin lift

Price Levels in Early 1990's

Crane type	Unit price (m USD)
Small Panamax (< 40m outreach)	4.5
Large Panamax (> 40 m outreach)	5.0
Post-Panamax (44 - 48 m outreach)	5.5 - 6
Super Post-Panamax	Not available

The above tables shows that a Super Post Panamax crane is sold today at between USD 5.1 m to 5.5 m each, whereas five years ago this would have been close to the price of a Panamax crane. Post-Panamax QCCs have seen its price tag slashed from USD 6.0 m level to less than USD 4.0 m.

RTG Prices

RTGs tend to be a more homogeneous product in that most of them are 6 plus 1 wide, and 1 over 5 high machines. Prices have also shown a sharp decline over the last 5 years. Prices levels of USD 1.1 to 1.2 m of 5 years ago had dropped through USD 1.0 m in the last two years to recently reported levels of USD 0.8 to 0.85 million.

Following are some recent reported contract prices:

Project	Order size	Unit price (m USD)	Specifications
Humpuss / Sumitomo / 1996	33		Standard 8 wheel
Port Klang / Samsung / 1996	8	1.08	Standard 8 wheel
Dalian / Samsung / 1996	10	1.0	Standard 8 wheel
Aden / Fels Cranes / 1997	8	1.0	16 wheel design

RMG prices

RMGs are custom built machines and there is not normally any standard pricing associated with it. Span of such machines could vary from 8 to 13 containers wide, and height could be from 1 over 3 to 1 over 9. The mechanical and electrical specification could also vary greatly from the basic specification to sophisticated machines complete with automation capabilities. Price ranges from the USD 1.0 m low cost machines as found in Kaohsiung, to about USD 1.6 - 2.0 m as used in inland terminals in Europe, to USD 3.0 -3.5m for those high end machines in Singapore and Hongkong.

For ease of reference, overhead bridge cranes OHBCs are included in the same category as RMGs. As with the latter, OHBCs are non-standard machines selectively employed by high volume and sophisticated terminals who desire a high level of automation for working in conjunction with Automated Guided Vehicle (AGVs). There are presently 44 units of such machines being delivered at PSA in Singapore. Price of the OHBCs are in the same ball park as a high end RMGs owing to the much higher automation requirements.

Whether RMG or OHBCs may be adopted by other smaller terminals and become the norm remains to be seen. Such equipment may not be suitable for lower volume terminals in the first place and level of expertise in the terminal may not be sufficient to maintain the system.

Prices in Japan domestic market:

Prices in Japan domestic are also on a downward spiral: Prices in excess of 1 billion Yen for a QCC were the morm some years ago. About 3 years ago, prices then fell to about

1.0 billion (which at the prevailing rate of say 100 Yen per USD, would translate to 10m USD each crane). Today, prices are in the region of 700m to 800 m Yen, which is equivalent to USD 5.4 m to 6.1 m at the prevailing exchange rate of Yen 130 to the dollar. And these prices could buy you Super-Post Panamax cranes.

In some extreme cases, such as one unit of Hitachi Zosen / Kone crane delivered to Osaka City Port, the price was only 500 m Yen (USD 3.85 m). On the other hand, Shimizu port was reported to have awarded one crane to NKK at a price of 960 m Yen or USD 7.38 m. Such price distortions are due to special arrangements between the buyer and seller.

In the case of RTG pricing, there has not been such drastic drop in pricing. This is primarily due to the fact that RTGs were traditionally purchased by the private operators who had always shopped for a good deal. Hence, prices (which had been competitive to begin with) only show moderate decline from about 120 m Yen previously to about 100 m Yen today. This worked out to be a shocking USD 7690,000 which is extremely competitive even against international levels.

Factors influencing crane prices

The primary driving forces on the crane prices are simply: Supply and Demand forces. Capacity of crane manufacturers and demand from terminal operators determine the direction of the price trend over time. Within that major trend line, other secondary factors do have significant impact on price levels of each project.

- Technical specification
- Manufacturing costs - whether own manufacture or subcontracted in low cost countries.
- Choice of major components such as drives, spreaders, gearboxes, etc.
- The size of an order which influence economies of scale
- Level of competition in a particular project
- Strategic importance to manufacturers of certain orders.

Cranes have increased in technical complexity: Crane Management Systems (CMS), automation requirement, fibre optics communication, camera systems; Crane weights have also increased: old cranes of the 70's weighed between 500 to 600 m ton; new cranes of Post Panamax, and Super Post Panamax dimensions weigh about 900 to 1200 m ton, inspite of more efficient structural designs. Outreach have gone from 36 m to 58 m. Yet crane manufacturers do not get any more money for such new requirement. Prices declined in most cases, and at best they remain stagnant. No doubt, one can argue that with the quantity getting larger, economies of scale would lead to cost savings. Such cost savings, however, is only incremental in nature and cannot justify the drastic fall in prices. And that is before adjusting for inflation and CPI.

Many crane manufacturers are known to have incurred huge losses from undertaking large orders in Asia, particularly Singapore and Hongkong. They suffer huge cost over runs, further compounded by severe liquidated damages. Management restructuring in the manufacturing company often follow after major project losses. However, people have short memory, the new management prove to be just as aggressive and history soon repeats itself. The cycle of reckless under-pricing just continues.

Impact of Asian Economic Crisis

Economic Crisis in Asia started in July 97 as an attack on certain currencies such as the Thai baht and later the Philippine Pesos and Malaysian Ringgit. The contagion effect soon caught up with other currencies and led to a severe loss of confidence in Asian countries and in the value of their currencies. The economies suffered such severe shocks and disruptions that trade (both imports and exports) were sharply reduced for the first 9 months of the crisis. In the first quarter of 98, throughput in Tg Priok, Jakarta suffered a drop in throughput of 25%, Port Klang 17%. For terminals where container growth rates of 10 to 30 % are the norm for the last decade, this sudden drop in throughput must have come as a real shocker. Many projects are being put on hold, delayed or canceled completely. Some of these are:

Project	**Equipment**
Humpuss Terminal	3 QCC, 12 RTGs
Bojonegara	4 QCCs, 12 RTGs
Kelang Port Management	16 RTGs
Kelang Container Terminal	3 QCCs
Gadok, Korea	18 QCCs + 54 RTGs

The withdrawal / postponement of the above and other projects from the market will intensify competition for remaining projects and bring prices to new levels never seen before.

In the last two months, it is however encouraging to note that export of some affected ports have picked up considerably, although shortage of empty containers is a problem due to trade imbalance. Export orientated ports, especially those exporting commodities and indigeneous products will see a surge in their export throughput from the secnd half of 1998. Overall, I expect demand for container cranes to slacken in 1998 and 1999 before recovering to 1996/7 levels in year 2000 or 2001.

Implications for Crane Purchasers & Factors in the buying decision

Quality and Reliability

If there is one rule in buying cranes, it should be reliability, reliability and reliability. A crane is a long term investment of some 25-30 years. If you buy a problem crane, you have to live with the problem for the next 30 years, and you have to spend a lot more money later on to correct the problem. A buyer will always try to get the best deal he can. By all means, he should take advantage of the current soft market to bargain for the lowest price. Prices are easy to determine, but quality and reliability is more difficult to put a value on.

A case in point is that of a port in Malaysia who bought 3 QCCs from a manufacturer in Australia who had no experience in manufacturing cranes. The outcome is that from day one of crane operation, structural, mechanical and electrical problems emerged. The port is now preparing to undertake costly repairs and refurbishment of the cranes. It is a pity that after investing heavily in the port infrastructure, the owner cannot get a return on such investment because of poor crane performance.

For a private terminal operator, the largest investment in a terminal must be the cost of purchasing the "goodwill" in the business and capital costs in dredging the seabed and constructing the quay and back up yard. It is said that it costs USD 150 million to build and equip a container berth, out of which, equipment package (4 QCCs, 12 RTGs and other equipment) only takes up less than USD 35 million or less than a quarter of total outlay. Having built the infrastructure, it is the equipment that will play a major role in determining the productivity and profitability of the terminal. Therefore, a buyer is actually working against his own interest by unduly minimising the initial costs of the equipment at the risks of working with unreliable equipment. A case of penny wise and pound foolish. The costs of crane downtime is indeed high. Following calculation will give some idea:

Loss of revenue to terminal operator:

Average moves per hour per crane: 25
Tariff per lift: USD 80.00
Downtime costs per hour: 25 x 80 = USD 2,000

Cost to shipping line:

Daily costs of chartering and operating a 3000 TEU ship: USD 15,000 per day.
If there is an average of 3 quay cranes to one ship, then cost of 1 crane hour of breakdown is = 15,000 / 24 / 3 = USD 208 per crane hour.

In addition, there are other losses to be considered, such as loss in revenue from use of the berths, consequential losses to shipping line from missed schedules, costs of attending to breakdown and repairs, loss of customer goodwill etc.

Assuming a conservative figure of USD 2,300 per crane hour, a difference of just one per cent in the total availability (reliability) of a crane will amount to a loss of following revenue to the operator:

3.65 days (1 % of 365 days) x 24 hours x USD 2,300 = USD 201,500 per year.

The cost of downtime and lost revenue for the next 25 years of the crane life far exceeds the savings a buyer can obtain from buying a cheaper and less reliable crane. In fact the difference in the prices of various makes of cranes actually becomes rather irrelevant when compared to the life time cost of those cranes.

Subcontract Manufacturing

Prices do vary significantly depending on where the sellers have proposed to manufacture the cranes. Unfortunately, quality also varies according to the location of manufacture. In their eagerness to secure orders and cut costs, many manufacturers resort to taking great risks by subcontracting the fabrication to local fabricators in low cost countries. In many cases, crane manufacturers were misled by a false sense of economy, hoping to capitalise on the low labour costs, but eventually paying more in terms of having to rework the defects and paying hefty liquidated damages for late delivery. Buyers should therefore insist on his right to decide on the place of manufacture of cranes and if he should allow crane manufacturers to subcontract the manufacturing, such subcontractors should be subject to the approval from the owner.

Either engage a Crane Consultant or have your own engineering team to write specifications, evaluate tenders, and supervise crane construction. In their haste to equip their terminals with the most modern equipment, many terminals lose sight of the type of vessels which may call at their terminals. Instead of having the right mix of crane types (i.e. Panamax, Post Panamax or Super Post Panamax) they have opted for all Post-Panamax cranes, such that when it comes to handling smaller feeder ships,

Crane Drives and Control

Again in their effort to save costs, many crane manufacturers are increasingly trying to play the role of system integrator of crane drives. This means that they buy only the core drive units (inverter units), configure the system software, put together other components and assemble the entire drive package themselves. While some may argue that this gives the crane manufacturer higher degree of control and allows better integration of the drive system into the crane, there are obvious disadvantages to the crane buyer:

- It locks in the buyer with the crane manufacturer for the after sale support of the drive systems. The drive system in this case is a unique configuration that is only fully understood by the crane manufacturers, and not by any third party such as the drive manufacturer. This makes the buyer even more dependent on the crane manufacturers, a riskier situation than being dependent on the mainstream drive manufacturers
- Crane manufacturers may not have the resources to undertake complex tasks such as automation of the drive system, which could have been better undertaken by a dedicated drive maker who have the economies of scale, the motivation and resources to push the technical development of crane drives.

Crane purchasers could counter the negative effects of indiscriminate cost cutting by exercising greater due diligence in preparing bid specification and evaluation, and imposing stringent supervision during the construction period. Many purchasers however lack the necessary personnel for this kind of work. It is increasingly common for buyers to engage crane consultants to act as their consulting engineers for the entire procurement process right from writing specification through tenders evaluation, to supervision of construction, delivery and acceptance.
In their haste to equip their terminals with the most modern equipment, many terminals lose sight of the type of vessels which may call at their terminals. Instead of having the right mix of crane types (i.e. Panamax, Post Panamax or Super Post Panamax) they have opted for all Post-Panamax cranes, which are not as efficient as smaller cranes of Panamax dimensions.

Balance between Reliability and Innovation.

Some of the larger terminals are torn between the need for proven technology on the one hand and the need for innovation and automation on the other hand. Innovation invariably carries technological risks. Both manufacturers and operators must go through the learning curves. It is tricky to find a proper balance between reliability and innovation. Over-emphasis on reliable and proven technology will set back the terminal in technical advancement and leave it with obsolete technology. Too ambitious adoption of new technology will mean having to cope with risks and pain of making the system work for you or to live with mistakes.

One way to introduce new or unproven technology is to set aside a development budget and have a separate team dedicated for studying, developing or adopting new technology. This team of people could work with manufacturers, consultants and suppliers in a joint effort so that respective expertise could be shared and synthesised to provide solutions. Trials can be carried out outside the normal terminal operation and if proven workdable then introduced on a system wide basis.

Implications and options for crane manufacturers

It is clear from the above that there are far too many players in the market. Further rationalisation and re-structuring will have to take place in the manufacturing sector. Crane manufacturers could consider the following options to save themselves from further disasters:

- Accept that crane business at today's prices is not an attractive business and there is no light at the end of the tunnel if everyone continues doing business the same old way of price cutting. It is meaningless to be the Number 1 in a loss making business. Being number one means you have the honour of losing the most money. It is futile to hope to drive your competitor out of business by depriving them of orders.
- Drop all plans to create new capacity, which is unfortunately still being added at this very moment.

- Establish a forum for discussion and exchange of ideas. Subjects such as harmonization of design standards, standardization of certain crane designs for example crane spans, etc could help to reduce design hours and speed up projects. A Crane Manufacturer's Association could be instrumental in providing such a platform for crane manufacturers to communicate with each other. Such crane manufacturers' association could be formed at various levels: national, regional and ultimately international level. The association could be formed within the ambit of some existing organisations such as ICHCA, etc.
- Crane manufacturers could restrict themselves to bidding in their traditional market and focus on creating long term relationships with specific customers, instead of bidding all over the world and be exposed to unfamiliar risks and losses. Some European manufacturers seems to have adopted this approach and seem to have done quite well. Nelcon, Kone, Liebherr Ireland are examples. They tailor their capacity to their traditional market requirement and do not indiscriminately expand capacity.
- Manufacturing capacity should be cut by at least a quarter to be more in line with the world demand. This will require tremendous political will and determination from all concerned and will certainly not be an easy task.
- The basic design of the container crane remains essentially as it was first conceived 30 years ago. Perhaps it is intrinsic in the nature of this industry that the rate of technological change is rather slow.. The crane has only got bigger, heavier and perhaps faster and it has more electronics in it. But there is no quantum or revolutionary change in the design concept of the crane. This may explain the lack of innovation in the industry. However, crane manufacturers should still push for innovation as a way to differentiate their products from that of their competitors. Instead of investing in additional capacity, they should invest in innovation and new technology instead.
- Vertical integration measures such as building own heavy lift ships for crane transportation (ZPMC and Mitsui), configuring and assembling own crane drive systems, etc, are doubtful attempts at increasing value added and reducing costs. It is a step backwards away from the trend of greater specialization and focusing on core competence, and may not be cost effective or viable in the long run.

Some crane manufacturer survive by means of cross subsidy from other projects. Japanese manufacturers are known to subsidise their losses from overseas projects by lucrative prices from their domestic market. However this may no longer possible with the domestic prices tumbling down.. Some overseas losses are in any case so huge that even domestic orders are not enough to compensate for such losses. Further, the Japanese government has also decided to open up domestic crane market to foreign competition within three years. Some Korean crane builders are able to subsidize their crane losses with earnings from the shipbuilding or other divisions. However, faced with present economic crisis and economic restructuring, and the push for greater accountability and transparency, it will soon be more difficult to cross subsidise and hide losses.

Conclusion

No doubt, world demand for container cranes have increased steadily over the last 5 years. Capacity expansion however far exceeds demand. Mindless pursuit of market share leads to cut-throat competition and collapse in prices. This trend will certainly be exacerbated by the Asian economic crisis. Terminal operators should certainly take advantage of this soft market to replace their old cranes. However, low prices may not necessarily be in their long term interest as quality and reliability of cranes may be compromised by poor subcontract manufacturing or poorly configured drive systems. Buyers should be wary of high dependency on crane manufacturer to support drive systems if uniquely configured drive system is used. And for crane manufacturers, it will be bad news and more bad news unless they resolve to change the way they have been doing business and safeguard their own interests by exercising self restraint in capacity creation and price slashing. A sick industry with unstable suppliers will not be in the interest of all concerned, be they buyers or sellers.

Acknowledgments
Crane demand data were pricinpally extracted from Containerization International Market Analysis, supported by data from other sources including World Cargo News and Cargo Systems