IDENTIFICATION AND APPRAISAL OF MARINE DREDGING EQUIPMENT

The dredging industry is one of the few industries where the marine world and the machinery and equipment world overlap. Dredges are simply material movers afloat.

The main purpose of dredges is to move sand, soil, mud, gravel or, rock, from one area to another. You may not want the material at its current location. This would be the dredging out of sludge ponds, docks, marinas, canals, harbors, rivers, and shipping channels. You may want material at a specific location. This is creating hills and overpasses from "borrow pits", or beach or wetlands replenishment. Or, you may want to use or process the material being moved. Such as the commercial sand and gravel pits that service the construction, road, and concrete industry, mining, and some sections of the fishing industry.

The big division in dredging equipment is between the two main ways of moving material, namely mechanical and hydraulics. A third area of equipment is the support equipment for the actual material movers.

Mechanical Dredges

A mechanical or bucket dredge, at its simplest, is a floating object supporting a crane. The floating object can be truckable interlocking floats such as Shugart, Flexifloat, Rendrag. Or, more commonly, they are all welded steel mono hull barges of the most common sizes, 110', 120', or 140' in length. On the deck of these barges will be a duty cycle crawler or rubber tired crane usually rigged for clamshell and/or drag line use and often secured to the deck by wires/chains and turnbuckles. At a higher level, the barge may have a fixed crane with a turret like tub or occasionally a ringer mount. There are some special applications that have been using large semi-custom Liebherr hydraulic excavators.

To the basic bucket dredge hull may be added one to four spuds for pinning the barge on location, a "walking" spud which allows the barge to be self-shifting, a self-contained winch and fairlead system for handling the spuds, and an auxiliary engine or engines for electrical and/or hydraulic power. Finally, if a bucket dredge is being used in 24-hour service it may have full crew quarters.

In service there are big differences between a crane working on land and one working on a barge. The barge must be suitable for the job, location, and the crane being used. The barge must be able to fit in terms of length, width, and depth at a work site. It must also be large enough to safety handle the sea and weather conditions at the work site. If it is being used with a crawler crane, the deck must be able to support the crane being used. Although timber mats are commonly used to spread the deck point load, barge decks are built to different pound per square foot capacities. Also, barges built for construction use often have tracking bulkheads which are longitudinal walls within the hull spaced at a similar width as that of crane crawlers.

The biggest concern with crane use on barges is the barge stability. A crane may be able to make its maximum lift with the boom in line with the centerline of the barge. But once the load shifts off centerline the barge will begin to tilt. Too much weight too far off center and the barge will roll over. For most dredging purposes the weight of the crane boom and full bucket over the side of the barge should not cause an accident. But barge widths of 50’ to 60’ are always desirable and even needed with cranes with long booms or that swing large cubic clamshell buckets. Some bucket dredge barges have the forward two spuds set up to be able to force the spuds down to “pin up” or lift the forward end of the barge to create more stability while swinging the boom, and loaded bucket, off centerline to dump to a scow. Any experienced machinery appraiser will know how to assess the condition of the normal deck equipment such as the crane, buckets, and spud hoist equipment. However the barges need special care. Crane barges often receive heavy service and limited maintenance. Due to continuous cycling, structural fatigue failure is often a problem. For the same reasons, this same problem often shows up in the spuds as cracks, especially around spud pin holes. Spud case/gate wear should also be considered. They are also often barges that have been purchased after they have used up much of their economic life in cargo carrying services. Therefore, whenever possible, it is highly recommended that the interior of a barge be made accessible for inspection. In such cases confined space entry safety precautions must be taken.

In some parts of the world, mostly in Europe, there are a few other types of mechanical dredges such as the bucket ladder (bucket conveyor) and punch barge, a combination of a floating pile driver and jackhammer. There are none of these in the U.S. market that we are aware of.

Valuing Mechanical Dredges

Bucket dredges are almost all custom-built. There may be different units with similar utility, but the chances of finding a comparable sale are almost non-existent. Dredges often work with a spread of additional equipment so the income stream, frequently in the form of a fixed bid for a fixed project, is difficult to track.

So for bucket dredges both the cost and comparable sales methods are often used. Comparable sales and brokerage offerings of used sectional barges and of standard size deck barges may be found and adjusted for the subject barge. For odd size barges, which can be common in the construction industry, one must use as comparables standard size barges suitably adjusted for size. One can also find appraisal information on crawler cranes and rubber tired cranes through normal machinery sources. Tub or pedestal types are difficult to value. The best source is tracking the cost of the original conversion or construction. One should also be able to find winch hoist units for sale. From this point on, one is often looking at the cost approach for the additional equipment. This will be the cost of installing spud wells, constructing spuds, and rigging a spud handling system. Onboard quarters construction will also be based on cost, although in some cases an argument can be made for the substitution of prefab modular quarters, where comparable sales or replacement costs can be found. Although it is probably rare, care should be taken to see if the quarters must meet certain Coast Guard or Classification Society[1] safety specifications which greatly increase the cost of

[1] Classification societies are private groups that “class” vessels by having them designed and/or built and/or maintained to the specifications, with the maintenance documented by periodic scheduled mandatory inspections, the vessels will maintain awarded compliance certificates. Having such certificates is a significant factor is reducing insurance premiums. Although the classification societies are headquartered in major maritime nations, their regulations may pertain to vessels of any flag that desire to be classed by that specific society. The most

these quarters over normal modular quarters. If the barge has quarters installed, there will also be the cost of a potable water tank and pumping system, an approved Marine Sanitation Device (MSD), and suitable safety equipment. While dredges with quarters and USCG and/or Class Certificates are more expensive to build and maintain, they can also have higher values as they are not as common and are suited for higher paying dredge projects.

Based on our 30-year study of construction work barges, we believe them to have a normal economic life of thirty years in fresh water and twenty to twenty-five years in salt water. The residual value for old barge hulls is scrap value, when scrap is high, or for use as floating or sunken docks when scrap value is low.

Hydraulic Dredges

The term hydraulic dredge comes from hydrodynamics and engineering dealing with the transportation of liquids. These dredges are also often called suction dredges. Operating a centrifugal pump creates a vacuum which can move a slurry of liquid and solids from the suction end through the pump along a discharge pipeline to a disposal site.

At its simplest, a hydraulic dredge is a pump and its prime mover on a float, with a suction and discharge hose. From this simple arrangement there are dozens of variations.

The biggest subdivision, particularly for appraisal purposes, is between the dredges that are “portable” and those that are not.

Portable dredges are sectional dredges that can be broken down into truckable units for over-the-road mobilization, generally without oversize permits. However, some “portables” push the boundaries in ease of disassembly/assembly and oversize permit transport. Transportation costs of these “semi” portable units will be a consideration in their value.

There are portable dredges with pump sizes up to 24” while some non-portable dredges may have pumps as small as 16”, as large as 36”. On a few non-portable dredges the pump size may be larger or smaller than the normal range.

Hydraulic dredges are designed and equipped as follows:

The suction end may just be an open pipe fitted with a wide mouth (dustpan dredge), or fitted with a cutterhead for mechanical excavation. A cutterhead is most often a multi-blade digging device at the suction pipe mouth that is rotated by a shaft through gearing or hydraulics with the prime mover being a diesel or electric motor(s). It may have a number of different blade designs, each suitable for digging up or stirring up a particular type of bottom so that soil enters the suction line as a slurry. Smooth edge blades for loose sand and silt, serrated edge for hard packed sand and clay, and replaceable pick points for very hard material and rock. There are dredge like aquatic harvesters that have hedge clipper type cutting blades and a chain mesh conveyor on the ladder. In soft bottoms a high pressure water jet may be used instead of a mechanical cutterhead.

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common of societies seen in the United States are ABS (American Bureau of Shipping), DNV (Det Norske Veritas), BV (Bureau Veritas), and LR (Lloyd’s Register).

In order to control the suction pipe on the bottom, it is attached to a rigid frame called the ladder. The ladder, similar to a crane boom, pivots vertically on trunions attached to the dredge hull. But while a crane boom is made to pivot from the horizontal upward, a dredge ladder pivots from the horizontal down. The vertical movement is generally controlled by a standard winch hoist through sheaves in an A-frame or gallows arrangement on the front of the dredge, over the ladder. On smaller portable dredges the ladder is often controlled by one or two hydraulic pistons.

The ladder carries the suction and jet piping (if used) and the shafting and bearings for the cutterhead, if installed. A hydraulically driven cutterhead will probably have the drive motor close to the cutterhead and under water, while electric driven cutterheads have the drive motors, direct DC, DC via SCR (silicon controlled rectifier), or AC via VFD (variable frequency drives) units, on the above water portion of the ladder. All of these drive units may also have an associated gearbox. A more recent innovation is to have a dredge pump on the ladder and underwater which greatly aids hydraulic efficiency. This pump may be the primary pump or a ladder booster along with a regular onboard dredge pump, and it may be hydraulically, electronically, or engine driven via shafting.

Also located on the ladder, or immediately adjacent to the ladder on the dredge hull, are fairlead blocks for swing wires. The ladder hoist located above the ladder adjust the ladder height and therefore its relationship to the bottom. Variations in the depth of “bite” can vary the density of the slurry. Many dredges will have a “Hofer” valve which automatically controls vacuum preventing an excess material “choke” and decreased production. The suction tip must also sweep a path along the bottom for the desired width of the channel. This is similar to the path of the tip of a windshield wiper. In order to get a wide swing, anchors or land based “deadmen” are planted ahead of and to both sides of the desired digging path. Wires are run from onboard winches, through the forward fairlead blocks, and to these temporarily fixed objects. By slacking off on one wire and taking up on the other, the suction tip can be moved laterally over the bottom. Some dredges have a swinging ladder instead of the conventional swinging dredge. In this arrangement the dredge is spudded down forward and aft so as not to move and the ladder is swung from side to side by hydraulic cylinders, pivoting on a gooseneck type connection instead of standard trunnions.

As part of the sweeping motion the stern of most dredges are fitted with two spuds. Spud towers with winches and fairleads, or towers with long stroke pistons with wires and fairleads, lift the spuds or release them to pin the stern of the dredge in place. One spud is always down allowing a pivot point. With a right rear spud down the dredge is swung to the right. At the end of that sweep the left rear spud is dropped and the right lifted allowing the dredge to move forward, for a length that is a factor of the width of the dredge. A sweep to the left can then be made. Many new dredges are now equipped with “walking spuds” that advance the dredge for the next cut by hydraulic cylinders or wire on winches. Walking spud frames usually travel on steel wheels in tracks or slide on polypropylene like pads. Another system, often used in heavy weather areas, is to use wires and anchors aft in place of spuds. A sheave assembly is attached to the stern of the dredge with the lowermost sheaves well below the waterline. Wires are led out each port and starboard side to anchors. A third wire is led out to an anchor aft of the dredge. The dredge is advanced and controlled by adjusting the five wires. All wires are controlled by onboard winches either electrically, hydraulically, or engine driven.

When a dredge has moved up on the swing wire so that the angle is no longer advantageous, the fixed securing points are advanced and the cycle begins again.

The auxiliary hoist machinery is usually installed on the main deck of the dredge. On almost all portable dredges the winches for the swing wires, ladder hoist, and spud hoist, are small hydraulic winches such as those manufactured by Tulsa or Pullmaster. Smaller portable dredges may have the ladder height and spud hoist controlled by long stroke hydraulic pistons.

Some shop made dredges are built on top of barges as are some modern dredges with ladder pumps, and they have all of their main dredging machinery on top of the hull. This is a safer design as it reduces the chances of the hull flooding and sinking, a risk with the more common design of machinery recessed within the hull. Forward will be the dredge pump with an associated cleanout site. The pump will usually be driven by a diesel engine via a clutch and gearbox and pedestal mounted shafting with thrust and line shaft bearings which are often water cooled. The discharge will go back up on deck and aft on either side of the dredge, depending on the position of the pump.

Other dredge auxiliary systems are usually very basic. The main pump engine or an auxiliary diesel engine can power a hydraulic power unit for the dredging system and possibly a small generator. There are small dredges that are strictly 12-volt DC with electrical power from an automobile type alternator. Other dredges may have a small hydraulic driven generator or a dedicated diesel engine with generator.

Most dredges will also have what is known as an auxiliary service, general service, or service water pump. This will be a small water pump that, via a hull opening, takes in surrounding water which is used to supply water lubricated bearings, water seals and machinery cooling. A larger volume pump will be on board if the ladder is equipped with a water jet.

The last common system that should be on all dredges is a bilge pump or pumps. These may be in the form of standard 110-volt AC pumps (220 or 440 on larger equipment) or as one or more 12-volt yacht type submersible pumps with automatic float switches. On many dredges there will also be an eductor pipe, where the suction created by the main dredging pump can pull water out of the dredge itself. An eductor system must be fitted with a check valve to prevent accidental back flooding.

Some dredges will have an SCR system to convert onboard AC generator power from a large generator set to DC power for fine control of DC traction motors for swing wire and ladder hoist winches, and cutterhead drives. As previously mentioned the newest and more efficient system is VFD. In some enclosed pit locations and in some areas with air pollution problems, such as California, all electric dredges are used. These dredges have all electric motor systems which are operated via an electrical umbilical cord running from a shore power source and are therefore often call “extension cord” dredges.

Control of a dredge is housed in the lever room. At its simplest, there will be levers to operate the two swing wire winches, to raise and lower the ladder, and to raise and lower the spuds. Hence the name lever room. There will also be a throttle control for the main pump engine and controls for the speed of the cutterhead if one is in use. From that point, a lever room can get complicated with equipment such as the following:

- Full analog, digital, or computerized gauges for all engines
- Pressure and vacuum gauges for the pump suction, discharge, flow line, and auxiliary service pump
- Flow discharge and density meters with mass flow and recorders
- Pump prime mover control for flow control
- Satellite positioning and chart plotting equipment
- Machinery and bilge alarm systems
- Radio communications
- Fire sensor alarm systems
- Single joystick ladder control
- Fully programmable automated dredging systems

Within the hydraulic dredge family are the large non-portable dredges that are built to work around the clock at a distance from shore support. Often this may be work in shipping channels at the mouth of rivers or bays in open water. These dredges will be arranged and outfitted as noted above, but may also have a second deck for crew berthing, sanitary, and cooking facilities. In the U.S. these dredges may be under U.S. Coast Guard and/or Corps of Engineer safety regulations where compliance or lack of compliance may affect the dredge's ability to work. For some open water service the dredge may be built and maintained "in class and/or load line". Being built and maintained to a certain high insurable standard greatly affects original cost and ongoing value.

All of the dredges noted above, mechanical or hydraulic, portable or non-portable, are not generally fitted with propulsion systems. They are moved by tugboats of an appropriate size. There have been standard hydraulic dredges that are self-propelled either with inboard engines or giant commercial type outboards, called out drives, such as those made by "Thrust Masters". More common are small dredges used in marinas, aquatic harvesting, or similar sheltered service that have paddlewheel type propulsion. A new design has mounted dredging equipment on a tracked marsh buggy.

The final major type of hydraulic dredge is almost always self-propelled. It is a trailing arm hopper suction dredge. Much of the hydraulic pumping system is similar to what is noted above, but for this dredge the slurry or spoil is loaded onboard the dredge which then delivers it to a disposal area.

To generalize, hopper dredges have more of a ship-shape as they often work in exposed waters and must be efficient when they are moving. Instead of a dredge ladder they will have one or two trailing suction arms. These are suction pipes with an upper end and a pivoting joint on the main deck of the dredge. The pipe runs aft and down where it is dragged along the bottom as the ship slowly moves forward. The lower end's contact with the bottom is controlled by a davit hoist unit and the entire arm can be raised to be parallel to the deck, or even swung inboard if the dredge mobilizes through open water to another project. Like the suction end on a ladder the suction end of an arm can be fitted with various jet and drag heads appropriate for the bottom being dredged. Many hopper dredge drag arms have the more efficient underwater dredge pump. Although a hopper dredge is made to carry dredge spoil, many have a second pump unit on deck that can act as a booster pump. Through a piping manifold slurry can be directed to a line with a nozzle that shoots the slurry far off to one side of the dredge in a process called side casting. A similar system is “rainbowing” where sand is sprayed forward of the bow to create islands or replenish beaches. Through parts of this same system the dredge spoil in the hopper can be made back into a slurry and piped off through a fixed discharge pipeline like a standard suction dredge.

However, the main purpose of the hopper dredge is to load and move the spoil. The solids settle and as much excess water as possible drains off. When the dredge hopper is full to its safe or legal capacity, usually by weight not volume, the dredge picks up the arm(s) and proceeds to a material pump out or disposal site.

It is important that the appraiser keep in mind that any dredge usually makes its money on the amount of material it moves from Point A to Point B in the shortest time possible. A hopper dredge moves this material in three steps. The first is loading the hopper, the second is transporting it, and the third disposal. Therefore part of the efficiency (read value) of a hopper dredge is its carrying capacity, given in cubic yards or meters, and its speed. Efficiency is often calculated by the cubic yards/meters per pump minute and/or cubic yards/meters per cycle minute. The cycle being total time to load, transit to disposal area, dispose of material, return, and start digging again. Therefore dredges are often classed or compared by their cubic yard or cubic meter capacity.

When a hopper dredge gets to the disposal site the desire is to empty the hopper as quickly as possible. Recreating a slurry to pump off the spoil, or using mechanical forms of discharge, would be prohibitively expensive for standard projects. Therefore hopper dredges are made to dump the load. The exception to dumping is the aforementioned island building, beach re-nourishment, or upland disposal where the load has to be moved to a non-deep water site.

One dump system has the dredge with a number of sliding gates on both sides of the hopper or on the bottom. The gates are opened by hydraulic cylinders and the spoil falls out assisted if necessary by one or more deck mounted water cannons. Buoyancy wing tanks in the vessel’s hull keep the vessel well afloat while the bottom is open.

The second main design is the split hull hopper dredge. As it is named, the hull of the ship is a giant clam shell with a forward and aft centerline hinge. Hydraulic cylinders open and close the hull. On many of these dredges the machinery rooms and crew’s quarters are raised above the hull and hinged so that they are unaffected by the hull movement and angles. Some equipment that can’t be isolated is of a design that it can operate at steep angles off of the horizontal.

Valuing Hydraulic Dredges

All non-portable cutterhead dredges and hopper dredges are custom built and appraisals are generally based on the cost approach. Extensive research may find a few similar offerings, particularly for cutterhead dredges, that may be adjusted for a comparable sales approach. But there are generally so many variables in these "comparables" that the calculations may only be a sanity check on the cost approach calculations.

Also keep in mind that dredges fall under the Cabotage Laws of the Jones Act so that there is a different market for similar size and service dredges that are built and used in the United States or worldwide, and those that are foreign built that can be used worldwide but not in the United States.

Valuing portable dredges may be somewhat easier as there is more standardization with a handful of manufacturers having "production" models. Many of these will have similar utility so comparables and near comparables may be found. Because they are portable, any values other than "in use" will have to consider dismantling and trucking costs. In the past most portable dredges were simple mechanical machines. But there are now new generation models that make very efficient use of hydraulics and have operational systems where satellite navigation hardware and software interfaces with onboard computers and custom software so that the lever room no longer has a console of levers but one of toggle switches and computerized joysticks.

The main points of market comparisons are dredge type and pump size. Of interest is the calendar age and effective age. On dredges the working parts such as drive engines, gears, pumps, and associated shafting and bearings, may get rebuilt repeatedly over the life of the dredge so it is important to learn engine hours and condition of the pump shell, impeller and related wear parts. Unfortunately, for many comparables, the only information on condition may be "recently rebuilt" or "just off job". Digging depth is important as it can be a factor of ladder and spud length. But digging depth is also ruled by the laws of hydraulics and controlled by matters other than the dredge itself. These are factors such as the material being moved and the distance it needs to be moved through a discharge line. When pricing comparables of portable dredges the price is usually at its current location, as one unit or possibly partially or wholly disassembled. Depending on the purpose of the appraisal the subject dredge may be valued "in use" or for orderly liquidation value or forced sale with disassembly and removal costs considered. Just as there are usually comparables for standard design portable dredges, replacement costs for standard dredges can also be obtained. With a normal economic life of twenty years and a residual value consisting of the salvage value of the engines and pump, a cost approach value can be calculated. For most of the dredges other than standard dredges, ranging from home made gravel pit units to trailing arm hopper dredges, replacement cost must often be calculated by assembling the dredge piece by piece or system by system. If one has good contacts with dredge operators there may be some information available on proposed equipment that these companies may have put out for budgeting bids. Since there has been very little new construction of large dredges in the United States in the last five or more years recent information is scarce.

Support Equipment

There are a number of pieces of support equipment that you will find working with dredges. They are covered briefly below.

Anchor or A-Frame Barges

These are usually 20' or 30' steel deck barges with an A-frame at one end and a mechanical or hydraulically operated winch. They are used for hoisting and moving the buoys and anchors that are associated with a hydraulic dredge swing and walking wire system.

Dredge Tender

Dredge tenders are often a truckable small tugboat with one or two small diesel engines and a small operator's shelter. If under 8 meters (26') they may be driven by an unlicensed operator. For more open waters they may be larger model bow (V bow) tugs that could be 30' or 40' long and also set up for day or shift use. The large dredges use standard multi-purpose tugboats and pushboats.

Pipeline

Most dredges will be operated with a discharge line. It may be sunken or buoyant on floats. Diameters vary by the pump size and the pipeline material may vary from steel to various synthetic materials. The pipeline is mostly sold by the foot. Pipelines floats may be metal, synthetic or foam. Larger diameter discharge line will also have a number of ball joint assemblies made up of a bell (female) ball (male) and a locking ring which allows for pipeline flexibility. These assemblies can be the most expensive units in a discharge pipeline. Because of the abrasive nature of the slurry in dredge pipelines, and possible salt water use, determining the condition of the pipeline is very important.

Booster Barge

When a dredge has a long distance for the dredge material to travel to the disposal site it may be necessary to install a booster pump along the discharge line. This is usually a barge mounted self-contained dredge pump and prime mover, possibly also with a small generator set. A booster pump can be attached to the dredge, to an idler barge, or to a skid mounted unit on land.

Idler Barge

An idler barge is a barge that is usually of a similar width to a matching dredge. One end of this barge is pinned to the aft end of the dredge at the spud wells. The aft end of the idler barge then has its own set of spud wells, spuds, winches, and spud controls. Instead of a 200' long dredge swinging an arc based on its 200' long length, the addition of a 100' idler barge allows the dredge to swing a digging arc based on a

300' radius. Even with the usual 90° arc of swing this allows more efficient dredging in a wide channel.

Dump Scow

Bucket dredges or hydraulic dredges without a close spoil site have to load their material into a hopper barge or deck barge with a deck pen. In doing so this creates extra expense and loss of time as these barges have to be mechanically discharged. Dump scows are barges that, like hopper dredges, have a self-contained means of unloading. Older dump scows have cable operated bottom gates. The more efficient design is the split hopper dump scow. A tugboat moves the dump scow to a disposal site and a self-contained hydraulic power unit opens the clam shell like hull dumping the spoil. Like hopper dredges these are compared by their cubic yard or cubic meter capacity.

Almost all of this associated equipment is custom or even shop made and is valued by the cost approach. Occasionally some comparables may be found for small tugs and A-frame barges. It is more likely to find comparables with the truckable dredge tenders as several manufacturers build various standardized models.

Conclusion

Like appraising any machinery and equipment asset, one needs to know a little about the industry and the use of the dredge or dredge equipment being appraised.

It must be remembered that dredge equipment in the United States falls under the Jones Act so foreign flag dredges cannot work in U.S. waters. So like other marine assets there is a 2-tier market, foreign and U.S. domestic.

Small portable dredges can be used wherever there is sheltered water, subject to many factors including the water depth, the material being moved, and how far it needs to be moved. Large dredges, both standard hydraulic and trailing arm hydraulic, are usually involved in large projects paid for by national or local governments. In the United States it is projects paid for or overseen by the United States Corps of Engineers or in the case of channel maintenance or beach re-nourishment a state, county or city government. Foreign projects are often conceived and paid for by similar governmental bodies. The use of large dredges is usually connected with a project bid process and/or the dredging process is just a part of other construction work that is going on. While it is easy to understand how large self-propelled dredges are moved around the world, it is also possible to move large non-portable non-propelled barges around. This can be done in some cases with the units being towed by tugs, or in more recent times for longer voyages the dredges are loaded onto semi-submersible ships or barges and "dry towed".

Therefore marketing of a dredge asset is subject to matching the equipment to a use and value is subject to mobilization and demobilization costs.

There are several brokerage websites that post information on portable dredges and their associated equipment. Large non-portable dredges, particularly those operated under the American flag, are rarely traded in arms length transactions. There are also several international brokerage sites that may have information on foreign flag dredges mostly of the propelled and trailing arm type.

This article was written with the assistance of Mr. William Quick. He has sailed as an Engineering Officer aboard U.S. flag vessels and holds a current U.S.C.G. Chief Engineer's License for motor and gas turbine vessels of any horsepower. He also is a Certified Marine Surveyor (CMS) with the National Association of Marine Surveyors (NAMS) and an Accredited Marine Surveyor (AMS) with the Society of Accredited Marine Surveyors (SAMS). Bill Quick is the Principal of Q-Marine, Inc. a marine surveying and consulting company located in Florida. Mr. Quick is considered to be a leading expert in dredging machinery having spent many years in the industry including the position of maintenance superintendent for Great Lakes Dredge prior to starting his own consulting business. Presently Mr. Quick travels the country and the world consulting on construction, maintenance and repair of all types of dredging equipment.

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