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STUDENT HANDOUT

TACTICAL WATER DISTRIBUTION SYSTEM (TWDS)

LEARNING OBJECTIVES:

1. Terminal Learning Objectives:

a. Provided components of a Tactical Water Distribution System (TWDS), fuel, oil, and water supply, operate the system in accordance with TM 5-4320-303-13. (1171.02.08)

b. Provided a GPM pump, a water source, tools, oil, grease, fuel, and references, perform preventive maintenance on the pump in accordance with the technical manual. (1171.04.01)

2. Enabling Learning Objectives:

a. Given the necessary equipment, tools and materials, without the aid of references, as a member of a team set up the system in accordance with TM 5-4320-303-13. (1171.02.08a)

b. Given the necessary equipment, tools and materials, without the aid of references, as a member of a team conduct operator maintenance in accordance with TM 5-4320-303-13. (1171.04.01b)

c. Given the necessary equipment, tools and materials, without the aid of references, as a member of a team start the system in accordance with TM 10-4320-303-13. (1171.02.08b)

d. Given the necessary equipment, tools and materials, without the aid of references, as a member of a team shutdown the system in accordance with TM 10-4320-303-13. (1171.02.08c)

BODY

1. Characteristics and Capabilities:

a. Characteristics: The Tactical Water Distribution System (TWDS) is part of the Military Water Supply Support System. The TWDS is not intended for use with brackish or contaminated water, or at temperatures below 32^{o} F (0^{o}C). The TWDS can be assembled for operation with in 48 hours.

b. Capabilities: The TWDS is capable of transporting water at the rate of 600gpm across level terrain. It can transport nearly 846,000 gallons of

water within a 24 hour period.

2. Description of Components: The system consists 4 main components broken down into the following categories:

a. Storage Assemblies: Two 20,000 gallon pillow type water storage tanks are supplied with the TWDS. Tank fill rate is controlled by manually operated gate valves. Tanks are used for storage or to supply water to the distribution points.

b. Distribution Points: Two distribution points are provided with TWDS. Each distribution point is made up of a 125 gpm pump, a hypochlorination unit, and a network of hoses. The pump draws water from the storage assembly and feeds it through the hypochlorination unit which will be used to disinfect drinking water. This water is then routed through a network of hoses to manual disbursing stations for distribution to personnel.

(1) 125 GPM Pump - Frame-mounted, small diesel engine driven unit, manually controlled.

(2) Hypochlorination Unit - Skid-mounted unit, powered by impulse diaphragm motor which operates on water pressure. The amount of chlorine injected into the water is controlled by adjusting the pump strokes. The rate of water flow through the unit is controlled by adjusting on-line valves. Once controls are set, the unit usually requires no further adjustments. It will inject the same dosage of chlorine into the water, regardless of changes in flow rate. Operators will periodically refill the 5 gallon chlorine solution reservoir. Water at manual disbursing stations is tested periodically using a color comparator kit.

(3) Hose Network and Manual Dispersing Stations - The rate of water flow through the network is controlled by adjusting on-line gate valves. The network ends at four manual dispersing stations, where elbow valves or nozzles are attached to the end of hoses. A 36 gallon drinking water storage bag known as a lister bag is suspended on a tripod and fitted with faucets. The lister bag is used to dispense water to canteens and other small containers. Lister bags require periodic refilling by an operator.

(a) Elbow valve: Used to fill FAWPSS bags only.

(b) Nozzle: Used to fill 5 gallon cans, canteen, etc.

(c) Nozzle Stand Assembly: Collapsible tripod used to hang elbow valves and nozzle assemblies when not being used.

(d) Lister Bags: The lister bag has a 36 gallon capacity, and is made of cotton duck. It hangs from a stand, with a faucet located at the bottom of the bag to distribute water to personnel. Lister bags need to be mounted on tripods that are sturdy enough to support at least 400lbs.

c. 10-mile Hoseline Segment: The 10 mile hoseline segment transfers water to the major components of the TWDS. This segment is used to connect pumping stations and storage assemblies. Components of the 10 mile hoseline

segment are packed in 34 crates. Thirty two (32) of the crates contain flaking boxes and are marked HOSE ASSEMBLY, 6 INCH x 500 FEET. The remaining two crates marked 10-Mile Segment, contain all the accessories for connection of the hose segments as well as a lifting sling, road guards, suspension kits, displacement and evacuation kit and repair kit.

(1) Flaking Boxes: Each holds one 500 foot hose. It allows hose to be flaked from the back of a truck. Used in groups of four boxes during hoseline laying operation. Adapted for forklift or lifting sling. Four flaking boxes make up one crate.

(2) Accessories: The remaining crates marked 10-Mile Segment, are used for various purposes. They contain:

(a) Lifting Sling: Used for lifting flaking boxes in the field when forklifts are not available. Capable of lifting a stack of four flaking boxes.

(b) Road Crossing Guards: Used when hose must be laid across a roadway or railroad.

(c) Suspension Kit: Used to cross small streams or deep gaps. May be used to cross roads where digging is not practical. If the elevation of the hoseline does not crimp or interfere with the delivery of water.

(d) Displacement and Evacuation Kit: Used to remove water and air from 500 foot hoseline and 20K tanks.

(e) Repair Kit: Used to repair 6 inch hoseline sections.

d. Pumping Stations: There are six pumping stations supplied with the TWDS. The number of stations used primarily depends upon the terrain and distance that the stations are spread across. Smooth terrain requires five pumping stations with the sixth as a spare. Rough terrain requires all six pumping stations.

(1) Pumping Stations - Each pumping station consists of a trailer mounted pump assembly, a check valve, butterfly valves, and several 6 in. diameter hose assemblies. The pump assembly is powered by a six-cylinder diesel engine. Pump operation is controlled through the panel, mounted on the pump.

(a) Lead Pumping Station: Draws water from a large storage and distribution unit, that is supplied by the water purification equipment. This feeds water downline through the hoseline to the first boost pumping station. Flow of water through the unit is controlled by manually operating butterfly valves on suction and discharge hoses. The PSI is regulated by adjusting engine speed.

(b) Boost Pumping Stations: Picks up water from the Lead pump and feeds it downline to the next boost pumping station or storage assembly. After initial startup, boost pumps can be switched to electric automatic mode. Engine speed will be regulated automatically. If pumping stations fail, water can be routed through a bypass hose assembly to keep downline

pumps primed. Flow of water is controlled by manually operating on-line butterfly valves. PSI is regulated by adjusting engine speed.

3. Setup Procedures:

a. Site Selection: Prior to installing TWDS equipment, a thorough study of the terrain is required. A general route for hoseline and general locations for the pumping stations, storage assemblies, and distribution points can be determined from examination and comparison of maps, photos, and charts. If possible, site locations should be near or parallel to existing roads to ease transportation, assembly, inspection, maintenance, and disassembly of the system. Avoid routes along the banks of streams, marshes, ponds, gullies, ravines, or other areas subject to flooding. Whenever possible, the hoseline should be laid out on firm, dry, level ground that allows easy access. Some elements to be considered in selecting a route or site for the TWDS are:

(1) Whether the TWDS will operate independently or as part of a larger system.

(2) The assigned mission for the TWDS (i.e., dispensing, storing, or transferring water).

(3) Expected length of time the TWDS will be required to operate.

(4) Elevation differences and distances the TWDS will encounter along its route.

b. Site placement of Pumping Stations:

(1) Lead pump: In selecting pumping station installation sites, the location of the lead or first pumping station will be determined by the location of the water source.

(2) Boost Pumps: Boost pumping stations are intended to be spaced at approximately two mile intervals, assuming that the route is reasonably direct and the terrain is level. However, a substantial rise or fall in elevation along the hoseline route may require adjustment of standard spacing intervals:

(a) If the next downline pumping station is substantially higher in elevation than the upline pumping station, the distance between them must be decreased.

(b) If the next downline pump station is lower in elevation than the upline station the distance between them must be increased.

NOTE: Adjustments to spacing between pumping stations (due to elevation change) assures that water pressure will be maintained within optimum operational range under normal conditions. The TWDS will deliver water to the suction port of each boost pumping station at a pressure of 20 psig. Whenever suction pressure falls below 20 psig, boost pumping stations are designed to begin reducing speed, when operated in the electric automatic mode. Therefore, if an upline pumping station is substantially lower than

the next downline station, and the elevation difference has not been offset by spacing adjustment, suction pressure at the downline pumping station may fall below 20 psig and cause that pump to slow down. This in turn will cause remaining downline boost pumping stations to slow down, seriously degrading overall performance of TWDS.

c. Installation:

(1) Lead Pump: The first stage of assembly begins at the water source. Once you have located a site for the lead pump near the storage tanks you will install the lead pump by performing the following:

(a) Install Suction Side:

1 Install a butterfly valve to inlet on suction side.

2 Connect a 6" X 10′ suction hose, to a 6" wye.

3 Attach (2) 6″ X 4″ reducers to the 6″ wye. Then connect it to the storage tanks using the 4″ suction hoses coming from the tanks.

(b) Install Discharge Side:

1 Install a 6" check valve to the discharge port of the 600 gpm pump.

NOTE: **Ensure you install the check valve in the proper direction.**

2 Attach a 6" x 20' discharge hose to the other side of the check valve using a victaulic coupling.

3 At the end of the 20' discharge hose, you will need to install a 6" Butterfly valve using victaulic couplings.

4 On the other side of the butterfly valve, connect a 6" nipple and relief valve using a victaulic coupling.

5 Set the butterfly valve in the fully closed position.

(2) Assembly of Ten Mile Hoseline Segment: Installation of the 10 mile hoseline segment will require at least 28 crates (112 flaking boxes) of hoseline. Use enough hoseline to provide slack so that the connections to the pumping stations and storage assemblies are easily made

(a) Connect the first hose on the bottom of the flaking box to the valve assembly (butterfly and pressure relief) from the lead pump.

(b) As the truck moves forward along the route, hose flakes begin to unfold out of the boxes and is manually laid out. Remove any small obstructions, branches, and sharp objects which can damage the hoseline and straighten any bends, twists, or kinks in the hoseline.

(c) Continue to lay the hose until the hoseline in all four boxes has been flaked.

(d) Reload the truck with 4 new flaking boxes.

(e) Connect the bottom hose from the new flaking boxes to the last hose laid out and continue the laying process.

(3) Assembly of Boost Pump Station: At the 2 mile interval, our 10 mile segment will need a pressure boost to continue downline. The assembly is done in a different manner than the lead pump. This assembly is the same for the remaining pump stations downline. To install the boost pump station, perform the following:

(a) Suction side.

1 Connect the 10 mile hoseline segment with a victaulic clamp to a 45 degree lateral.

2 Attach a butterfly valve with a 6 inch victualic clamp to the 45 degree lateral.

3 Attach a 6" X 10' discharge hose to the inlet on the suction port of the 600 GPM pump.

4 Go back to lateral and attach another butterfly valve with a 6″ victualic clamp. Connect this to a 6" X 75' discharge hose. connect the hose to another 45 degree lateral. This completes the suction side.

(b) Discharge Side:

1 Connect a check valve to the discharge port of the 600 GPM pump using a 6" victualic clamp.

2 Connect a 6" X 20' discharge hose to the check valve.

3 Connect a butterfly valve to the end of the discharge hose and attach it to the 45^{o} lateral with a 6" victualic clamp.

4 Connect a pressure relief valve to the lateral with a 6" clamp and then to continuing 10 mile hoseline segment.

(4) Assembly of Distribution Points: Positioning of distribution points depend on the TWDS mission. They can be located at any suitable site along the 10 mile hoseline route.

(a) 20k Water Tank: Locate the tank adjacent to a 600 GPM pump to facilitate operation of storage and distribution points by personnel operating pump. Ensure that the area where the 20K is to be laid out is:

1 Free of all debris which might puncture the 20K tank.

2 Level so that the tank won't roll when it is filled.

3 Dug with a shallow trench for proper drainage.

4 At the junction of two 500 foot hoses, a 6 inch to 4 inch reducing tee will be installed.

5 Assemble a 4 inch gate valve.

6 Connect one end of a 4" X 10' discharge hose to a 4" gate valve.

7 Connect the other end of the 4" X 10' discharge hose to a 20K tank.

(b) 125 GPM Pump/Hypochlorinator: Assembly of the 125 GPM pump and hypochlorinator begins on the other connection of the 20K tank.

1 Connect a 4" X 2" reducer to the fitting on the 20K tank.

2 Connect a 2" X 20' suction hose **(2)** to the reducer and connect it to the suction side of the 125 GPM pump **(3)**.

NOTE: The use of adapters may be required for proper connection of male and female ends. Make all required adjustments accordingly.

3 Connect a 2" X 10’ discharge hose **(2)** to the discharge side of the 125 GPM pump. Route the 2” X 10’ discharge hose to the hypochlorinator.

4 The inlet side of the hypochlorinator may need to be adapted. Connect a 2” X 10' discharge hose **(2)** to the discharge side of the hypochlorinator.

5 Connect the discharge hose from the hypochlorinator to a 2 inch wye **(5)**.

6 Attach 2 inch gate valves on both sides of the wye **(6)**.

7 Connect a 2" X 10' discharge hose **(2)** to the gate valves.

8 At the end of both hoses, attach a 2 inch wye **(5).**

9 On both sides of the wye, connect a 2" x 10' discharge hose **(2)**.

10 On the end of the hose, connect either a 2 inch nozzle **(7)** or a 2 inch elbow coupler.

(c) Lister Bags: Install 2 lister bags for filling of small containers.

1 Construct a 4 x 4 tripod out of any suitable material that will support a weight of 400lbs.

2 Suspend each bag from the center of its tripod.

3 Fill the bag with potable water.

(4) Crossing Obstacles: Logistical support needed to cross obstacles will be determined by the type of obstacle encountered. Below are examples of the two most common obstacles.

(66-67)

(a) Crossing Roads: Whenever roads present an obstacle to the laying of hoseline, install **Road Guards** by performing the following:

1 Dig a trench 18" deep X 26" wide.

2 Lay the planking in the trench.

3 Lay the hoseline on the planking.

4 Lay the road guards over the hoseline. Each guard is 5ft. in length.

5 Nail the road guards down to the plank on all four corners.

6 Back fill the trench.

7 Continue the hoseline laying operation.

(b) Crossing Streams or Deep Gaps: To cross streams or deep gaps, use the **Suspension Kit**. Each suspension kit provides material for one 200 foot crossing or two shorter crossings. Materials for construction of suspension towers are not included. When constructing suspension towers, perform the following:

NOTE: Spans up to 75 feet 4 X 4's are adequate. Spans over 75 feet 6 X 8's are adequate. Trees may be used if they are large enough to support the weight of the hose when full.

1 Position one tower leg facing the obstacle, with the other rear legs angled backwards. This gives maximum strength and stability.

2 After the suspension towers are installed, connect the wire cable and hoseline.

3 Drive an anchor stake into the deck approximately 15 feet from each tower. This stake should be at a 30^{o} angle in line with the tower and approximately 6 inches above the ground.

4 Hang a pulley block from each tower and thread the wire rope through the pulley.

5 Pull the wire rope across the stream or obstacle.

6 Thread the wire rope through the pulley block on the far side.

7 Make a loop in the wire rope approximately 6 inches at each end.

8 Secure the loop with 2 clamps.

9 Unscrew the turnbuckle until fully extended.

10 Hook the turnbuckle to the loop on the wire rope and hook it up to the stake on each side of the suspension towers.

11 Place a shackle on top of the wire rope and wrap a saddle around the hoseline. Attach the saddle to the shackle.

12 Tie a manila rope on the end of the hoseline to pull it across the obstacle. Pull the hoseline through

13 Pull the hoseline across the obstacle while placing shackles and saddles at 5 foot intervals on the hoseline.

14 When the hoseline fills with water, adjust the turnbuckles to the sag specifications listed below:

EMPTY HOSE		FULL HOSE	
SPAN DISTANCE	MAXIMUM SAG	SPAN DISTANCE	MAXIMUM SAG
DIMENSION A (FEET)	DIMENSION B (FEET) (APPROX)	DIMENSION A (FEET)	DIMENSION B (FEET) (APPROX)
25	1.5	25	2.25
50	3	50	4.50
75	4.5	75	6.75
100	6.5	100	9
150	9.5	150	13.50
200	13	200	18

15 When the hoseline is in place, use a few more saddles to ensure the hose is graduated up the cable to prevent kinks.

d. Prepositioning Valves and Switches:

(1) Prepositioning Valves:

(a) Lead Pump:

1 Ensure that the gate valves on the tank you are drawing water from are open.

2 Make sure that the butterfly valve on the suction side of the pump is open.

3 Make sure that the butterfly valve on the discharge side of the pump is in the closed position.

(b) Booster Pump: Ensure all butterfly valves on the booster pumps are in the closed positions.

(2) Prepositioning Switches: 600 GPM pumps operate in electric automatic, electric manual, or manual modes. To operate the **lead pump**, perform the following:

(a) Set the pressure regulator to start.

(b) Turn the electric manual speed control to the idle.

(c) Pull out engine mode switch to unlock and set it to PRESSURE REGULATOR (MANUAL).

(d) Turn the manual throttle fully in.

(e) Pull the fuel rack handle fully out and lock.

e. Before Operation checks and Services:

(1) Prime Lead Pump

(a) Remove the plug on top of the pump housing.

(b) Fill the housing to a minimum level of the suction port.

(c) Install the plug.

(2) Perform 360 Visual Inspection: Perform a visual inspection of the pump checking for:

(a) Oil level: Ensure oil level is in the proper range for Operation.

(b) Fuel level: Ensure that there is sufficient fuel to operate the pump.

(c) Radiator coolant level: Coolant level should be 1 – 2 inches from the neck on the radiator fill cap.

(d) Fan belt: Check fan belt for proper tension and look for cuts or rot on the rubber.

(e) Missing nuts and bolts: Look over the pump to ensure there are not any missing nuts or bolts that would cause damage to the equipment or personnel.

(f) Battery: Check that the battery cables are tight and that the terminals are clean.

4. Startup Procedures:

a. Lead Pump:

(1) Set the engine start/run switch to start. Release the switch when engine starts. Engine should idle at approx. 1000 rpm's.

(2) Gradually, turn the manual throttle out until 20 psi is obtained on both suction and discharge ports of the pump.

NOTE: The engine alarm horn operates in each mode and will sound if:

1. Engine operating temperature exceeds 220°F.

2. Engine oil pressure falls below 10 psi.

3. Engine does not start within 30 seconds after Engine Run Switch is first set at START position.

If the engine alarm horn sounds, check the engine temperature gauge and the engine oil pressure gauge. If engine temperature or oil pressure is not within limits, set the Engine Run Switch at OFF, and depress the Alarm Horn set to shut off the alarm.

(3) Open the butterfly valve on the discharge side of the pump and allow water to proceed down the column.

(4) Monitor the gauges to ensure that the proper readings are maintained.

(5) Inspect the 10 mile hose segment all the way to the first booster pump for:

(a) Kinks or twists in the hose.

(b) Leaks in the hose or at connectors.

(c) Objects that could damage the hose.

NOTE: Do not start downline pumps until primed.

b. Booster Pump:

(1) Priming Downline Pumps - Once the lead pump is primed and operating, it will feed water to the downline pumps.

(2) Open the butterfly valve on the suction side of the booster pump.

(3) Allow booster pump to prime.

c. Before Operation Checks and Services: Perform a 360 Visual Inspection of the pump checking for:

(1) Oil level: Ensure oil level is in the proper range for Operation.

(2) Fuel level: Ensure that there is sufficient fuel to operate the pump.

(3) Radiator coolant level: Coolant level should be 1 – 2 inches from the neck on the radiator fill cap.

(4) Fan belt: Check fan belt for proper tension and look for cuts or rot on the rubber.

(5) Missing nuts and bolts: Look over the pump to ensure there are not any missing nuts or bolts that would cause damage to the equipment or personnel.

(6) Battery: Check that the battery cables are tight and that the terminals are clean.

d. Preposition Switches:

(1) Set the pressure regulator to start.

(2) Turn the electric manual speed control to idle.

(3) Pull out engine mode switch to unlock and set it to PRESSURE REGULATOR (NORMAL).

(4) Turn the manual throttle fully in.

(5) Push the fuel rack handle fully in and lock.

e. Start Booster Pump:

(1) Set the engine run switch to start. Release the switch when engine starts. Engine should idle at 1000 rpm's.

(2) Turn the manual throttle fully out.

(3) Set the pressure regulator switch to auto. Engine speed isnow automatically controlled by the pressure regulator.

(4) Open the butterfly valve on the discharge side of the pump and allow water to proceed down the column.

(5) Monitor the gauges to ensure that the proper readings are maintained and that the pump is operating properly.

(6) Inspect the 10 mile hose segment all the way to the next booster pump for:

(a) Kinks or twists in the hose.

(b) Leaks in the hose or at connectors.

(c) Objects that could damage the hose.

NOTE: Follow the instructions for starting booster pump for all remaining pumps until the complete system is in operation.

f. Filling of Storage and distribution Points

(1) The water column coming downline moves at about 6 mph.

(2) Using a water column to fill a 20K tank will slow the downline progress of the column to 3 mph while the 20K tank fills.

(3) Once the 20K tank is full, close the 4 inch supply valve.

g. Operation of Distribution Point

(1) Operation begins with the 125 gpm pump.

(a) Prime the pump through the priming plug.

(b) Perform a 360 visual inspection.

(c) Set the fuel cock to the open position.

(d) Move the engine speed control lever to the start position.

(e) Push the decompression lever down and release it.

(f) Turn the starting handle until the engine starts.

(g) To stop the engine, slowly move the speed control lever knob and let the engine idle for 3 minutes.

(2) Operation of the hypochlorinator after the start up of the 125 GPM pump.

(a) Fill the reservoir with 5 gallons of clear water.

(b) Add chlorine to the water. (see chart) Ounces of HTH to be mixed depends on desired dosage.

DOSAGE PPM	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
OUNCES HYPO		**4.75**			**10**					

(c) Set the pump stroke adjustment at 50%.

(d) Set the flow rate valve to position 5 and slightly open the flow regulator valve until the proper reading is obtained.

(e) Using a 125 gpm pump, open the regulator valve until the meter reads 5 gpm.

(f) If air enters the unit, vent thru a small hole in the bottom of the pump and reset the stroke adjustment to 50%.

(g) Allow the unit to operate a few minutes and then take a chlorine residual test at the distribution nozzles. If the chlorine is too high or too low, perform these steps.

1 High chlorine - turn stroke to 30%, repeat residual test. If it is still high, dilute the solution. Repeat the residual test.

2 Low chlorine - increase the stroke to 70%. Repeat chlorine test. Continue adjusting strokes until the proper level is achieved.

5. During Operation Checks and Services: The easiest way to accomplish this task is to start at the lead pump station and work downline.

a. 600 GPM Pump (Lead Pump)

(1) Check the operation mode of the pump. It should be in the manual or electric manual mode.

(2) Ensure the pump is operating at correct rpm's.

(3) Check the fuel level of the pump and refill if needed.

(4) Check the oil level.

(5) Check for leaks. (oil, fuel, or water)

(6) Visually inspect the unit.

b. 10 Mile Hose Segment

(1) Requires a daily visual inspection. It can easily be done with the use of a vehicle.

(2) Ensure there are no interruption to the hoseline.

(a) Road Guards - still operational.

(b) Suspension Kits - have no major changes in operation.

(3) Ensure there are no kinks.

(4) Check for leaks at all connections.

(5) If hose is damaged and needs repair, report this to the NCOIC immediately so shut down can begin.

c. 600 GPM Pump (Boost Pump)

(1) Check the operation mode of the pump. It should be in electric automatic mode.

(2) Ensure the pump is operating at correct rpm's.

(3) Ensure the by-pass butterfly valve is closed. Only use the by-pass if the pump is disabled or when performing maintenance.

(4) Check the fuel level of the pump and refill if needed.

(5) Check the oil level.

(6) Check for leaks, (fuel, oil, or water).

(7) Visually inspect the unit.

d. Distribution Points

(1) Begin by checking all connections from the 10-mile hoseline segment to the distribution point. Ensure you have no leaks and the gate valve functions properly.

(2) Perform a visual inspection of the 20K tank, ensuring it has no leaks.

(3) Perform a visual inspection of the 125 gpm pump.

(4) Add fuel if necessary.

(5) Add oil if necessary.

(6) Ensure the operation is normal.

(7) Perform a visual inspection of the hypochlorinator.

(8) Take a chlorine residual.

(9) Fill the chlorine reservoir if needed.

(10) Ensure the hypochlorinator is set on the correct pump stroke setting to achieve the correct chlorine residual.

6. Shutdown Procedures: Because of the variety of installation arrangements with the TWDS, shut down procedures will always start with the last booster pump and work back towards the lead pump.

a. Place an operator with a radio, at each boost pump downline.

b. Shut down the last boost pump downline from the lead pump.

(1) Close the valve on the discharge side first.

(2) Then close the valve on the suction side.

(3) On the Boost Pump, set the electric manual speed control to idle, the pressure regulator switch to electric, and the engine run switch to off.

c. Repeat this process, working your way to the lead pump, VIA RADIO.

d. On the lead pump, set electric manual speed control to idle and the engine run switch to off.

e. Ensure the supply gate valves at the 20K tanks are closed.

f. Shut down the 125 gpm pump.

g. For a short shut down on the hypochlorinator, nothing is done. It is powered by the 125 gpm pump.

NOTE: Any period of shut down longer than six (6) hours requires complete flushing of the Hypochlorinator Unit. Chlorine will damage equipment.

7. After Operation Checks and Services:

a. Check the oil - requires 6 quarts (30 wt).

b. Check the radiator - ensure it is full.

c. Check the fuel tank.

d. Check the air cleaner (if it is clogged, blow it out with an air compressor).

e. Visually inspect the pump for damage.

f. Perform preventative maintenance procedures on the 125 GPM pumps.

(1) Inspect the frame for cracks or damage.

(2) Check the oil level - 1 quart - 30 wt.

(3) Check the air filter, blow it out if it is clogged.

(4) Check the air restrictor indicator.

(5) Check the fuel tank. Fill with one (1) gallon of diesel.

(6) Check the pump housing for damage or leaks.

8. Disassembly and Storage procedures:

a. When given the order to recover the TWDS after completion of the operation, it will require specific procedures to ensure the life span of the equipment is maintained.

b. This is done with the use of a 250 CFM air compressor, and evacuation kit.

c. Recovering the Pump Stations:

(1) Open the drain plugs on the pump. Close the plug when it is drained.

(2) Connect the pump to the truck using a pintle hook.

(3) Drain and roll up the by-pass lines.

d. Recovering 20K Tanks - In the past, units had difficulty removing the water from tanks, thus causing dry rotting and contaminants to form inside.

(1) Remove as much water as possible from the 20K tanks.

(2) Cap the vent pipe and the other outlet valve to the tank.

(3) Attach an evacuator to the remaining outlet line on the tank. Connect the evacuator to the air compressor.

(4) Turn on the air compressor and open the valve on the evacuator. This creates a vacuum removing water from the tank. The procedure will take approximately 2-3 hours. Once the tank is vacuumed, shut the valve on the evacuator and begin filling the tank with the air compressor. This will also take about 2-3 hours.

CAUTION: WHEN THE TANK FILLS, IT BECOMES VERY UNSTABLE ESPECIALLY IN A WINDY ENVIRONMENT.

(5) Remove the evacuator and open plugs to tank. As air escapes, it will dry the tank.

(6) The tank should then fold-up properly and fit in its box. If not, connect the evacuator and vacuum for one (1) more hour.

e. 10-Mile Hose Segment

(1) After disconnecting the 6" x 500' hose from the lead pump station, you need to disconnect the hose every 1,000 feet.

(2) At the end of each 1,000 ft., install a Ball Catcher Assembly.

(3) Starting at the lead pump station, you will place the ball in the evacuator assembly and connect the assembly to the hose using a victaulic coupling. Connect the air compressor to the evacuator.

(4) Apply pressure to the ball assembly. The air compressor will discharge the ball down the hose pushing out trapped water.

NOTE: Ensure hose is in a safe direction and not connected to boost pump.

(5) Continue this procedure every 1,000 feet down line.

(6) When all ten miles have been purged of excess water, start disconnecting the hose every 500 feet.

(7) Place an end cap on the first hose using a victaulic coupling. At the other end of the hose, connect the evacuator to the hose using a victaulic coupling. Turn on the air compressor and open the valve. This creates a vacuum, pulling out moisture and sealing the hose. This procedure takes approx. 10-15 minutes a hose. When the hose starts to "Cave-In", shut off the air compressor. Remove the evacuator and install another end cap. Ensure you don't lose vacuum. Now the hose is ready for recovery.

(8) Place the hose in the flaking box so that the end is exposed to the packers. One (1) packer can go inside the flaking box to ensure an even feed into the box. A minimum of three (3) packers are needed to pick-up and push the hose into the box. Continue until all hoses are recovered.

(9) Once this is completed, remove both end caps and install the gate. When done properly, the hose should fit perfectly with three feet of space in the box.

(10) This is repeated for the other hoseline segments.

REFERENCES

TM 10-4320-344-24P-1
TM 10-4320-324-14
TM 10-4320-303-13
TM 5-4320-309-14
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