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BBSS: Electrolyser (Hydrogen Generator) Operations and Maintenance

NAURU

I. Purpose:

The purpose of this procedure is to document the Electrolyser operations and maintenance: startup, idle mode, shutdown, weekly maintenance, monthly check, oxygen test.

II. Cautions and Hazards:

None.

III. Requirements:

None.

IV. Procedure:

A. Electrolyser Startup:

See Attachment 1, Startup Form.

1. Turn ON isolator switch near U-van at the start of each day.
2. Check that fan is working.
3. Check that V2 (gasholder) is closed and V1 (vent) is open.
4. Check manometer fluid levels.
5. Check electrolyte level. **DO NOT LEAVE UNATTENDED WHILE FILLING.**
6. Top-up water seal. **DO NOT LEAVE UNATTENDED WHILE FILLING.**
7. Top-up header tank. **DO NOT LEAVE UNATTENDED WHILE FILLING.**
8. Top-up gasholder. **DO NOT LEAVE UNATTENDED WHILE FILLING.**
9. Turn ON rectifier.
10. Raise current to 100 amps.
11. Allow a few minutes of operation before carrying out the oxygen contamination test.
12. Equalize/zero oxygen tester.
13. Open sample valve V14.

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14. Read and record volts, amps, and pressure in storage and oxygen contamination (see Attachment 1).
15. If oxygen contamination is more than 1%, repeat the test.
16. If contamination is more than 1%, turn OFF rectifier and request technical assistance.
17. If oxygen contamination is less than 1%, proceed as follows:
 - CLOSE V1 (vent) THEN IMMEDIATELY OPEN V2 (gasholder).
 - OPEN V4 (compressor inlet).
 - OPEN V7 (compressor outlet).
18. Raise current to maximum (no more than 250 amp).

B. Idle Mode:

1. Verify that you have 100 psi.
2. Verify that current is about 30 amps.
3. Check voltage.
4. Check that gasholder is at the top of its allowable travel.

C. Electrolyser Shutdown:

1. Wait until the gasholder is nearly full (usually before leaving each day).
2. Turn current to zero.
3. CLOSE gasholder (V2).
4. OPEN vent (V1).
5. CLOSE compressor inlet and outlet valves (V4 & V7).
6. Turn OFF rectifier.
7. Turn OFF disconnect switch at the U-van.

D. Weekly Maintenance Check:

See Attachment 2, Weekly Form.

1. Start the Electrolyser.
2. Disconnect filter/saturator from aspirator assemble. Wash wool.
3. Close compressor outlet. Allow compressor to start. Check that the high-pressure cut-off switch stops compressor and puts electrolyser into idle mode. Write down pressure.

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4. Check that the gasholder lowest limit switch stops the compressor by using the spare ring magnet to trip the reed switch.
5. Check color change of ion-exchange filter; if half way, write down and request technical assistance.
6. Make sure rectifier is off. Use woolen duster to clean electrolyser.
7. Sweep out container.
8. With rectifier still off, check oil level of compressor. Should be a little more than half way on window.
9. Restart or shutdown Electrolyser as required.

E. Monthly Maintenance Check:

See Attachment 3, Monthly Form.

1. Start the Electrolyser.
2. Turn OFF rectifier when compressor starts.
3. Read inlet manometer (difference between two sides) and note time.
4. Mark position of gasholder.
5. Turn OFF isolating switch (near U-van).
6. Open electrical cabinet and check air filter.
7. After five minutes, check inlet manometer again. (Should not fall by more than 2.5). **SO NOT ALLOW THE MANOMETER FLUID TO FALL BELOW MINUS 3.0 IN BOTH TUBES.**
8. Check position of gasholder. (Should not fall at all).
9. Add water to manometers (only if needed) through hole at back. (Use syringe with plastic tubing filled with water from header tank).
10. Restart or shutdown Electrolyser as required.
11. Fax TWP copies of 1)Electrolyser Startup Form, 2)Electrolyser Weekly Form, and 3)Electrolyser Monthly Form.

F. Performing an Oxygen Test (Using Teledyne Tester)

This test to be performed at least once a day while the Electrolyser is on.

CAUTION! Do not use this instrument for testing when it is plugged in and charging.

1. Turn right hand (RANGE) switch to Battery Test. Pointer should rise to 9 or greater. If not, the set needs to be plugged into power to

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recharge overnight. A test can still be done as long as the pointer is greater than 6 but the analyzer should be recharged as soon as possible after performing the test.

2. Turn RANGE switch to 25% position.
3. Plug short plastic hose into either hole at the back of the analyzer.
4. Disconnect sample hose at the nozzle coming out of the Electrolyzer.
5. Plug other end into the other hole at the back of the analyzer, make sure the open end stays clear of the pipe coming out of the water seal (the one that is usually steaming).
6. Using slow regular pumps on the aspirator bulb the pointer should rise, usually to around the CAL mark on the red scale. The pointer will go up and down slightly with the pumping of the bulb, continue with slow regular pumps. After each pump wait a second and see where the pointer settles. The pointer should be adjusted during the rests between each pump to read exactly on the CAL line. To do this turn the lock/unlock (back section of the SPAN knob) anti-clockwise to unlock and adjust pointer position with the inner knob to CAL line.
7. When it rests on the line between each pump, turn the lock/unlock to lock.
8. The analyzer is ready to test the oxygen level. Now reconnect sample hose to the nozzle on the Electrolyzer and turn V14 to open.
9. Do not pump the bulb, the flow of gas coming from the sample nozzle will push hydrogen through the analyzer and the pointer will slowly fall. The pointer should fall to below 1 of the red numbered scale. Make sure you have read the correct scale. This is the one with the red numbers 0, 5, 10; up to 25.
10. If the pointer is below 1 (1%) the gas is good and can be run to the gasholder. Turn sample lever to closed.
11. Turn off the instrument and disconnect the hoses from the back of the analyzer (the one from the gas sample first and then the short hose)
12. **IMPORTANT.....MAKE SURE BOTH HOSES ARE DISCONNECTED AND THE ANALYZER IS TURNED OFF BEFORE LEAVING.**

V. References:

Australian BOM recommendations, C. Maxfield, A. Kovacs.

VI. Attachments:

1. Attachment 1, Electrolyser (Hydrogen Generator) Startup Form.

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2. Attachment 2, Electrolyser (Hydrogen Generator) Weekly Form.
3. Attachment 3, Electrolyser (Hydrogen Generator) Monthly Form.

