HUMBER WORK BOATS LTD

John M

12" Self Manoeuvring Cutter Suction Dredger

"JOHN M" DREDGING SOFT MATERIAL
AT NORTH KILLINGHOLME HAVEN

John M

Specification Details

1. General The dredger is equipped to operate under a wide variety of conditions. Basically, three different operating modes can be used:

1. Using the three chain driven spuds and the self manoeuvring ladder. Suitable for tidal area's where steel cables cannot be used for example, in marinas, or narrow channels and busy shipping lanes.

2. Using the two side winches, and the aft mounted spud carriage. Suitable for wider canals, or ponds, where combining the length of the hull and the ladders a swing of about 50m can be made in one operation.

3. Using the winches only, extreme wide swings of up to 150m wide can be made. Especially useful for maintenance dredging and rapid removal of soft top layers.

2. Principal Characteristics

Length of pontoons (inc spud carriage)	20.50 m
Length over all (with extended dredge ladder)	39.00 m
Width over all	5.95 m
Draft without Spuds	1.00 m
Draft with short spear	1.80 m
Draft with long spear	3.20 m
Dredging depth	max 12.50 m
Suction pipe diam.	300 mm
Main engine Cummins KT 19 M	425 hp @ 1800 r.p.m
Cutter power	60 hp @ 50 r.p.m.

3. Dredge Pump The dredgepump fitted onboard is a double walled "Hollandsche Ijssel" make equipped with Nihard IV linings and bainitic nodulair impeller.

Impeller diameter	650 mm
Suction diameter	300 mm
Discharge diameter	290 mm
Capacity in mixture	900 - 1600 m3/hr

The pump is capable of operating on a static head of 6 bar and is able, without the use of a booster station, to transport spoil over distances in excess of 2 km.

4. Dredge Ladder The ladder, which is connected to the hydraulically activated cardan at the front of the dredger, is of modular design.

The ladder consists of two parts, a short section and a similar but much longer section. These two sections can be connected to the cardan individually or in a combination. On the other end of the ladder a number of the various cutting tools can be mounted.

Where a shallow or narrow canal has to be dredged the shorter ladder may be connected to the cardan.

Utilising the long section with the cutter head a dredging depth of up to 9m, and a swing width of up to 18m can be achieved.

By combining the two ladders together with the cutter head even deeper depth and wider swings can be achieved. This latter combination also provides the facility to dredge under floating objects for example pontoons or yachts, with a forward reach under pontoons of 14 meters.

For specialist dredging in soft materials a further section has been designed to achieve a forward reach of 21 meters under floating pontoons and boats with a draft of up to 3 meters. This dredge-arm was specifically designed for modern linkspan and pontoon structures which have become common in new and existing roll-on roll-off ferry terminals. Dredging of these pontoons can be undertaken whist still in use, so as to keep vessel traffic disruption to a minimum.

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The ladder is connected to the main pontoon by a cardan. It is possible to swing and hoist simultaneously in order to dredge slopes. A depth indicator system is fitted providing an accuracy ± 5 cm .To compliment this arrangement, a radio tide gauge system interfaced to a graphical display in the wheel house has now been fitted, along with differential global positioning system and computer software to give the operator and the client accurate control and information of the dredging in progress.

5. Cutter Head

The complete cutter with drive is mounted on a separate ladder section, which can be connected to the cardan, the short ladder, the long ladder, or a ladder continuation. The ladder angle may be adjusted to suit the best cutting angle independent of the dredging depth. The cutter head is directly driven by a low speed hydraulic motor fitted with flexible suspension, and a water lubricated rubber bearing.

Cutter capacity	60 hp
Cutter speed	0 - 50 revs/min

6. Winches

Four hydraulic winches are installed onboard, one forward winch, two side winches, and one aft winch, all of which are all controlled by the operator from the cabin.

Each winch has a line pull of approximately 2800 kgs, and all are fitted with a "free wheel" device.

Forward winch - Cable diameter 14mm - drum capacity approx 220m
Side Winches - Cable diameter 12 mm - drum capacity approx 300m.
Aft Winch - Cable diameter 16mm drum capacity approx 200m

7. Spuds

The three hydraulically powered spuds are rated with a driving force of 6000 kgs. The vertical movement is by a facilitated chain drive system, which allows a positive force in both (lifting and lowering) directions. Long or short spears may be fitted to the spud feet for varying ground conditions. The two front spuds are mounted on each of the side pontoons.

The aft spud is mounted in the spudcarriage pontoon. Alternatively this spud can be mounted on a side pontoon,where space is at a premium, and manoeuvring may then be effected by the winches. The stroke of the spudcarriage is 3m, and is controlled by a hydraulic cylinder. This method accurately controls forward movement of the dredger.

A mechanical position indicator showing the position of the spudcarriage, can be seen by the operator from the cabin.

8. Control Cabin

Geographical positioning is achieved by a DGPS receiver interfaced with a VDU, providing an accuracy of better than 1 meter, under most reception conditions.

The dredger is equipped with an operators cabin providing good all around visibility and is equipped with two lockable doors and a front window.

The complete cabin is mounted on four rubber blocks in order to minimize noise and vibration in the cabin. Heating to the cabin is by cooling water from the engine. For negotiating low bridges, and for road transport, the top of the cabin can be dismounted to reduce air draft.

9. Miscellaneous

The hatches that cover the engineroom can be removed easily, allowing for quick and easy maintenance of the engine, and the dredgepump.
The hydraulic control system consists of two circuits. One circuit for the winches, cylinders and spuds, and a second circuit for the cutter drive only. The hydraulic system is fitted with bio-degradable oil so as to protect the environment should any leaks occur
The diesel engine drives a hydraulic tandem pump through a flexible coupling at the aft end of the engine.
All functions can be controlled independently by the operator from his cabin, by means of a low pressure hydraulic servo system.

SPECIAL CUTTER HEADS:

Instead of the usual cutter head it is also possible to mount a low turbulence auger at the front of the ladder.
This auger is normally used for special jobs where very soft top layers have to be dredged (for instance in natural swimming water basins or inland canals or lakes - where contaminated top layers may have to be dredged without causing turbulence).
The auger is driven from one side by a hydraulic motor. The hydraulic motor is mounted to the ladder in a flexible suspension, whilst the other end is supported in a water lubricated rubber bearing.
The auger is equipped with two flaps. These are operated by a double acting hydraulic cylinder, which is automatically directed in the correct position during the swing of the ladder.
By using the extra cylinder (between the ladder and the auger head) the auger can always be positioned horizontally. For inspection, and for dredging slopes the auger head can be lifted independent from the ladder position.

Auger length	approx	2.50 m
Auger diameter	approx	320 mm
Auger pitch	approx	345 mm
Power	approx	40 hp
Speed stepless from	approx	0-150 r.p.m.

In addition to the cutter/auger head, a specially designed weed cutter can also be mounted on the ladder.
The weed cutter consists of two vertical augers fitted with special knives. The two augers grab floating weeds, roots and other organic materials, cut the same into small pieces and then transport the material into the suction pipe.
The weed cutter is used mainly to clean canals and basins of floating water plants, or to create new canals in floating peat soil areas.

Dredging depth (short ladder)	max	2.50 m
Swing width	max	12.00 m
Weed cutting capacity		60 hp
Cutter speed		0-100 r.p.m.

At the aft end of the dredger a nozzle spreader can be fitted to spread the soil over one or both banks.

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