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New Barge to Barge Terminal for Coal Transport

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Eine neue Kohle-Umschlagsanlage für Lastkähne
Nouveau terminal barge à barge pour le transport du charbon
Nueva terminal »de barcaza a barcaza« para el transporte de carbón
石炭運搬用新型バージ・ツー・バージ・ターミナル
为运煤驳船码头设计的一种新型的驳船
الخطة الجديدة لنقل الفحم من الصندل الى الصندل

1. Introduction

A new barge-to-barge coal transfer terminal owned by International Marine Terminals (IMT) has just been placed in operation, meeting a need for additional capacity in transferring coal from inland river barges to large gulf barges suitable for movement across the Gulf of Mexico. Located on the west bank at Mile 57 near the mouth of the Mississippi River, the first phase of construction is now complete, and coal from the Illinois Basin is now moving through the Plaquemines Parish Terminal and across the Gulf to the Crystal River generating station of Florida Power Corporation on the west coast of Florida.

Alert to the need for expanded transfer facilities for domestic and overseas traffic, International Marine Terminals retained Dravo Corporation to proceed with feasibility studies and preliminary designs [1]. Several designs were developed to suit different potential coal handling opportunities. The design selected was one which provided in Phase I for transfer of coal required by Florida Power Corporation in converting two generating units from oil to coal as well as provision for modest storage as an emergency buffer. Thus a river barge unloader, a fixed gulf barge loading boom, connecting conveyors and minimal land storage using mobile equipment were constructed initially (Fig. 1).

2. Planned Expansion

While Phase I provides essentially for direct transfer of coal from open hopper barges carrying 1500 ton each to gulf barges of 13.000 ton capacity, it was anticipated that additional coal handling contracts would be secured and that some coal would be loaded into larger vessels for ocean shipment.

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Fig. 1: Overview of new International Marine Terminal's transfer facility at Plaquemines Parish, Louisiana

Fig. 2: 5000 ton/h barge unloader unloads hopper barges in two passes

Economics of ship loading require a moveable ship loader to minimize vessel movement at the dock as well as backup storage to ensure rapid ship turnaround. Thus plans for the first expansion identified as Phase II include a downstream dock extension supporting a travelling ship loader fed by a new dock conveyor. This high tonnage ship loader will be designed to load coal from both the barge unloader and land storage simultaneously.

A further expansion in Phase III will add a wide conveyor to land paralleling the present conveyor and using the existing support bents and truss structure. Additionally, land storage will be increased from the present 70.000 ton in Phase I to something approaching one million tons. This expanded storage will be handled by the addition of a yard conveyor, a rail-mounted stacker reclaimer and supplementary mobile equipment.

The flexible master plan was developed to permit construction and investment to parallel the growth of material handling contracts. The initial construction phase was justified on the basis of a current contract level of 1.2 million ton/year. As additional handling contracts are negotiated, the terminal capacity may be sequentially increased to approximately 12 million ton/year without major disruption of the present operation.

3. Material Flow Path — Phase I

Coal is unloaded from river barges by a continuous bucket ladder type unloader with a free digging rate of 5.000 ton/h (Fig. 2). A collecting conveyor and two elevating conveyors arranged in scissors fashion elevate to coal to a point above the hinged loading boom. A pivoted flop gate at that transfer point directs the coal either onto the loading boom or alternately onto the long conveyor to move the coal to land storage. All the conveyors at the dock utilize 72 inch wide steel cable belts at speeds between 850 and 950 ft/min to handle the 5.000 ton/h with adequate overload capacity. The loading boom conveyor operates between —12° and +16°, and discharges into a pivoted bifurcated chute for trimming both athwartship and fore and aft. A weigh scale with 1/4 % accuracy is located on one of the elevating conveyors to record coal received.

If coal is unloaded without a gulf barge in position, the coal may be directed onto the 615 ft conveyor across the levee and thence onto a radial stacker which creates an open storage pile (Fig. 3). Mobile equipment is used to spread the stored coal, thus building an emergency storage of 70.000 ton. If this emergency reserve is needed, mobile equipment moves it over a reclaim hopper below grade. Two vibro feeders draw it onto an underground belt which brings it above ground where it is transferred to an elevating conveyor. This conveyor deposits it onto the reversing long conveyor across the levee, out to the dock and onto the loading boom conveyor.

Fig. 3: Radial stacker and reclaim conveyors are sufficient for Phase I coal storage

Economic evaluation concluded that a tonnage rate of 2.500 ton/h should be used for coal movement to handle storage in Phase I, and 1.200 ton/h be used from land storage to gulf barge. Thus the long conveyor incorporates a 48 inch wide belt at 950 ft/min, and the radial stacker a 60 inch wide belt at a speed of 610 ft/min. The reclaiming conveyors are 48 inch wide, but operate at 600 ft/min. When unloading coal for land storage, the unloader must operate at half tonnage.

4. Dock Structure and Fleeting

Arrangement and design of the dock structure posed some peculiar problems. This site had been previously utilized, and a wooden deck dock structure existed. A detailed examination determined that this existing structure could not be utilized to withstand the mooring, fendering and hauling loads imposed by the river barges, gulf barges and future 50.000 DWT ("Panamax") vessels. Rather than remove the existing dock, it was partially resurfaced with walkways and wire mesh and used as access in the final plan. A new dock structure was built over and around the old, consisting of a 59 ft by 90 ft concrete platform at the loader/unloader location and tied pairs of pipe pile dolphins upstream and downstream (Fig. 4). The 100 ton pipe piles filled with concrete varied in length from 150 to 250 ft. The overall dock length is just over 800 ft; a minimum water depth of 40 ft at mean low water enables vessels to dock without difficulty.

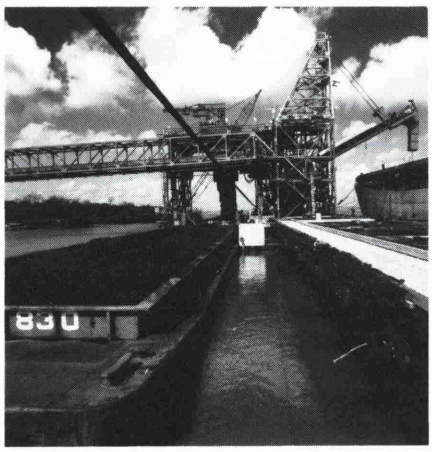

Fig. 4: Resurfaced original dock provides good access between new dolphins

River barges are moved beneath the unloader using a patented shuttle barge permanently attached to a barge hauling system. Gulf barges are moved along the dock during loading by the docking winches on the barge. The bow of the gulf barge is breasted by a snatch block attached to the bow which runs over a cable held by a constant tension winch. A stationary stern breasting line with pendant is used to breast the stern.

A fleeting area for 30 river barges was provided downstream of the dock by anchoring three floating buoys. Miscellaneous river-side structures include a piled pattern to support the inboard leg of the barge unloader, and two bents to support the conveyor crossing the levee.

5. Land Structures and Ancillaries

Turning our attention to the land storage, careful planning was required to satisfy the functional requirements and the various permit requirements. Drainage ditches surround the coal storage area, enabling surface water to be collected and directed to a two-stage retention pond and shell weir. Readily available sand, oyster and clamshells were used as a base for the coal pile, thus providing a natural neutralizing effect to counter acidity of water percolating through the coal.

The plant sanitary system consists of two septic tanks followed by an oxidation pond. Treated storm water and pond effluent are pumped across the levee for discharge only during extremely wet conditions when the ground will not absorb the moisture.

All conveyors are covered to the extent practical. Dust at the first transfer point from the unloader is suppressed with a wet water system. River water is pumped and stored at the dock for use in these systems, as well as for fire protection and conveyor washdown systems. All conveyors over the river have dribble pans, and all washdown water is collected and piped back to the land storage area.

As at any new site, many miscellaneous services and structures were needed. Electric service is provided at 34.5 KV to a 2500 KVA substation where it is stepped down to 4160/480 volts and distributed for power, control, lighting and the like. Miscellaneous facilities include a fuel oil tank, potable water tank, office and personnel trailers and a parts storage building. All these facilities are located on one side of the coal storage yard, leaving the upstream and downstream sides available for expansion of coal storage.

Permit applications were made as early as the design permitted, and construction permits were received in timely fashion as a result of good coordination and cooperation with the many federal, state and local permitting authorities [2]. Initial construction activity commenced in December 1977 and the first coal barges were unloaded in December 1978.

6. Terminal Operation

Between December 1978 and the end of September 1979, International Marine Terminals has unloaded 280.000 ton and loaded 230.000 ton of coal. 51.000 ton of purchased limestone have also been unloaded. This limestone was used to create a longterm storage area to supplement the Phase I 70.000 ton area. Despite the rushed construction schedule, no major operating difficulties were found; only normal debugging has taken place.

At the present volume level, the terminal is operated by 26 men, six of whom are strictly involved with the operation of the shift boat. One employee is a clerk/timekeeper, and four are supervisors or foremen. The remaining 15 perform all maintenance and operating functions of the terminal and mobile equipment. When an ETA for a gulf barge has been established, these 15 men are divided into two shifts of varying durations to accommodate the arrival time and expected duration of the loading. A loading can vary from six to twelve hours depending upon the amount of coal available in barges for direct transfer, versus the amount that needs to be reclaimed from land storage.

Coal barges are received from various New Orleans fleeting areas in groups of four to six; usually no more than 15 to 20 barges are held in the fleet at one time. One 1200 HP, triple screw, Dravo Steelship shift boat is used for fleet surveillance and shifting. During the high water period experienced last spring, this boat was able to handle the downstream landings on the shuttle barge and all other required shifting with safety and with minimum delays. Efficient utilization of the unloader is very much keyed to the shuttle barge haulage system and in turn to the shift boat operation. With adequate preparation of the fleeting area a loaded barge can be supplied to the unloader every 20 minutes. Although all barges handled are 35 ft x 195 ft open hopper barges, the haulage system is designed to accommodate barges up to 250 ft long.

The gulf barges loaded at IMT are new units specifically built for the Crystal River movement. These units have four holds, an overall length of 462 ft, a beam of 82 ft, and a design draft of 18 ft. Due to the current draft limitations at Crystal River prior to completion of the channel dredging program, barges are loaded with approximately 9.300 ton at 14 ft draft. Ultimately, they will be loaded with 13.500 ton at 18 ft draft. These barges were designed to be loaded continuously; that is, starting with hold # 4 or # 1, each hold can be fully loaded before shifting the barge to fully load the next hold and so on (Fig. 5).

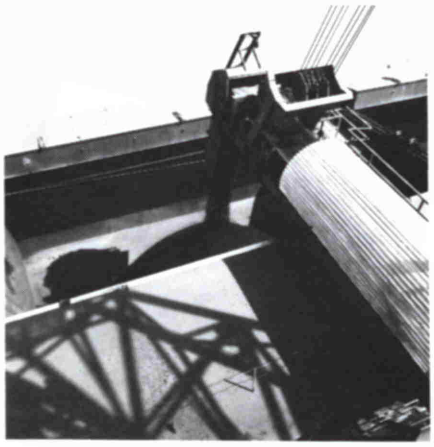

Fig. 5: Gulf barge design permits full loading of each hatch in turn

This shifting of the gulf barge is done with two hydraulic winches mounted on the fore and aft decks. The breasting is done at the head with a pendant attached to the bow which runs over a cable held by a hydraulic constant tension winch. At the stern a capstan on the barge pulls on a pendant mounted on a fixed line on the dock. This eliminates the need to maintain a 5600 HP tug powered during the loading (Fig. 6).

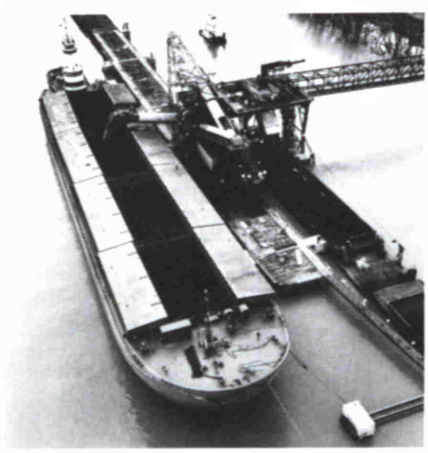

Fig. 6: Coal is transferred to large gulf barge from smaller river barges, while 1200 HP workboat (top) waits to pick up empty river barge

Shifting time per barge loading normally occupies about two hours. It is anticipated that this shifting time will be reduced as both the boat crew and the terminal personnel become more proficient.

7. Current Expansion

During the time of starting up and commissioning of Phase I, (the base terminal), the seagoing barges were contracted to return phosphate rock from Tampa, and there was an obvious benefit in unloading the phosphate rock directly into river barges at this terminal. In looking at various crane types and arrangements, including a barge mounted crane, it was concluded that, just as with the base terminal, the best investment would be a crane with greater capacity than the 600.000 to 1 million ton per year limit of the original phosphate rock transfer contract. After reviewing the various types of crane available, a 25 metric ton level luffing crane was purchased from Sumitomo Heavy Industries. The installation and commissioning of the crane which arrived in October has just been completed. The crane was assembled completely in two major assemblies at the factory in Japan and was shipped via seagoing barge to Mobile, Alabama, where the upper structure was set on the lower structure. It was then transported on the same barge to this terminal where it was moved onto the dock platform that had been prepared for it.

IMT personnel visited Japan as the crane was nearing completion to observe actual operation of the various features of the crane. The adjustments

Fig. 7: Operator at dockside control station monitors coal loading operation

required were then completed by factory personnel. This procedure eliminated a long and tedious erection and commissioning process utilizing erection personnel unfamiliar with the equipment. The delivery schedule was quite good; the order was placed on September 19, 1978 and delivery was made 13 months later. Using this method of construction and shipment, about two weeks were required for installation at the site and the machine is now operating. The theoretical capacity of this crane is 1.070 metric ton/h of phosphate. Due to its design and operating characteristics, it is expected to average 60—70% of the theoretical capacity in actual operation. Changes are already being contemplated for the crane to enable it to handle metallurgical coke; the principal use for this crane may be for transfer of imported metallurgical coke from ship to river barges for movement to the upriver steel mills. It is anticipated that during the next five years there will also be a real potential for the unloading of imported coal. As with the base terminal, Phase I, the crane arrangement is also expandable. Although it is presently mounted on a fixed platform, it was designed so that at a later date it can be jacked up for the installation of bogeys. Then, by adding some additional piling and dock, it may be converted into a travelling ship unloader. Conceivably, a second similar machine could then be added, and the possibility exists of tieing the unloader into the present conveyor system.

Another addition currently expected to be completed by the end of February 1981 is the ship hauling system.

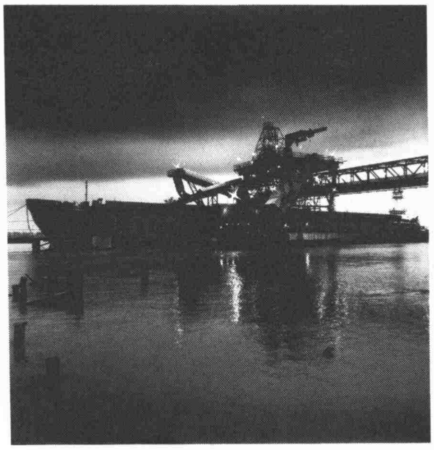

Fig. 8: A 13.000 ton capacity gulf barge moored at the new Plaquemines Parish Terminal will deliver Illinois coal to powerplants on Florida's west coast

This additional system will permit the loading and unloading of gulf barges with less shifting time and also reduce the transfer costs for the importers of metallurgical coke or iron ore pellets.

8. Market Outlook

As mentioned earlier, it was originally expected that the primary market would be the transfer of domestic coastwise steam coal. A limited market for imported metallurgical coke was also anticipated. Surprisingly, a rather large number of inquiries have been received involving export steam coal. It appears that there is growth in coal demand in all areas of the world, which apparently stems from the same factors affecting the US; i.e., the rising cost of imported oil. IMT anticipates a rather large future market for exported American steam coal.

In summary, this terminal is uniquely positioned for future coal demand. One disadvantage is the 40 ft draft which is the project depth at Southwest Pass. By comparison, some of the East coast coal ports can load to 46 ft draft. However, to the extent that there is a growing interest in the Illinois Basin and western coals, the ability to move these coals by barge to this new terminal and the resulting lower freight costs should more than offset the draft disadvantages.

References

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[2] Gawinski, M.J.; "Planning Solves Permit Problems for 11 Million Ton Per Year Facility", Coal Mining & Processing, October 1978.