UNITED STATES MARINE CORPS
Utilities Instruction Company
Marine Corps Engineer School
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Oct 99

STUDENT HANDOUT

REPAIR PUMPS

1. **LEARNING OBJECTIVES:**

a. **Terminal Learning Objectives**:

(1) Provided a worksheet for quarterly preventive maintenance and technical inspection for engineer equipment (NAVMC 10560), an item of hygiene equipment, a water source, power source, and fuel, with the aid of references, perform hygiene equipment limited technical inspection in accordance with the technical manual. (1171.05.09)

(2) Provided an equipment repair order, a faulty GPM pump, repair facility, supplies, and references, repair GPM pumps in accordance with appropriate technical manuals. (1171.05.01)

b. **Enabling Learning Objectives:**

(1) Provided a malfunctioning GPM pump and a Worksheet for Quarterly Preventive Maintenance and Technical Inspection for Engineer Equipment (NAVMC 10560), inspect the unit in accordance with the technical manual. (1171.05.09a)

(2) Provided a malfunctioning 65 GPM pump, an Equipment Repair Order (NAVMC 10245), a water source, and fuel, with the aid of references, diagnose the malfunction in accordance with TM-5-4320-200-15. (1171.05.01a)

(3) Provided a malfunctioning 65 GPM pump, an Equipment Repair Order (NAVMC 10245), tools, repair facility, and repair parts, with the aid of references, repair the 65 GPM pump in accordance with TM-5-4320-200-15. (1171.05.01b)

(4) Provided a malfunctioning 125 GPM pump, an Equipment Repair Order (NAVMC 10245), a water source, and fuel, with the aid of references, diagnose the malfunction in accordance with TM- 4320-24P/2. (1171.05.01c)

(5) Provided a malfunctioning 125 GPM pump, an Equipment Repair Order (NAVMC 10245), tools, repair facility, and repair parts, with the aid of references, repair the 125 GPM pump in accordance with TM- 4320-24P/2. (1171.05.01d)

(6) Provided a malfunctioning 350 GPM pump, an Equipment Repair Order (NAVMC 10245), a water source, and fuel, with the aid of references,

diagnose the malfunction in accordance with TM-10- 4320-324-24P, TM-10-4320-343-14, and TM-10-4320-226-14. (1171.05.01e)

(7) Provided a malfunctioning 350 GPM pump, an Equipment Repair Order (NAVMC 10245), tools, repair facility, and repair parts, with the aid of references, repair the 350 GPM pump in accordance with TM-10-4320-324-24P, TM-10-4320-343-14, and TM-10-4320-226-14. (1171.05.01f)

(8) Provided a malfunctioning 600 GPM pump, an Equipment Repair Order (NAVMC 10245), a water source, and fuel, with the aid of references, diagnose the malfunction in accordance with TM-10-4320-344-24P-1, TM-10-4320-344-24P-2, and TM-10-4320-24P-3. (1171.05.01g)

(9) Provided a malfunctioning 600 GPM pump, an Equipment Repair Order (NAVMC 10245), tools, repair facility, and repair parts, with the aid of references, repair the 600 GPM pump in accordance with TM-10-4320-344-24P-1, TM-10-4320-344-24P-2, and TM-10-4320-24P-3. (1171.05.01h)

BODY

1. Perform a Limited Technical Inspection on the GPM Pumps:

    a. Inspecting the pump.

        (1) Ensure the pump frame is not damaged or cracked.

        (2) Ensure the pump housing is not cracked.

        (3) Check the oil and fuel levels.

        (4) Check the air filter.

        (5) Check the oil filter.

        (6) Check the fuel filter.

2. Diagnoses for a malfunctioning 65 GPM Pump:

    a. Pump fails to pump rated capacity.

        (1) Check strainer.

            (a) ensure its not clogged.

            (b) ensure its not warped, cracked, or damaged.

        (2) Check hoses.

            (a) check for gaskets.

            (b) check for any rips or tears.

        (3) Check impeller.

            (a) ensure its not clogged.

(b) check the impeller for cracks or damage.

(c) ensure its not warped(check for shims).

(4) Check pump housing.

(a) check pump body for cracks.

(b) check for water leaking around the face plate.

(5) Check packing seals.

(a) ensure seals fit properly.

(b) ensure seals are not worn.

3. Repairing the 65 GPM Pump:

a. Disassembly of the 65 GPM pump.

(1) Remove impeller.

(a) Remove two bolts from face plate.

(b) Remove impeller bolt along with lock washer and flat washer.

(c) Use puller to pull off impeller.

(2) Remove packing seal from inside outer edge of face plate.

b. Assembly.

(1) Install serviceable inner packing seals on pump shaft.

(2) Install serviceable impeller.

(a) Place impeller securely on shaft.

(b) Replace flat washer lock washer and impeller bolt.

(c) Place serviceable packing seal on inside outer edge of face plate securely.

(d) Position face plate back on housing.

(e) Tighten down two bolts to face plate evenly.

4. Diagnoses for a malfunctioning 125 GPM Pump (PUMP FAILS TO PRIME).

a. Check strainer.

(1) Ensure the strainer is not clogged.

(2) ensure it’s not warped, cracked, or damaged.

b. Check hoses.

(1) ensure hoses have serviceable gaskets.

(2) ensure hoses are not torn or ripped.

c. Check fuel.

(1) ensure fuel tank is full.

(2) ensure fuel is not dirty or milky looking .

d. Check impeller.

(1) ensure the impeller is not clogged.

(2) ensure the impeller is not cracked or broken.

e. Check clearance.

(1) check clearance between wear plate and impeller.

(2) check impeller for looseness.

d. Check shaft seal.

(1) ensure seal is not worn or dry rotted.

(2) ensure seal is seated properly and not loose.

5. Repairing the 125 GPM Pump:

a. Disassembly of the 125 GPM pump.

(1) Remove packing, shaft seal, and impeller.

(a) Remove nuts(**1**) and washers(**2**) securing volute(**3**) to pump case assembly(**4**).

(b) Prevent adapter shaft(**6**) from moving and remove screw(**7**) and lock washer(**8**).

(c) Unscrew impeller(**9**) counterclockwise and remove shims(**10)** and (**11**).

(d) Remove screws(**12**). Remove wear plate(**13**) and packing(**14**). Discard packing.

(e) Remove shaft seal(**15**) from pump case assembly(**4**). Discard shaft seal.

(f) Remove adapter shaft(**6**) from pump case assembly(**4**)and Remove key (**16**).

b. Assembly; installing packing, shaft seal, and impeller.

(1) Install new shaft seal(**15**) on adapter shaft(**6**). Install key(**16**).

(2) Install adapter shaft with shaft seal into pump case assembly(**4**).

(3) Install new packing(**14**) in pump case assembly(**4**).

(4) Install wear plate(**13**) and screws(**12**). Tighten screws securely.

(5) If a new impeller and/or wear plate is to be installed, or if the impeller clearance is to be changed, determine the shim thickness required to obtain a clearance of 0.010 to 0.020 inch (0.254 to 0.508mm) between the impeller and wear plate as follows:

(a) Screw impeller(**9**) clockwise in shaft(**6**) without shims. Be sure that it is seated firmly against the shaft shoulder. Secure impeller with lock washer(**8**) and screw(**7**).

(b) Measure from the face of the impeller(**9**) to the face of the wear plate(**13**) using a feeler gauge.

(c) Select shims(**10** and **11**) to equal the dimension obtained less 0.010 to 0.020 inch (0.254 to 0.508mm) for clearance.

(6) Install impeller(**9**), lock washer(**8**), and screw(**7**). Tighten screw securely.

(7) Install new packing(**5**) on volute(**3**). Install volute on pump case assembly(**4**).

(8) Install washers(**2**) and nuts(**1**). Tighten nuts securely.

6. DIAGNOSES OF A MALFUNCTIONING 350 GPM PUMP; (FAILS TO STAY PRIMED).

a. Check hoses.

(1) check hoses for gaskets.

(2) check hoses for proper connections.

b. Check fuel.

(1) ensure tank has adequate fuel supply for operation.

(2) ensure fuel is not dirty or milky looking.

c. Check impeller.

(1) ensure impeller is not clogged.

(2) ensure impeller is not damaged or cracked.

d. Check pump housing.

(1) check housing for stability.

(2) check housing for any damage or cracks.

7. Repairing the 350 GPM Pump:

a. Disassembly of the 350 GPM pump, (remove impeller).

(1) Scribe a mark on intermediate housing(**1**) and volute housing(**2**).

(2) Remove nuts(**3**), lockwashers(**4**), and intermediate housing(**1**) from volute housing(**2**).

(3) Remove and discard gasket(**5**).

(4) Remove and retain two screws(**6**) and lockwashers(**7**) diagonally opposite each other.

(5) Install two 3-inch (76.2mm) long screws into threaded holes.

(6) Place steel bar(**8**), 1 ¼ inch (31.75mm) x 3/8 inch (9.525mm) x 14 inches (355.6mm), between screws as shown in diagram.

(7) Place a second steel bar(**9**) into impeller between vanes as shown in diagram.

(8) With one steel bar(**8**) on coupling and another steel bar(**9**) on impeller, tap steel bar(**9**) on impeller in a counterclockwise direction (**10**) until impeller breaks loose from shaft.

(9) Remove impeller(**10**), holding bar(**8**) and striking bar(**9**).

(10) Remove spacer shims(**11**), spring centering washer(**12**), and spring(**13**) from shaft.

b. Assembly, (install impeller).

(1) Install spring(**13**), spring centered washer(**12**), and spacer shims(**11**) on shaft.

(2) With large end of intermediate bracket on clean work surface, and threaded impeller end of shaft up, install impeller(**10**) onto shaft by rotating clockwise until main shaft, sleeve, and impeller hub mating surfaces are a snug fit. No torque is required. Impeller tightens itself during pump operation.

(3) Place gasket(**5**) on volute housing(**2**) near flange.

(4) With vernier caliper, determine dimension **A** from rear of gasket on flange of volute to center of discharge opening inside volute as shown in diagram.

(5) Measure dimension **B** from front flange of seal plate to center of impeller opening as shown in diagram.

(6) Determine the difference between dimensions **A** and **B**.

(7) When difference is greater or less than 1/32 inch (0.794mm), remove impeller and add or remove shims as required.

(8) Tap out suction wear ring.

(9) Install new suction wear ring with widest face towards suction outlet.

(10) Assemble volute housing(**2**) and intermediate housing(**1**), making certain that scribe marks made in disassembly are aligned.

(11) Secure volute housing(**2**) and intermediate bracket(**1**) together with lockwashers(**4**) and nuts(**3**).

(12) Install lockwashers(**7**) and screws(**6**).

8. Diagnoses for a Malfunctioning 600 GPM Pump, (WATER LEAKING FROM PUMP HOUSING):

a. Check pump housing.

(1) inspect pump housing for damage or cracks.

(2) ensure pump housing is not loose.

b. Check seal assembly.

(1) ensure seal assembly is not worn.

(2) ensure seal assembly is seated properly.

c. Check impeller.

(1) ensure impeller is not clogged.

(2) ensure impeller is not warped, cracked, or damaged.

d. Check impeller shaft.

(1) ensure shaft is not damaged or cracked.

(2) ensure shaft is tight.

9. Repairing the 600 GPM Pump:

a. Disassembly of the 600 GPM pump, (removing the seal assembly).

(1) Remove and retain two cap screws(**1**) and lockwashers(**2**), diagonally opposite each other, from flexible coupling assembly(**3**).

(2) Measure thread diameter of cap screw(**1**) and obtain two screws 3 inches long and same thread diameter as cap screw(**1**).

(3) Install two 3 inch (76.2mm) long screws(**4**) into thread holes of flexible coupling assembly(**3**).

(4) Place steel bar(**5**), 1 ¼ inch (31.75mm) x 3/8 inch (9.525mm) x 14 inches (355.6mm) between screws(**4**) and remove cap screw(**6**) and sleeve spacer(**7**).

(5) Place second steel bar(**8**) into impeller(**9**) between vanes as shown.

(6) While holding steel bars(**5**) at flexible coupling assembly(**3**) securely in position, and steel bar(**8**) in impeller(**9**) rigid, firmly strike steel bar(**8**) in counterclockwise direction while facing impeller(**9**) until impeller(**9**) unscrews.

(7) Remove steel bars(**5** and **8**), impeller(**1**), shims(**2**); if present, seal washer(**3**), spring(**4**), seal assembly(**5**), and stationary seat(**6**) from impeller shaft(**7**). Discard seal assembly(**5**).

b. Assembly, (replacing the seal assembly).

(1) Lightly lubricate stationary seal(**6**) with silicone lubricant.

(2) Install stationary seal(**6**) on impeller shaft(**7**) and press into seal housing bore in seal retaining plate(**8**).

(3) Lubricate interior diameter of seal assembly with light coating of silicone lubricant.

(4) Lubricate faces of precision seals of seal assembly with silicone lubricant.

(5) Slide seal assembly(**5**) on impeller shaft(**7**) until it comes in contact with polished side of stationary seal(**6**).

(6) Install spring(**4**) and seal washer(**3**) on impeller shaft(**7**).

REFERENCES

TM 08922A-14
TM 08922A-24P/2
TM 10-4320-226-24P
TM 10-4320-344-14
TM 10-4320-344-24
TM 5-2805-256-14
TM 5-2805-256-24P