

## ***H<sub>2</sub> Generator Maintenance Report (RESET-11N)***

*by Colin Maxfield of Australian BOM*

### **Nauru Site (ARCS-2) 22 June – 27 June 2000**

On arrival in Nauru, the air cargo depot of Air Nauru was visited to determine if the replacement cell had arrived. Advice was given that due to the cancellation of four flights over the previous fortnight, there was no guarantee when the cell would arrive due to higher priority freight and foodstuffs. Air Nauru's Head Office in Melbourne was visited on my return and confirmed the advice given by their staff in Nauru.

#### ***Visual Inspection:***

- It was observed that cell 3 was leaking electrolyte from its front vertical weld seam.
- The sight tube of cell 2 was dripping electrolyte excessively.
- All sight tubes had become blackened and stiff from the PVC reaction with the electrolyte.
- All other areas of the electrolyser appeared to be satisfactory.

#### ***Maintenance Action:***

1. The first priority was to remove the leaking cell and ascertain the leak source. After cleaning off the paint it was observed that a small pinhole was present in the front plate vertical weld seam. Due to non arrival of the spare cell, the unit was completely emptied of electrolyte, washed thoroughly internally and transported to NPC (Nauru Phosphate Commission) to determine if they could brazed over the pinhole. This was duly completed on the same day and operationally was found to be satisfactory the following day
2. All sight tubes were changed to the original material and an improvement in performance is expected. The failure of these sight tubes was my fault as I obtained the incorrect roll of tubing when manufacture was undertaken. A new supply of material is being tested and more details are provided later in this report.
3. The specific gravity of each was tested and found to require adjustment. As no concentrated electrolyte was available, 15 litres was prepared using potassium hydroxide from site stocks. Correction to the electrolyte in each cell was undertaken.
4. Water seal completely dismantled, cleaned re-assembled.
5. Compressor head valve plate completely dismantled, cleaned, adjusted and re-assembled. Compressor oil drained and replaced, coalescing filter of compressor also replaced.
6. The electronic gas analyser was charged and calibrated.
7. Tested and reset electrical control systems.

8. Air filter replaced.
9. Integrity of air pressurization of the electrical cabinet undertaken, wind sail switch required a slight adjustment.
10. Tests performed on the electrolyser as detailed in the BoM three monthly schedule, results satisfactory.
11. All tests performed on the RBL as detailed in the BoM three monthly schedule, results obtained satisfactory.
12. Deficient items noted on the previous visit (February 2000) supplied.
13. Request R/23510 raised for issue of items (used during maintenance action) depleting Station Establishment.

***Sight Tubes:***

14. It has been found that the sight tubes, at stations using electrolyte manufactured from Electrolyser Corporation supplied KOH, deteriorates rapidly compared to Australian supplied KOH (Technical Grade). Previous suppliers of plastic tubing have guaranteed their product to be suitable for use with concentrated KOH up to a temperature of 55°C, however, field tests reveal that this is not the case.
15. Prior to my departure for Nauru, a sample length of "PVA" was obtained from a different supplier with a view to carrying out tests at Nauru. This sample was placed in a glass vessel containing concentrated KOH and positioned in direct sunlight to obtain maximum heat exposure. Nicholas was requested to monitor the situation on a monthly basis.
16. Simultaneously, a sight tube on the "test bed" electrolyser at the BoM Training Annex has been replaced with a PVA unit. Results of both tests should indicate its suitability for use, before the next planned maintenance visit.

***Empty Gas Cylinders:***

17. A considerable number of helium/hydrogen/nitrogen cylinders are being stored on site resulting from the initial installation requirements and the Nauru99 tests carried out last year. Those cylinders (especially BOC owned) that are empty, require to be returned to the supplier ASAP. Rental is being paid on these cylinders at the rate of approximately \$10 per month.
18. BOC owned cylinders that can be returned are detailed below:
  - 8 number 'G' size helium cylinders
  - 3 'G' size hydrogen cylinders, and
  - 4 number 'G' size nitrogen cylinders
19. In addition, there are 6 - 'G' and 6 - 'E' size BOC cylinders that contain helium on site.
20. 28 number empty helium cylinders, believed to be owned by USDoE (ex US Bureau of Mines) and filled by Air Liquide (Melbourne) for the Nauru99 tests are also on site. In addition, 13 number full cylinders are also being held. The action of returning /storing these is questionable. A considerable number are very badly

corroded and it is my opinion that they probably would not meet Australian Standards for pressure testing and re-filling.

***Further Action:***

21. Ascertain the expected arrival date of the replacement cell in Nauru.
22. In conjunction with Nicholas and tests at the BoM Training Annex, determine the suitability in using PVA tubing in the manufacture of the sight tubes.
23. USDoE to determine the action required in disposing/ returning the commercial gas cylinders on site.