



# Maxville Dredge

## **Table of Contents**

|                                  |           |
|----------------------------------|-----------|
| <b>IV. Dredge</b>                | <b>2</b>  |
| A. Hull                          | 2         |
| B. Ladder                        | 2         |
| C. Gantry & Ladder Hoist Winch   | 3         |
| D. Dredge Pump                   | 5         |
| E. Cutterhead & Cutterhead Drive | 8         |
| F. Swing System                  | 10        |
| G. Spud and Carriage System      | 12        |
| <b>V. Service Systems</b>        | <b>14</b> |
| A. Diesel Generator              | 14        |
| B. Service Water System          | 14        |
| C. Main Lubrication System       | 15        |
| D. Air System                    | 15        |
| E. Fresh Water System            | 15        |

## I. Dredge

### Hull

1. Function - The dredge hull provides a working platform for the dredge ladder, dredge pump, cutterhead, spud carriage and related equipment.

| Dimensions              |           |
|-------------------------|-----------|
| Length, Ft.             | 165       |
| Depth, Ft.              | 11.5      |
| Width, Ft.              | 48        |
| Ladder Slot, Ft.        | 24 x 50   |
| Spud Carriage Slot, Ft. | 16.5 x 45 |

2. Weight - 700,000 lbs.
3. Wetted Plate Thickness - 3/8 in. minimum
4. Mean Draft in Operating Conditions - 7.6 ft.
5. Displacement - 1420 tons

### Ladder

1. Function - The dredge ladder supports the cutterhead, dredge pump, suction throat and related shafts, bearings, swing sheaves, and service water piping. The ladder is hinged at one end by the ladder Trunnion with the other end supported by the gantry and the 8-part ladder hoist cable. The ladder hoist winch raises and lowers the ladder to vary the dredging depth from 10 to 50 feet below water level.

| Dimensions                                         |    |
|----------------------------------------------------|----|
| Length, Ft. (Trunnion centerline to end of cutter) | 79 |
| Width, Ft.                                         | 23 |
| Depth, Ft.                                         | 8  |

2. Weight - 182 tons
3. Digging Depth - The digging depth is measured by an IHC Ladder Angle Transducer.  
Minimum, Ft. 10 Maximum, ft. (45°) 50
4. Trunnions - The two Trunnions support the aft end of the ladder. The trunnion pins are 18" O.D. and fit into steel bushed bearings. The ladder pivots on these bushed bearings which are replaceable. A grease fitting is provided at each Trunnion and piped to the automatic lubrication system.
5. Swing Sheaves - The swing sheaves are described in Swing System section below.

### Gantry & Ladder Hoist Winch

6. Function - The dredge gantry supports the point (upper) and bale (lower) sheaves which are reeved with the 8-part ladder hoist cable to support the forward end of the ladder. The ladder hoist winch raises or lowers the ladder to the digging depth.
7. Point Sheave Assembly - The point sheave assembly has 4 40" diameter x 6" wide sheaves for 1.625 wire rope.
8. Bale Sheave Assembly - The bale sheave assembly has 4 40" diameter x 6" wide sheaves for 1.625 wire rope.
9. Idler Sheave - The idler sheave is a single 40" diameter x 6" wide sheave grooved for 1.625 wire rope.
10. Lubrication - All sheaves described above have grease lubricated bronze bushings.
11. Ladder Hoist Winch - The ladder winch is driven by a DC electric motor direct coupled to a gear reduction box. The output shaft drives the winch drum. The drum has a manually actuated pawl that can be engaged to store the ladder in the raised position. A magnetic shoe brake is connected to the high speed shaft of the gear box. This brake is shoe set and magnetically released whenever the winch motor is energized.

|                                              |         |
|----------------------------------------------|---------|
| Shaft Horsepower Normal                      | 400     |
| Permissible Overload                         | 50%     |
| Motor Speed Normal, RPM                      | 0 – 750 |
| Line Speed 1 <sup>st</sup> Layer Normal, FPM | 179     |
| Hoisting Speed, Average FPM                  | 29      |
| Line Pull Normal, Pounds                     | 72,000  |
| Wire Rope Size, Inches                       | 1.625   |
| Drum Capacity, ft. (3 layers)                | 324     |

12. Ladder Hoist Motor - The ladder hoist is driven by a G.E. 752 traction DC motor driven by a Silicon Controlled Rectifier (SCR). It is capable of a speed range of zero to 1,000 RPM with 50% overload. The motor is rated as follows:

|                                              |
|----------------------------------------------|
| 900 H.P. w/10 H.P. blower and IT-900 brushes |
| 750 volts                                    |
| 1100 RPM                                     |

13. SCR Drive - The SCR drive is Gulf Power Systems Model DDS-1600-2-600. The SCR is adjusted to 400 H.P. with 50% overload capability.

14. Ladder Hoist Gear Reducer - Brad Foote Gear Works, Inc.

|                    |
|--------------------|
| Size 3PH2800-5     |
| Ratio 35.72:1      |
| Input RPM 750      |
| HP Rating 637      |
| Service Factor 1.5 |

15. Ladder Hoist Cable

|                                  |
|----------------------------------|
| 1.625" extra improved plow steel |
| 6 x 19 I.W.R.C.                  |
| 132 tons breaking strength       |
| 620', Right Lang Lay.            |

16. Instrumentation

|                               |
|-------------------------------|
| <b>SCR Drive</b>              |
| Ammeter                       |
| Pilot Light "DC ON"           |
| Pilot Light "AC ON"           |
| Pilot Light "AC ON"           |
| Pilot Light Blower Motor "ON" |
| Pilot Light SCR Blower "ON"   |
| Raise/Lower push button       |

|                                        |
|----------------------------------------|
| <b>Process</b>                         |
| Ladder Angle Indicator ( Digging Depth |

17. Interlocks - The ladder hoist motor is interlocked with:  
Ladder hoist motor blower

Ladder hoist brake  
Ladder hoist motor heater  
Ladder hoist motor tach generator

## Dredge Pump

1. Function - The 30" dredge pump, located on the ladder, transports ore dislodged by the cutterhead from the suction throat, located within the cutterhead, to the wet mill. The pump is driven by a DC electric motor direct coupled to a gear reduction box. The output shaft drives the dredge pump.
2. Dredge Pump Motor - The dredge pump is driven by a Gulf Power Systems DC Model GP-300 motor re-manufactured from a GE locomotive traction generator. It is controlled by a Silicon Controlled Rectifier (SCR) and is capable of a speed range of zero to 900 RPM with 25% overload. The motor is rated as follows:

|                             |
|-----------------------------|
| 3390 HP w/2x10 H.P. Blowers |
| 750 volts                   |
| 1200 RPM                    |

1. SCR Drive - The SCR drive is Gulf Power Systems Model GPS-DDS-3000-2-750-6P-SH. The SCR is adjusted to 2000 HP with 25% overload capability.
2. Dredge Pump Reducer - The gear reducer is connected to the pump motor with a Para Flex Coupling with a 280 Tire-PX280

| Brad Foote Gear Works, Inc. |             |
|-----------------------------|-------------|
| Size                        | 1PH1800 - S |
| Ratio                       | 3.26:1      |
| Input RPM                   | 900         |
| HP Rating                   | 3500        |
| Service Factor              | 1.75        |

1. Line Shaft Drive - The dredge pump is driven through a 9" diameter line shaft extending the length of the ladder and connecting the gear reducer to the pump bearing box. The shaft has a flexible coupling at each end and is supported by four grease cooled bronze journal bearings.
2. Upper Shaft - The upper shaft is 226-7/8" long x 9" diameter with an Atra-Flex M10HUBRFN407X280 WITH SHRIK DISC SD B-LOC 280-10 coupling on the upper end for a flexible connection to the dredge pump gear reducer. The lower end has a forged 18" flange for a rigid connection to the lower pump shaft. The journal areas (2) are machined stainless steel overlay.
3. Lower Shaft - The lower shaft is identical to and interchangeable with the upper shaft. It is installed with the flanged end mating with the upper shaft and the Atra-Flex hub machined for RFN 4071x280 shrink disc to fit 8.750 shaft M-10 with orange insert coupling mating with the pump barrel assembly.
4. Bearings - The four pillow block bearings are 16" in length and fitted for grease lubricated cooled bronze bearings.
5. Pump Bearing Housing - The pump bearing housing is located immediately in back of the dredge pump. It is oil filled and kept under pressure by a head tank located behind the control room. The bearing housing is equipped with double Duo-Cone seals at each end which are also connected to a head tank to provide leak detection.
6. Head Tank - The 34" tall x 16" diameter (30 gal.) head tank for bearing housing pressure is located atop the deck house immediately behind the lever room. This develops 21 foot of head plus the immersion depth of the ladder. The 32" tall x 12" diameter (15 gal.) head tank for the seals is stacked on the bearing housing pressure tank and consequently, develops ~3 foot higher pressure on the seals than on the bearing box. Each tank has a low level pump shutoff and alarm to warn of leaks.

Dredge Pump - The GIW 30" dredge pump is a centrifugal single-suction volute type with a three-vane closed impeller. All wearing parts in contact with the slurry are of abrasion resisting material with a Brinnel hardness of 450-500.

|                             |                                        |
|-----------------------------|----------------------------------------|
| Suction I.D.                | 32"                                    |
| Discharge I.D.              | 30"                                    |
| Impeller Diameter           | 73"                                    |
| Impeller Particle Clearance | 14.4"                                  |
| Number of Impeller Blades   | 3                                      |
| Pump Type                   | MHD - 30 x 33.72.10 MSLR NN C/3ME<br>L |
| Pump Shaft Speed            | 306 RPM                                |

- 1.—Packing Gland – No packing or packing gland
- 2.—Seal Water - No Seal water
- 3.—Suction Mouth Piece - The suction mouthpiece is cast steel with 1½" thick walls and a cross sectional area of 939 square inches.
- 4.—Suction Cleanout - A suction cleanout for removing obstructions from the impeller is located immediately in front of the pump suction.
5. Jacking Motor - The jacking motor is used to remove and replace the dredge pump impeller on repair days when using generator power. The jacking motor drives the pump shaft through a gear reducer and a chain sprocket a second chain sprocket on the high speed side of the gear reducer. The chain is installed only during actual use.

|                                   |
|-----------------------------------|
| <b>Toshiba 10HP/1745RPM motor</b> |
| Falk Gear Reducer                 |
| Model 1060FZ3A                    |
| 1750/25 RPM reduction             |
| 10 HP rating                      |
| 1.17 Service Factor               |

1. Chain Sprocket Reduction - 45 (pump):26 (motor)

#### Instrumentation

|                                     |
|-------------------------------------|
| <b>SCR control</b>                  |
| Throttle                            |
| Ammeter                             |
| Tachometer                          |
| Pilot Light "DC ON"                 |
| Pilot Light "AC ON"                 |
|                                     |
| Pilot Light Blower MOTOR "ON"       |
| Emergency Stop Mushroom Pull Button |
| Start/Stop Push Button              |

|                                          |
|------------------------------------------|
| <b>Dredge Pump</b>                       |
| <del>Pump discharge pressure gauge</del> |
| <del>Pump vacuum/pressure gauge</del>    |
| Ohmart Density Sensor (specific gravity) |
| Foxboro Magnetic Flow Meter (velocity)   |



## Cutterhead & Cutterhead Drive

2. Function - The cutterhead is a revolving cutting tool which loosens the earth and delivers it to the suction throat. It is driven by a variable speed, SCR controlled DC motor, through a heavy duty speed reducer and line shaft.
3. Cutterhead Motor - The dredge pump is driven by a Gulf Power Systems DC Model GP-300 motor re-manufactured from a GE locomotive traction generator. It is controlled by a Silicon Controlled Rectifier (SCR) and is capable of a speed range of zero to 900 RPM with 25% overload. The motor is rated as follows:

|                             |
|-----------------------------|
| 3390 HP w/2x10 H.P. Blowers |
| 750 volts                   |
| 1200 RPM                    |

4. SCR Drive - The SCR drive is Gulf Power Systems Model DDS-3000-2-750-6P-SH. The SCR is adjusted to 1450 HP with 25% overload capability.
5. Cutterhead Reduction Gear - The gear reducer is connected to the cutterhead motor with a Falk Shear Pin Coupling.

|                     |                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------|
| Manufacturer:       | Falk Corporation                                                                                                           |
| Type:               | Concentric Shaft Planetary - 2 Stage                                                                                       |
| Model No.:          | 146PL2                                                                                                                     |
| Input Horsepower:   | 1450                                                                                                                       |
| Input Speed:        | 0 - 900 RPM. @ Constant Torque, 900 - 1200 RPM. @ Constant H.P                                                             |
| Ratio:              | 42.54 to 1 (21.2 L.S.S. RPM. /900 RPM. Input                                                                               |
| Service Factor:     | 2.1                                                                                                                        |
| Bearings:           | Anti-friction throughout - 100,000 hours minimum B-10 life @ 1450 H.P                                                      |
| Gears:              | Alloy Steel - Precision cut                                                                                                |
| Housing:            | Welded Steel                                                                                                               |
| Lubrication System: | Integral 460 volt - 60 Hertz - 3 phase T.E.F.C. M.A.C. driven oil pump with fin and tube, air cooled, deck mounted cooler. |

6. Cutterhead Shaft - The cutterhead line shaft is a four piece shaft supported by 4 Pillow Blocks with bronze bearing.
7. Jacking Motor - The jacking motor is used to remove and replace the cutterhead. The jacking motor drives the cutterhead shaft through a gear reducer and a chain sprocket with a second chain sprocket on the high speed side of the Falk gear reducer. The chain is installed only during actual use.

|                                   |
|-----------------------------------|
| <b>Toshiba 40HP/1760RPM motor</b> |
| Falk Gear Reducer                 |
| Model 1050FZ2A                    |
| 1750/352 RPM reduction            |
| 40 HP rating                      |
| 1.57 Service Factor               |

1. Chain Sprocket Reduction - 40 (ch): 24 (motor)
2. Instrumentation –

|                                     |
|-------------------------------------|
| <b>SCR control</b>                  |
| Throttle                            |
| Ammeter                             |
| Tachometer                          |
| Pilot Light "DC ON"                 |
| Pilot Light "AC ON"                 |
| Pilot Light "Interlocks ON - READY" |
| Pilot Light Blower MOTOR "ON"       |
| Pilot Light SCR Blower "ON"         |
| Emergency Stop Mushroom Pull Button |
| Start/Stop Push Button              |

1. Interlocks

|                              |
|------------------------------|
| <b>Cutterhead Motor</b>      |
| Blowers                      |
| Brakes                       |
| Heaters                      |
| Tach Generator               |
| Shaft Bearing Flushing Water |
| Reduction Gear Oil Flow      |
| Lube Tank Level              |

## Swing System

1. Function - The swing system provides the lateral movement to the cutterhead as the dredge pivots on the spud. The two swing lines, one port and one starboard are anchored at the bank. The lines are reeved through the swing sheaves and idler sheaves on the ladder to the port and starboard swing winches. As one hoist pulls line in the other winch pays it out.
2. Port Swing Winch - The port swing winch is driven by a DC electric motor direct coupled to a gear reduction box. The output shaft drives the winch drum. This drum has a 4-layer rope capacity of 1,062 feet (active capacity is 1,000') of 1 3/4 inch 6 x 19 I.W.R.C. wire cable. The winch is rated at 123,000 lbs. on the first layer with a line speed of 75 FPM at 750 RPM and 92,000 lbs. on first layer with a line speed of 99.4 FPM at 1,000 RPM. A magnetic shoe brake is connected to the high speed shaft of the gear box. This brake is shoe set and magnetically released whenever the winch motor is energized.

|                                  |           |
|----------------------------------|-----------|
| Shaft Horsepower Normal          | 300       |
| Permissible Overload             | 50%       |
| Motor Speed Normal, RPM          | 0 – 1,000 |
| Line Speed 1st Layer Normal, FPM | 75        |
| Line Pull Normal, Pounds         | 123,000   |
| Wire Rope Size, Inches           | 1.755     |
| Drum Capacity, ft. (4 layers)    | 1,000     |

1. Port Swing Motor - The port swing winch is driven by a G.E. 752 traction DC motor controlled by a Silicon Controlled Rectifier (SCR). It is capable of a speed range of zero to 1,000 RPM with 25% overload. The motor is rated as follows:

|                                              |
|----------------------------------------------|
| 900 H.P. w/10 H.P. blower and IT-900 brushes |
| 750 volts                                    |
| 1100 RPM                                     |

2. Port SCR Drive - The port SCR drive is Gulf Power Systems Model DDS-1600-2-600-SH. The SCR is adjusted to 300 H.P. with 25% overload capability.
3. Port Swing Winch Reducer -

| Brad Foote Gear Works, Inc. |         |
|-----------------------------|---------|
| Size                        | 3PH3600 |
| Ratio                       | 88.5:1  |
| Input RPM                   | 750     |
| HP Rating                   | 300     |

|                |      |
|----------------|------|
| Service Factor | 1.52 |
|----------------|------|

1. Port Idler Sheave - The port idler sheave is mounted on the aft end of the ladder. The sheave is 40" diameter x 6" and grooved for 1 3/4" wire rope. It slides from side to side on a 36" axle so that the cable can be laid properly on the swing drum. It is bronze-bushed and grease lubricated.
2. Port Swing Sheave - The port swing sheave is mounted on the forward end of the ladder and translates the winch action into lateral movement. The sheave is 40" diameter x 6" and grooved for 1 3/4" wire rope. It pivots up and down on 9" Trunnions to permit different dredging depths. Both Trunnions and axles are bronze-bushed and grease-lubricated.
3. Starboard Swing System - The starboard swing system is identical to the port swing system except the starboard swing winch assembly is a mirror image of the port swing winch system.
4. Swing Lines

|                                      |
|--------------------------------------|
| 1.75" dia. Extra Improved Plow Steel |
| 6 x 19 I.W.R.C. wire cable.          |
| 153 tons breaking strength           |
| 1100', regular right lay.            |

1. Constant Tension - The constant tension swing winch control is manufactured by Electronic Power Design, Inc. of Houston, Tex. This system interfaces the two (2) independent, regenerative S.C.R./motor swing winch drives. This system uses regenerative torque control on the paying-out winch to provide constant tension in the swing line, regardless of speed.
2. Instrumentation

| <b>Port and Starboard SCR Drives</b>                      |
|-----------------------------------------------------------|
| Ammeter                                                   |
| Pilot Light "DC ON"                                       |
| Pilot Light "AC ON"                                       |
| Pilot Light Blower Motor "ON"                             |
| Pilot Light SCR Blower "ON"                               |
| Single "joystick" for port or starboard movement.         |
| Individual "joystick" controls for changing swing lines.  |
| Individual/Manual/Automatic selector for operating modes. |

1. Interlocks - Each swing motor is interlocked with

|                                        |
|----------------------------------------|
| Swing winch motor blower               |
| Swing winch brake                      |
| Swing winch motor heater               |
| Swing winch hoist motor tach generator |

NOTE: The swing winches are also interlocked through the DCS control system and the spud hydraulic systems to prevent swinging the dredge with both spuds in the "down" position.

### Spud and Carriage System

1. Function - The spud carriage allows the dredge to move ahead smoothly in whatever increments desired by extending the carriage cylinder. The working spud is located on the carriage and the holding spud is located on the aft starboard side of the hull. All dredging is done off the working spud with the holding spud in the raised position. The dredge can advance ahead 20 feet before it is necessary to reset the carriage. This is done by dropping the holding spud and raising the working spud, then retracting the carriage cylinder. Once the carriage is retracted, the working spud is dropped and holding spud is raised. Each spud operates off its own hydraulic system. The spud is raised with a lifting sling which tightens about the spud as the lift cylinder is extended. A spud clamp holds the spud to allow another lift if necessary. The carriage moves on rollers on guide tracks.
2. Spuds - The working and holding spuds are identical. Each spud is 42" diameter x 80' long and weighs approximately 80,000 lbs.
3. Spud Keepers - The working and holding spud keepers are identical. Both the top keeper and the lower keeper are 3'6" deep and are separated by 8' to give a supported length on the spud of 15'. The keepers are pinned to allow opening.
4. Spud Lift Cylinders - The working and holding spud lift cylinders are identical. The supplier and specifications are:

|                                   |
|-----------------------------------|
| <b>Victor Fluid Power, Inc.</b>   |
| Spud Hoist Ram Type Cylinder      |
| 12" bore, 9½" rod, 157.48" stroke |
| Working pressure - 3,000 psi      |

5. Holding Spud Hydraulic System - The holding spud hydraulic system supplies oil to the holding spud lift cylinder and the holding spud clamp. It operates only when lifting the holding spud. It has the following components:

|                                                  |
|--------------------------------------------------|
| <b>300 hydraulic oil reservoir</b>               |
| 125 A.C. motor to drive a tandem hydraulic pump. |

|                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------|
| Tandem hydraulic pump. Each pump rated at 63 gpm @1750 RPM at 1530 psi.                                                             |
| Solenoid operated directional valves to fill, empty, or hold pressure on cylinder.                                                  |
| Pilot pump 2.5 gpm capacity equipped with a 5 HP/1800 drive motor. This pump supplies hydraulic oil to control valves & spud clamp. |
| Filter                                                                                                                              |

6. Spud Carriage - The spud carriage is a structural steel assembly which supports the working spud, working spud keepers, working spud lift cylinder, working spud hydraulic system, spud carriage lubrication system, and the cylinder end of the spud carriage cylinder ram. It is 15' long x 10' wide x 16' deep. Fully equipped (less spud) it weighs more than 90 tons. The carriage is supported by four 32" diameter wheels rolling on 32" wide x 40" deep rails. Another four wheels track the bottom side of the rails for stability. All eight wheels are bronze-bushed and grease-lubricated. The rails have ½" replaceable wear plates.

7. Carriage Cylinder - The supplier and specifications are:

|                                        |
|----------------------------------------|
| <b>Victor Fluid Power, Inc.</b>        |
| Model No. 29895-13                     |
| Spud Carriage Cylinder (double acting) |
| 10" bore, 8" rod, 240" stroke          |
| Working pressure - 2,500 psi           |

8. Spud Carriage Hydraulic System - The working spud hydraulic system supplies oil to the working spud lift cylinder, the carriage cylinder, and the working spud clamp. It operates continuously during dredging and, consequently, must be cooled. It has the following components:

|                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>300 hydraulic oil reservoir</b>                                                                                                         |
| 125 A.C. motor to drive a tandem hydraulic pump.                                                                                           |
| Tandem hydraulic pump. Each pump rated at 63 gpm @1750 RPM at 1530 psi.                                                                    |
| Solenoid operated directional valves to fill, empty, or hold pressure on cylinder.                                                         |
| Pilot pump with 2.5 gpm capacity equipped with a 5 HP/1800 drive motor. This pump supplies hydraulic oil to control valves and spud clamp. |
| Filter                                                                                                                                     |
| Fan cooled Hydraulic oil heat exchanger.                                                                                                   |

9.—Spud Carriage Lubrication System - The spud carriage is supplied with its own manual lubrication system.

|                                     |
|-------------------------------------|
| <b>Lincoln Model 1835</b>           |
| Electric Grease Pump with Reservoir |
| 12ln. (1.65 gal.) Reservoir         |

|                                                |
|------------------------------------------------|
| Time Controller                                |
| Reservoir Low — Level Alarm Kit                |
| Signal Monitor / Alarm Horn                    |
| Single “Caron Steel” Manifold mounted ejector. |
| Spud carriage position indicator               |
| Extend-Retract control for spud carriage       |
| Raise/lower/freefall control for each spud     |
| Hydraulic pressure, spud carriage              |
| Hydraulic pressure, holding spud.              |

## Service Systems

### A. Diesel Generator

1. Function - The diesel generator provides auxiliary power to the dredge when normal power is not available as on repair days or other power outages. The generator is key interlocked to ensure that only one source of power is available at a time. It is bussed to the ladder hoist and swing winches and to the 480 motor control center.

#### 2. Johnson & Towers Diesel Generator Set –

- Rated - 300 KW Standby, 1800 RPM, 480 volt, 3 phase, 60 hertz, and delta connected.
- Motor - Detroit Diesel 692 Engine Model 8063-7416
- Generator - Brushless with voltage regulator.
- Speed Control - Woodward EG3P Actuator with Woodward 2301A Governor.

#### 3. Instrumentation - Generator control panel with:

|                                |
|--------------------------------|
| ammeter                        |
| voltmeter                      |
| volt/amp phase selector switch |
| dial type frequency meter      |
| manual start module            |
| indicator lights for shutdown  |
| L.O. pressure gauge            |
| jacket water temperature gauge |
| DC voltmeter                   |
| Hour meter.                    |

#### 4. Interlocks -

Key interlock at 480 V motor control center.

Solenoid shutoff for:    Low L.O. pressure  
                                  High J.W. temperature  
                                  Over speed

#### Service Water System

1.     Function - The service water system is supplied by a ~~4x3~~ Warman pump with an installed spare. The system is manifold to supply water to the cutterhead Johnson Stave bearings-

|                                |                             |
|--------------------------------|-----------------------------|
| <b>Service Water Pump #1 -</b> | Warman 100 SPR Vertical 6x4 |
|                                | 60 H.P./1780 RPM TEFC motor |

|                                |                               |
|--------------------------------|-------------------------------|
| <b>Service Water Pump #2 -</b> | Warman 100 SPR Vertical 6x4   |
|                                | 60 .P./1780 RPM TEFC<br>motor |

2.     Strainer - Two duplex basket-type strainer with stainless steel baskets is installed in the main suction header. One section of the strainer can be serviced while the other is in operation.

#### 3. Instrumentation

|                                |
|--------------------------------|
| Service water pressure         |
| Differential strainer pressure |

4. Interlocks - The cutterhead is interlocked with service water pressure so that one of these pumps must be operating before the cutterhead can be started.

#### Main Lubrication System

18.    Function - The main manual lubrication system provides grease to the sheave blocks on the gantry, the winch idler sheaves, the swing sheaves, the ladder bale sheave, the ladder Trunnions, and the holding spud cylinder sheave.

#### Air System

1.     Function - The air compressors supplies air for the manual lubrication system, the air horn in the lever room and pneumatic tools. The larger compressor has the larger capacity required for the big air wrenches.

|                         |
|-------------------------|
| <b>Small Compressor</b> |
| Quincy Model QEH-10     |



|                                                                                                                |
|----------------------------------------------------------------------------------------------------------------|
| 10 HP/1750 electric motor                                                                                      |
| 48.5 CFM displacement (37.3 CFM free air @125 psi)                                                             |
| 125 psi max. pressure                                                                                          |
| 2 stage                                                                                                        |
| Horizontal tank mounted - 80 gal. ASME reservoir                                                               |
| Pressure switch - NEMA 12 - Factory set for automatic operation - set to cut in at 100 psi and out at 120 psi. |

|                                       |
|---------------------------------------|
| <b>Tool Air Compressor</b>            |
| Cooper, Industrial Machinery Division |
| Model AVLAVB                          |
| 20 HP / 1750 Motor                    |
| Type GZ – CH, Frame 286U              |

## Fresh Water System

1. Function - The dredge is equipped with a fresh water system that supplies water for the sink and toilet. The holding tank is located on the port side. The pump and pressure tank are located on the starboard side. A water heater is installed under the sink to provide hot water as needed. An additional pump and pressure tank are set up for deck washing.

|                                              |
|----------------------------------------------|
| <b>Domestic Service</b>                      |
| Gould's J03LS Shallow Well Jet Pump/motor    |
| Gould's 18 gallon hydro-pneumatic water tank |
| 1/3 HP/3450 RPM, TEFC, 56J frame.            |

|                                              |
|----------------------------------------------|
| <b>Deck Wash Service</b>                     |
| Gould's Jet Pump                             |
| Gould's 30 gallon hydro-pneumatic water tank |
| 1/2 HP/3450 RPM                              |