

**AUSTRALIAN NATIONAL UNIVERSITY
DEPARTMENT OF NUCLEAR PHYSICS
14 UD TANK OPENING REPORT # 104**

4th to 10th August 2006

A.K.COOPER D.C.WEISSER

REASON FOR TANK OPENING

- The HE Mid Section upgrade in June (TOR 102, 103) had immediately been found to have major weaknesses in spark protection. Further, the decision to run the Terminal and the Mid Section on the same fibre optic link was flawed in that loss of control of the Mid Section led to partial loss in the Terminal.
- The tasks to be tackled this opening include substantial improvement to Mid Section spark protection and the separation of the fibre optic links to the Terminal and Mid Section.

PUMP OUT 3-08-06

- Pump out tank, open doors and start ventilation system.
- The ventilation system ran overnight.

SUMMARY OF WORK 4-08-06 to 10-08-06

- The Oxygen monitor was used to check the atmosphere within the tank prior to entry.
- The service platform and equipment were deployed.
- After purging air through the tank overnight, the platform was deployed.
- Initial inspection found Unit 19 to have a resistor lead missing from the pair of resistors on Gap 4 post D. It was later found in the bottom of the tank.
- Unit 5, Tube 1, Gap 5 had a burnt resistor lead and the post C to tube 1 stringer was loose at the post.
- The new PFA tube, for the second fibre, was installed between the mid section and the bottom of the tank.

7-08-06

- The damaged resistors assemblies were removed from Unit 19.
- The new PFA tube between the terminal and the mid section was installed.
- The counter box and the Group 3 box were taken outside the tank for modification.
- The new fibre feed through was leak tested.
- The new Pi filter fitting was completed outside the tank.

8-08-06

- The new fibre feed through was fitted to the tank wall.
- The two resistors from unit 19 were found to be OK and were reinstalled with new sockets.
- The terminal stripper assembly was removed.

9-08-06

- The terminal stripper assembly was reinstalled.
- The fibre optic terminations were completed and the terminal was closed.
- The PFA tube was bent into the required "zig zag" shape at each casting and the column units were closed.
- The counter box, new Dell supply box and their conduits were reinstalled ready for wire termination.

10-08-06

- The Group 3 box was reinstalled and the conduit ends terminated.
- The modified fibre support post, in the bottom of the machine, was reinstalled and the fibre in and fibre out positions noted.
- Testing of all functions found both the terminal and mid section to be working correctly.
- The machine was cleaned, the usual charge and metering tests done and the machine was closed.

MID SECTION

Ideally the mid section should be of similar spark protective standard to that of the Terminal. That goal, even if at all possible, would have required much more time for planning and preparation, than the eight weeks allowed.

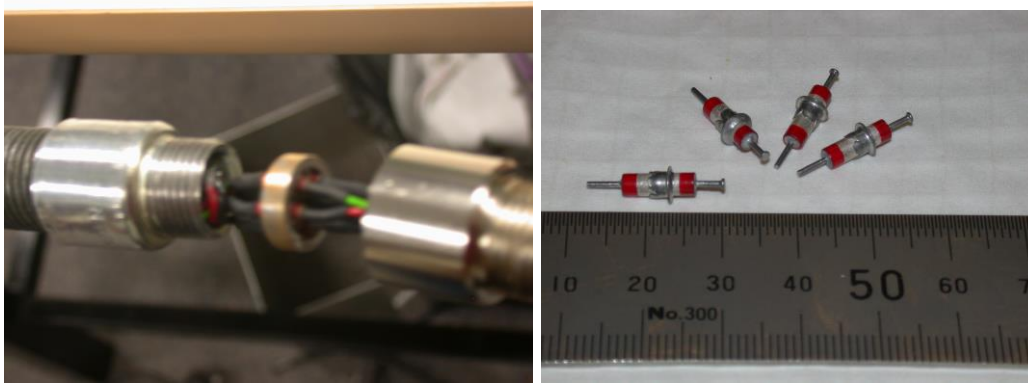
The modifications undertaken were very much viewed as an achievable expedient rather than the final set of solutions. Operational experience will dictate if and what further modifications will be undertaken in the future. The most important alteration was seen to be the transfer of the Dell suppressor power supply, and it's associated resistor chain, from the outer box, which housed the shield box for the Group 3, to its own separate box. This action removes the direct electrical path between the inside of the accelerator tube, where the suppressor may act as an aerial to spark energy, and the space occupied by the Group 3 inner box.

The next important step was to install separate fibre optic loops for the HE Midsection and Terminal. This allows independent operation of the Terminal and the Midsection. Therefore, if the Midsection failed and second stripping became unavailable, at least some experimental capacity would be available until the tank could be conveniently opened.

The new four-fibre tank wall feed through was fitted, after some problems with bolt PCD, and the fibre support column was modified and reinstalled.



FEED THROUGH FLANGE SUPPORT LEG



PI FILTERS SOLDERED INTO BULKHEAD FITTING

The fibres are run inside ¼" diameter PFA tube for mechanical protection.

The tubes are installed so that a change of direction, "Zig Zag", occurs every 500mm. The change of direction ensures that the fibre contacts the tube wall and the tube contacts the metal surround. This minimises voltage differences building up between the fibre and the tubing thus reduces the chance of sparking to the fibres.

Pi filters were installed on the readback and AC wires between the new Suppressor power supply box and the Group 3 outer box. These filters were incorporated into the bulkhead fittings of the shielding conduit.

Thirdly, the coaxes and AC wiring were replaced with shielded twisted pairs with the shield grounded at one end. The connection of the nominal neutral leg of the AC to ground was also removed. The power and read back shielded wiring were placed in the same conduit to eliminate the separate conduits forming an inductive loop. Using shielded, twisted pair cables plus a capacitor on the sensing end of the signal pair, reduced the hum pick up to an acceptably low level.

RECORDS - Note that the LE Shaft meter remains faulty, second digit did not roll over 55000

Machine meter hours as of 5- 08-06.

Chain #1, 41699. Chain #2, 41577. Chain #3, 41610.

LE Shaft, 55266. HE Shaft, 56503

Actual running time for each chain 1-12-05 to 2-06-06 was

Chain #1, 1873. Chain #2, 1759. Chain #3, 1780.

INITIAL PERFORMANCE

The machine ran up to 15.3 MV with little conditioning.

Subsequently, there have been 29 sparks at greater than 14.5MV, as of September 25th, requiring only 3 reboots.

The Mid Section has lost only readback with no loss of control functions whilst the Terminal has not been affected at all.