A - C SUBMERSIBLE PUMP TEST

OUTLINE

<table>
<thead>
<tr>
<th>TEST ITEMS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Resistance of motor at 25ºC</td>
<td>Extreme care</td>
</tr>
<tr>
<td>1b. Resistance to ground</td>
<td>100 megohms min.</td>
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<tr>
<td>1c. Electrical input - not pumping</td>
<td>425 watts max.</td>
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<tr>
<td>2a. Pump Position</td>
<td>Varied: Vertical, Horizontal and Inclined</td>
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<td>2b. 50 ft. head - Install foot valve and operate pump at pressure indicated on 13283. Record quantity of water.</td>
<td>200 gpm min.</td>
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<tr>
<td>3. Temperature rise after 2 hour run</td>
<td>Discontinue test if 90ºC rise</td>
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<tr>
<td>4. Temperature rise after 4 hour run Stop time in hour and minute and A.M. or P.M.</td>
<td>If 90ºC rise, do not run 8, 9, or 10</td>
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<tr>
<td>5a. Electrical input amount of water</td>
<td>Max. unbalance in current - 5% 200 gpm min.</td>
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<tr>
<td>5b. Record shut-off after 4 hour run</td>
<td>P.S.I. and head in feet</td>
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<tr>
<td>6. Physical inspection after 4 hours</td>
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<tr>
<td>7. Test resistance between all 3 input leads</td>
<td>50 megohms min. both off and on</td>
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<tr>
<td>8a. Examine seal chamber for water</td>
<td>No water</td>
</tr>
<tr>
<td>8b. Examine motor chamber for water, oil, or solvent. Dry out motor chamber if a small amount of moisture or water is present.</td>
<td>Discontinue test if water drips from lower plug hole or if there is oil in the motor chamber.</td>
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<tr>
<td>8c. Add 9 oz. of 2135TH oil and seal plugs. If test is discontinued, omit oil, but note this on job tag and data sheet and insert plug 1 thread only. Always seal motor chamber plug.</td>
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<tr>
<td>8d. Hi-pot test with controller connected in pump.</td>
<td>Satisfactory switch operation</td>
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</tbody>
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SUMMARY: Each pump is tested in accordance with MIL-P-17454 load test are made, at 50 ft. head for 2 & 4 hours. As the motor is submersible and water cooled, the temperature is taken by method 2, the resistance method. It is apparent that the resistance of the motor windings at the base temperature, 25ºC, must be taken very accurately. Each tester must initial the readings he has taken.

This spec. supersedes Spec. No. IN-192, dated 1/2/68, Rev. G
PROCEDURE

Ohms at 25ºC:
1a. Immerse the pump in tank for one hour. At the end of this period, take bridge readings and ambient temperature at 10 minute intervals until 3 are obtained with no over one-half of 1% variation at the 25º base. Compute the resistance at 25º from the resistance taken, deducting first the lead resistance and dividing by the factors given in Table 43012 at the corresponding ambient temperature. Record all data on Test Sheet. Do not allow the cord plugs to get damp as this will break down the insulation.

PRELIMINARY TEST:
Install in a vertical position in the large tank with the suction clear of the water and connect the cord to the receptacle on the rear of the switchboard number similar to the station in which the pump is hanging.

1b. Test the resistance to ground (minimum 100 megohms). Do not record any reading of less than 100 megohms without first testing the motor with the plug disconnected. If the low megohms are due to poor insulation in the plug, change the plug and proceed with the test. To make this test, close the circuit switch toward the center of the board connecting the motor to the metering buss. Close the analyzer switch in the down position, connecting the metering buss to the outlets for the megger and bridge. Close the line switch on the megabridge, set the pointer at 1000, and depress the button. If the gap in the light eye widens, 100 megohms is indicated. If it does not widen, turn the pointer and depress the button again until a reading is obtained.

1c. Take the electrical input running light at rated voltage, using the 5 amp analyzer circuit for 440 volt and the 25 amp for 220 volt motors. To do this, start the pump by closing the circuit switch away from the center of the board. Then with one hand close the circuit switch toward the center of the board, and with the other hand close the analyzer switch in the up position, taking care to close the circuit switch a fraction of a second before the analyzer switch. When turning back to the running position, open the analyzer switch a fraction of a second before closing the circuit switch. This will avoid making or breaking the motor load on the contacts of the circuit switch which are used for the bridge readings. Record the no-load watts (maximum 425), using the correct multiplier of 4 for 440 volt motors with the voltage range dial set at 600 and 10 for 220 volt motors with the voltage range dial set at 300. Record the amperes in each phase, using the scale corresponding to the circuit used.

IMMERSED POSITION OF PUMPS SHALL VARY:
2a. Some pumps being vertical, some horizontal and some inclined in a midway position.

50 HEAD SUCTION TEST:
2b. Start the pump by closing the circuit switch away from the center of the board, i.e., the upper row in the up position and the lower row in the down position. This connects the pump to the unmetered buss. Go immediately to the pump and adjust the throttle valve to obtain the pressure on Table 13283 corresponding to the vacuum gage reading. Hold this pressure through 5a. Record GPM output (200 min.), starting time (hrs. & minutes, AM or PM) and date of 2b recording.

TEMPERATURE RISE AFTER 2 HOUR RUN:
3. After 2 hour run, take ambient temperature and temperature rise of motor, resistance method, recording all readings on Test Sheet (maximum temperature rise 85ºC). Discontinue test if temperature rise reaches 90º. If over 80º rise, check megohms to ground every 30 minutes and discontinue if less than 100.

To measure hot resistance, with the analyzer switch in the down position and the unit dial of the bridge on 5 ohms for 440 volt and 1 ohm for 220 volt motors, open the circuit switch and close rapidly toward the center of the board connecting the motor to the bridge. Allow about one-half second for the motor to stop, then push the bridge galvanometer button and move the tenth-ohm dial up from 0 till the galvanometer balances. If the dial is moved too far and then back to balance, the reading will not be correct. If another motor is already connected to the metering buss, you will be unable to balance the bridge and your reading will be in error. Allow 20 minutes for the motor to heat up again and take the reading over. After the balance is obtained, move the circuit switch back to the running position and then record the bridge reading under ohms on Test Sheet. Subtract the cable and switchboard resistance which is .15 ohm for standard cable.
The motor is entirely surrounded with water and cools very rapidly. All bridge readings for temperature must therefore be taken very rapidly, but practice taking them with so precise a movement that on every reading you can duplicate the exact timing between the opening of the circuit and the balance of the galvanometer. It is important that you learn to reach the balance in the same elapsed time on every bridge reading.

**TEMPERATURE RISE:**

4. At the end of this 2 hour run (4 hours total at 50 ft. head), take the ambient temperature and temperature rise of motor, proceeding as in #3 and recording data on Test Sheet.

**ELECTRICAL INPUT:**

5a. Check the setting of the throttle valve to make sure the readings of the pressure gage is still at 50 ft. head and record the output of the motor in GPM as indicated on the manometer gage (minimum 200 gpm). After another 2 hours (4 hours total run), take the electrical input at 50 head using the 25 amp analyzer circuit. Record kW and amps each phase (maximum unbalance - 5% or 4 amp on 440 volt motors). To do this, close the selector switch to 25 amp side. Move the circuit switch toward the center of the board connecting the motor to the metering buss and with the other hand close the analyzer switch in the up position. Change the circuit switch about 1/4 second in advance of closing the analyzer switch. Read and record the kW load, using the multiplier indicated by the table which is 20. Read and record the amps, each phase using the 25 amp scale. Transfer the motor back to the running buss, opening the analyzer switch about 1/4 second in advance of changing the circuit switch. By following this sequence the motor current will not be made or broken on the down contacts of the circuit switch which are used to connect the motor to the bridge. If these contacts become blistered by opening or closing the motor circuit, a high resistance will be interposed in the bridge circuit and the readings will be uncertain.

**STOP TIME**

Stop motor for examination and record time.

**RECORD SHUT-OFF AFTER 4 HOUR RUN:**

5b. PSI and head in feet

6. Physical inspection after 4 hour run.

**GROUND TEST - INSULATION Megohms:**

7. 50 megohms min.

**SEAL CHAMBER:**

8a. Remove the top plug from the seal chamber, rotate the pump, and drain the oil into a glass container. Record the amount of water present. (Less than a tablespoon) Empty oil into waste tray.

**MOTOR CHAMBER:**

8b. Remove both motor plugs to examine the motor chamber for moisture, solvent, or oil, and record findings. Pump having a very small amount of moisture in the motor chamber may be blown out with nitrogen or dry air. Do not accept pumps if there is sufficient water or oil in motor chamber to drip from the lower plug hole.
**PROCEDURE**

**DETURBO OIL:**
8c. Add 9 oz. clean 2135TH oil and record amount added.
   
   **BEWARE:** Failure to add this oil will result in destruction of seals and require complete rebuilding of pump.

**DIELECTRIC TEST:**
8d. Check final assembly of pump switch and pump for high voltage to ground. Apply 1000 plus twice the rated pump voltage to all cable leads (grouped) and hold the high voltage to ground for one minute.

Mechanical Balance per MIL-P-17454B & MIL-M17060B or MIL-M-17413A

9a. By hand - the mechanical balance of the pump shall be checked by “touch” during the four (4) hour test. If pump feels to vibrate excessively, it shall be tested by instrument to conform to requirements of Para. 9b.

9b. Dynamic balance by instrument - Place the pump on an elastic mounting (designed per MIL-M-17060 Para. 4.3.4.7.1 or MIL-M-17413A Para. 4.2.4.6) and test at no-load speed with a reliable vibration indicator. The max. allowable total amplitude is .001 and shall be measured on the bearing housing in the direction giving the max. amplitude with the motor running at rated voltage.