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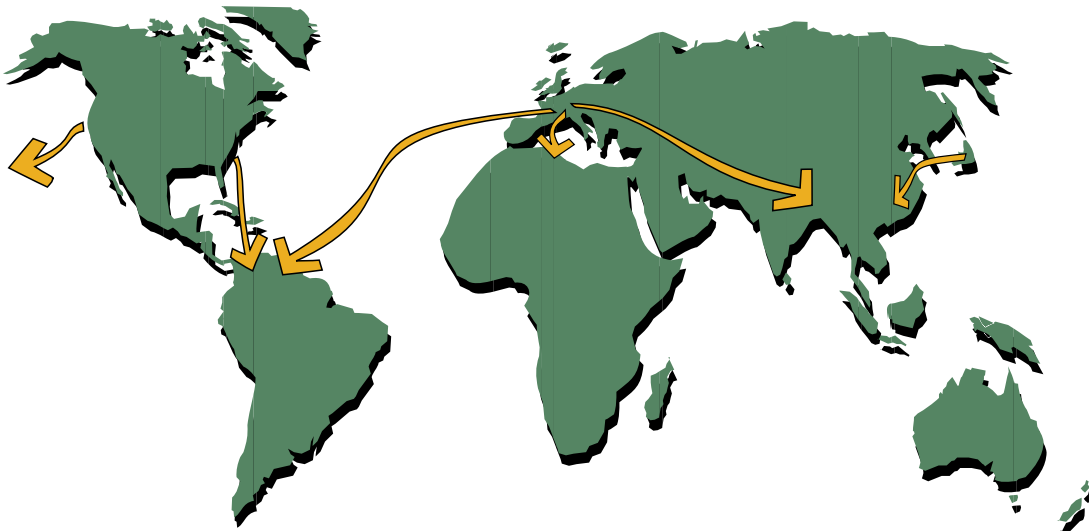
USED CRANES

What you need to know

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USED CRANES -- WHAT YOU NEED TO KNOW

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New cranes are replacing old cranes, especially at the larger and older European, US and Asian ports. What's happening to all those old cranes? Increasingly, these older cranes are put up for sale, and buyers are finding some good bargains.

Ports serving markets with smaller ships and ports that need cranes on short notice buy used cranes. Cranes are being relocated within the United States and Europe. Increasingly, cranes are also moving from Northern Europe and the United States to the Mediterranean, to Central and South America, and to China where they serve local markets.

A well maintained crane can continue to function reliably for just about forever. The low prices of placing these cranes in service - approximately \$1.5 to 3 million compared to \$5 to 7 million for a new crane — can make used cranes an attractive option.

A used crane can be available in a relatively short time. Procurement of a new crane takes a minimum of 12-15 months. A used crane can be modified and delivered anywhere in the world, ready for service, in less than six months.

But the relatively small number of used cranes on the market worldwide could discourage a port from pursuing the option of a used crane. Wheel loads and stability at a new location, in addition to rail gauge, lift height, and outreach requirements, must all be considered.

This paper looks at some of the typical characteristics of available used cranes, discusses modification options and their costs, and looks at the issues crane buyers and sellers need to consider when entering the used crane market.

Typical Used Crane Characteristics

Table 1 shows typical characteristics of container cranes recently available for purchase.

	USA	Europe	Japan
Manufacturer	Paceco, Star, Morris, Krupp, Hitachi	Kocks, Liebherr, Peiner/Noell	MES Paceco, Hitachi
Vintage	Late 1960's to early 1980's		
Capacity	30 to 40 t	40.6 to 45 t	30 to 36 t
Rail Gauge	38 to 100 ft	50 to 60 ft	50 to 80 ft
Outreach	95 to 125 ft	95 to 115 ft	125 ft
Backreach	25 to 80 ft	50 to 75 ft	30 to 75 ft
Lift Height	61 to 87 ft	61 to 85 ft	61 to 85 ft
Hoist Speed Fully Loaded	75 to 175 ft/m	75 to 131 ft/m	160 ft/m
Trolley Speed	400 to 500 ft/m	400 ft/m	500 ft/m

Table 1 Used Crane Characteristics

Modification Options

Because of the limited number of used cranes worldwide, prospective used crane buyers will most likely have to consider crane modifications as part of the package. Numerous changes can be made to container crane structures while still maintaining their structural integrity.

Changing the rail gauge and the power supply are the most frequent modifications to cranes for relocation. Most non-U.S. ports have different rail gauges and power systems from those used in the United States.

Some of the popular modification options are described.

Geometry Changes

Changing the rail gauge. The rail gauges at a buyer's facilities are

generally in the 50' to 60' range. Most available cranes have rail gauges ranging from 50' to 100', but these cranes can be modified to suit the buyer's rail gauge. It is economically feasible to increase or decrease a crane rail gauge up to 50 feet. The particular scheme for making this modification depends on the existing crane structure and the desired modification.

Increasing the lift height. Crane raises are the most common type of crane modification. Inserting new leg sections either below or above the sill beams provides lift height increases of 10 to 30 feet. The additional lift height may require additional hoist rope take up on the drum. If the hoist drums do not have excess capacity, they can often be modified. Otherwise, new drums are required.

The taller cranes may also require additional stiffening and reinforcing.

Increasing the outreach. Increasing outreach is another common modification made to second-generation cranes. An outreach increase of about 10 feet can be obtained by relocating the trolley bumper stops and extending the boom structure with minor structural modifications. The boom hoist system has to be evaluated and may require modification. On rope-towed trolleys, the trolley drive drum capacity needs to be evaluated.

Outreach on some Panamax cranes has recently been increased as much as 25' to post-Panamax geometry. This requires major structural changes to the boom, some reinforcing of the gantry frame and boogies, and upgrading of the boom hoist system.

Increasing the backreach. Backreach is often increased to allow placement of hatch covers behind the landside legs.

Increasing portal beam height. The portal beam height on first and second-generation cranes can be increased to clear the newer straddle carriers.

Increasing clearance between legs. The clearance between the legs of first generation cranes does not permit handling of 45' boxes. Often, an additional 12 inches of clearance can be gained by trimming the leg connection plate flanges. To obtain additional clearance, major structural modifications to legs and portal beams can be made, but these extreme

modifications are usually not exercised.

Decreasing overall width. For adjacent cranes to work consecutive hatches, their overall bumper to bumper width cannot exceed 88.5 feet. Many older cranes are wider than this. The overall width can be reduced by relocating the main equalizer pin on the sill beam and relocating the trucks. This may require some structural reinforcing of the sill beam as well as modifications to the gantry drive machinery.

Performance Changes

Increase load capacity. It is relatively inexpensive to increase load capacity from 30 LT to 40 LT. In addition to evaluating the structure, increasing load capacity requires new wire rope and upgrading or modification of the gear reducers, gears, motors, brakes, sheaves, and drums to maintain performance.

Increasing the main hoist speed. New main hoist motors are required to increase main hoist speed. Hoist gearing and brakes may require modification or replacement.

Upgrading gantry braking capacity. Frequently, the existing braking capacity is marginal for existing conditions. Modifying the crane structure may increase the total wind area and affect the gantry loads. The brake capacity must be carefully evaluated.

Modifying the snag protection system. Snag is the load imposed on a crane when the empty spreader, travelling

at high speed, is jammed in the ship's cell guides or is two blocked against the underside of the trolley. All cranes experience mild snag conditions during normal operation. Every few years, a snag will cause damage. Snag protection is combined with trim, list, and skew equipment on all new cranes. An existing crane can be retrofitted with a hydraulic snag system. The hydraulic device can also provide trim, list, and skew functions.

A Case in Point

Recently, at the Port of Portland, Liftech and McKay International Engineers designed modifications for a 1970's Hitachi crane. The changes included a 19' raise, 26' boom extension, 16' reduction in width, a change from 50' to 100' gauge, and the addition of a snag system. To allow the longer boom to be raised without

replacing the boom hoist drive, the boom hoist system, including reeving, was redesigned.

The Port needed to provide cranes that could operate on alternate hatches and with higher and further reaches for a new expected tenant. The Port did not have time to purchase new cranes. The ability to upgrade their existing cranes within a short time at a reasonable price made these modifications attractive.

Cost

Table 2 shows cost guidelines for modifying dockside container cranes based on 1997 costs for North America. The actual cost will depend on type and number of cranes, number of changes, method of procurement, and timing and schedule.

Modification or Relocation		Range of Costs (in thousands)
Raise 20 ft.		\$600 - 800
Extend Outreach:	6 ft	\$75 - 100
	12 ft	\$125 - 150
	20 ft	\$500 - 600
Change Gauge		\$200 - \$500
Decrease Overall Width		\$150 - \$250
Increase Capacity		\$200 - \$500
Increase Hoist Speed		\$150 - \$300
New Electric Drives		\$500 - \$1,500
Snag Protection		\$200 - \$300
Paint & Refurbish		\$200
Relocation:	intra-harbor	\$150 / \$200
	1,000 miles	\$400 / \$500
	3,000 miles	\$800 / \$1,000

Table 2 Cost guidelines for modifying and moving dockside container cranes

Getting the Seller and Buyer Together

Because of the limited number of transactions and the geographical diversity, there is no established worldwide clearinghouse for used container cranes. Some brokerage firms dealing in general construction equipment include container cranes as part of their services.

Generally, cranes are bought and sold by word of mouth, by advertising in trade magazines, and by retaining brokers or consulting firms. Sellers generally provide a one-page crane data sheet. The buyer retains a crane expert to provide a condition survey and the transportation and retrofitting of the crane.

Since there is no established market for used container cranes, cranes frequently end up selling for much less than their appraised value. And buyers often overlook an opportunity to purchase good cranes.

Let's look at some procedures that could improve the process.

What the Seller Can Do

The seller can facilitate the sale by providing prospective buyers with detailed characteristics, maintenance history, condition and loads of the crane. Wheel loads are frequently misinterpreted. Wheel loads should be clearly explained with a breakdown of the dead load, lift system weight, lifted load and operating and stowed wind loads. This allows the buyer to make a

realistic comparison of the wheel loads with the allowable loads.

The seller may also consider providing a technical evaluation of the condition of the crane prepared by an experienced professional. This document can be provided as a guide with the caveat that the buyers shall make their own independent verification. The document, available to all prospective buyers, would be used as a basis for initial negotiation.

What the Buyer Can Do

Buyers should consider all offerings. Frequently, buyers pass up a good opportunity, because a crane has a different rail gauge or outreach than required. Changing the rail gauge is one of the less costly modifications. Any crane can be modified. Don't rule out the possibility of modifying any crane without making a proper analysis of the costs involved.

Buyers should clearly establish allowable wheel loads. The allowable wheel loads of record are frequently overly conservative. A detailed analysis of the rail girders usually results in an increase in the allowable wheel loads of up to 25 percent.

Crane stability should also be considered. Buyers need to clearly establish storm wind criteria for their facilities. If the crane will be located in a hurricane area, it may need extensive reinforcing or ballast.

Conclusion

There is more activity than ever in the used crane market. The used crane

market provides excellent opportunities for buyers looking for readily available cranes to serve their needs. Buyers should consider the modification options available before dismissing any crane as unsuitable for their requirements. A crane can be modified to suit almost any required configuration.

Before relegating used cranes to the backlands, owners should actively promote selling. There's always life left in an old crane.

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