AUSTRALIAN NATIONAL UNIVERSITY

DEPARTMENT OF NUCLEAR PHYSICS

14 UD TANK OPENING REPORT # 107

4th to 8th April 2008

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REASON FOR TANK OPENING

The machine began sparking and was not useable at the terminal voltages required by the experimental program.
Shorting rods were used to isolate the offending units, 1 and 2, and then the machine was opened.
Locating and fixing the breakdown was the first priority, however, it was still planned to run all the routine inspections and tests required of a maintenance opening.
Since TO 106 the operational status of the terminal Ion Pumps was unclear so, it was planned to also investigate this problem.

PUMP OUT 3 and 4-04-08

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

- The ventilation system was run for only 1.5 hours before the Oxygen monitor was used to check the atmosphere within the tank prior to entry. Although work on the fail-safe platform motion stop had commenced it was not ready for service.

SUMMARY OF WORK 4-04-08 to 8-04-08

4-04-08

- The HV tester was used to check the column gaps and, sure enough, a failed resistor between Unit 1 and Unit 2 was found immediately. It was one of a

pair across Gap 8, Tube 4, Unit 1. The resistor was changed and the opening was then managed according to usual procedures.

- Further inspection found the machine to be clean, particularly dust free, but with some oil film in the HE end.

7-04-08

- Mechanical and electrical tests were performed. The shafts sounded fine.
- The chains and charging motors were serviceable.
- Resistor leads were visually found to be satisfactory.
- No further faults were found during the 30 kV column gap test.
- The column was wiped using RBS and water.
- The terminal was opened to check the Ion Pump supplies and cables.
- The terminal and mid section were Helium leak chased.
- The terminal was cleaned and closed.
- The column was blown down and stringers in Unit 16, Tube 3 and Unit 18, Tube 2 were found to be loose and were tightened.

8-04-08

- The bottom of the machine was cleaned and the HE inductors were cleaned and set.
- The column was wiped down using RBS and water.
- The HV gap test found no problems.
- Charging, metering and terminal tests were performed.
- The doors were closed and the machine was evacuated overnight.

TERMINAL ION PUMPS

The terminal Ion Pump power cables were disconnected from the supplies and checked to ground using a multimeter. The upper pump read 75 ohms to ground while the lower pump was open circuit.

The HV tester was then used and both pumps were found to be shorted to ground. It was assumed that the pumps had flakes of conducting material across the elements. Whacking the pumps with a soft but heavy hammer caused temporary removal of the short circuit but the shorts recurred with the application of high voltage. This supports the conclusion that the pumps were flaky.

These pumps were installed during the gas stripper installation (TOR 81) and have functioned well beyond expected service life.

Parts have been ordered for reconditioning these pumps. The maker's name for the pumps is Physical Electronics and they appear the same as Perkin Elmer

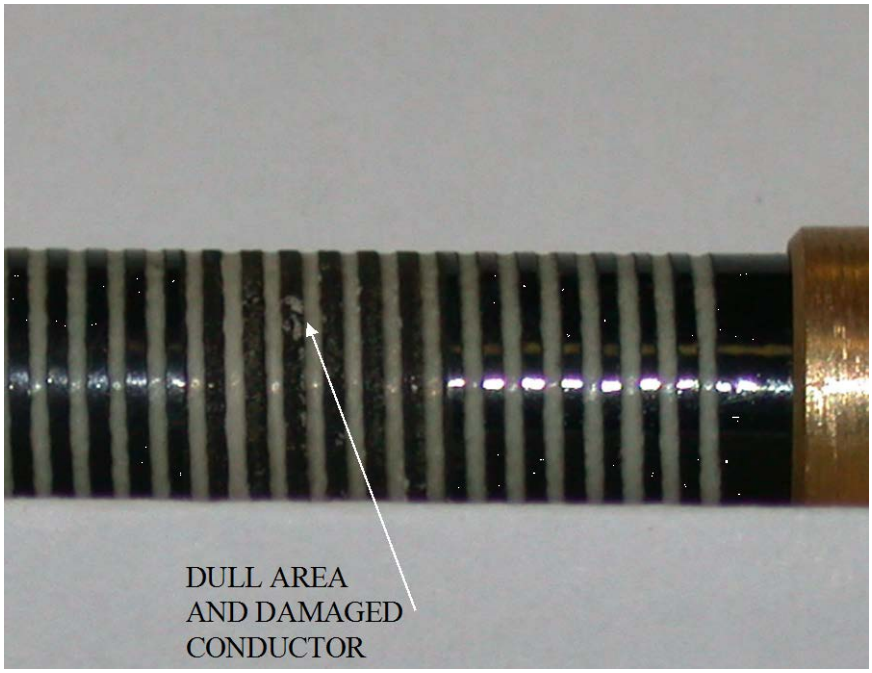
pumps. They are now supported by GammaVacuum (http://www.gammavacuum.com/)

TUBE RESISTOR

The failed tube resistor had a small chip in the conductor path. Chipping is an often seen consequence of the grinding process used in creating the insulating path on the resistive coating. This suggests that this failure is likely due to the manufacturing process perhaps exacerbated by electric stress during the 20 years of operation.

The area of the break had a dull appearance that went around the entire diameter. The area of damage was found to be adjacent to the internal transition from shield to housing. The reduction in internal diameter here, even though it is radiused, enhances the field thus reducing resistance to breakdown.

Subsequent sparking across this gap had eroded the glossy finish and finally severed the conductor.



INITIAL PERFORMANCE

The machine ran up to 14 MV with no problems.
Shorting rods were put in for AMS.
The machine sparked and soon after it was realised that the charging system was breaking down at 16 kV. The machine was opened to investigate the cause.