AUSTRALIAN NATIONAL UNIVERSITY

DEPARTMENT OF NUCLEAR PHYSICS

14 UD TANK OPENING REPORT # 106

4th to 8th February 2008

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REASON FOR TANK OPENING

The gas stripper Oxygen cylinder pressure was too low so the machine was opened primarily for gas replenishment. Terminal foils, whilst not prompting the opening, would not have lasted to the next scheduled opening so these too were replenished.
Three days were allowed so that all the usual tests and checks could be performed but had anything untoward been found then the opening would have been extended as required.

- Refill Gas Stripper Oxygen cylinder.
- Replenish terminal stripper foils.
- Investigate the reason for recent tank sparks.
- Inspect the black pulley tires on Chain #1.
- Full inspection of mechanical systems and column electrical components. Note to check URS bearing in Unit 5.
- Inspect Triode needles.

PUMP OUT 4-02-08

- Pump out tank, open doors and start ventilation system.
  Justin and Tom deployed the platform unassisted for the first time.
- The ventilation system ran overnight.

SUMMARY OF WORK 5-02-08 to 7-02-08

- The Oxygen monitor was used to check the atmosphere within the tank prior to entry.
- After purging air through the tank overnight, the platform was deployed.

The fail-safe platform motion stop was again found to defective and was removed for service. No real surprise there, as it was defective last opening and the repair had been forgotten.

5-02-08

- Initial inspection found the machine to be clean, particularly dust free, but with some oil film in the HE end.
- Mechanical and electrical tests were performed. The shafts sounded fine, even in Unit 5.
- Chain #1 was quite but had an oscillation of up to 25mm.
- Chain #2 sounds good but a bit of clacking on the idlers.
- Chain #3 sounded good.
- Resistor leads were visually found to be satisfactory.
- No faults were found during the 30 kV column gap test.
- The column was wiped using RBS and water.
- The terminal was opened and the Foil Changer was removed. (On foil position 999).
- He Mid Section was opened and the Foil Changer was removed.
- It was noticed that almost all the Triode needles were completely melted off. There were 57 spark marks on the terminal spinning opposite the Triode.

6-02-08

- The HE inductors were cleaned and setting checked.
- The black residue was wiped from Chain #1.
- The oilers were refilled and all charging system wires were checked.
- The Terminal control box was accessed to check the operation of the Gas Stripper solenoid.
- Refitted the second stripper Foil Changer.
- The Triode assembly was tested for breakdown to ground using the 30 kV HV tester.
- The terminal Foil Changer was reinstalled.
- The Triode needles were replaced
- The Gas Stripper Oxygen bottle was removed and refilled to 3.4 PSIG using Linac Digital Pressure Gauge.

7-02-08

- The Oxygen bottle was reinstalled and the pipe work was evacuated using the
  Mini Vacsorb connected between the fine valve and the turbo backing line.
  The solenoid and fine valves were open during the pump down.
  David Anderson checked operation of the fine valve and all was found to be OK.
- The terminal was cleaned, inductors checked, blown out with air and closed.
- The column was blown with high-pressure air.
- Loose stringer at the top, column side, of Unit 17 was tightened.

- Loose stringer rivets at the bottom of Unit 25 were reset.
- The column was wiped down with RBS and water. All spark marks were smoothed.
- The HV spark gap test revealed no problems.

TRIODE NEEDLES
Four of the Triode needles were melted off and had become a blob of solidified metal almost flush with the mount plate. The remaining needles were very blunt.

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This is the first time needles had becomeso severely damaged. Usually they erode away fairly uniformly and becoming blunt.

The melted points are due to tank sparks initiated by discharges between the sagging 1/8" rod connecting the needles to the vacuum tube and the hollow cylinder containing the rod in the SF6 space. There were 57 new spark marks on the terminal opposite the needles.

The assembly was dismantled and reassembled with the correct engagement of the 1/8" rod and the triode needle mushroom. The 1/8" rod was retightened sufficiently to ensure it was straight and therefore more concentric with the tubular housing.

GAS STRIPPER
The gas cylinder pressure had dropped to a point that prevented stripper operation. The cylinder was removed, evacuated and backfilled with welding grade oxygen to a pressure of 3.4 PSIG. The Digital Pressure gauge from the Linac was borrowed for this job.

The cylinder was reinstalled and all plumbing was evacuated between the tube isolation valve and the fine valve. The solenoid valve and the fine valve were then operated during tests and, whilst impedances would have restricted the

base pressure beyond, it was thought that any residual gasses would not unduly effect operations.

TERMINAL FOILS

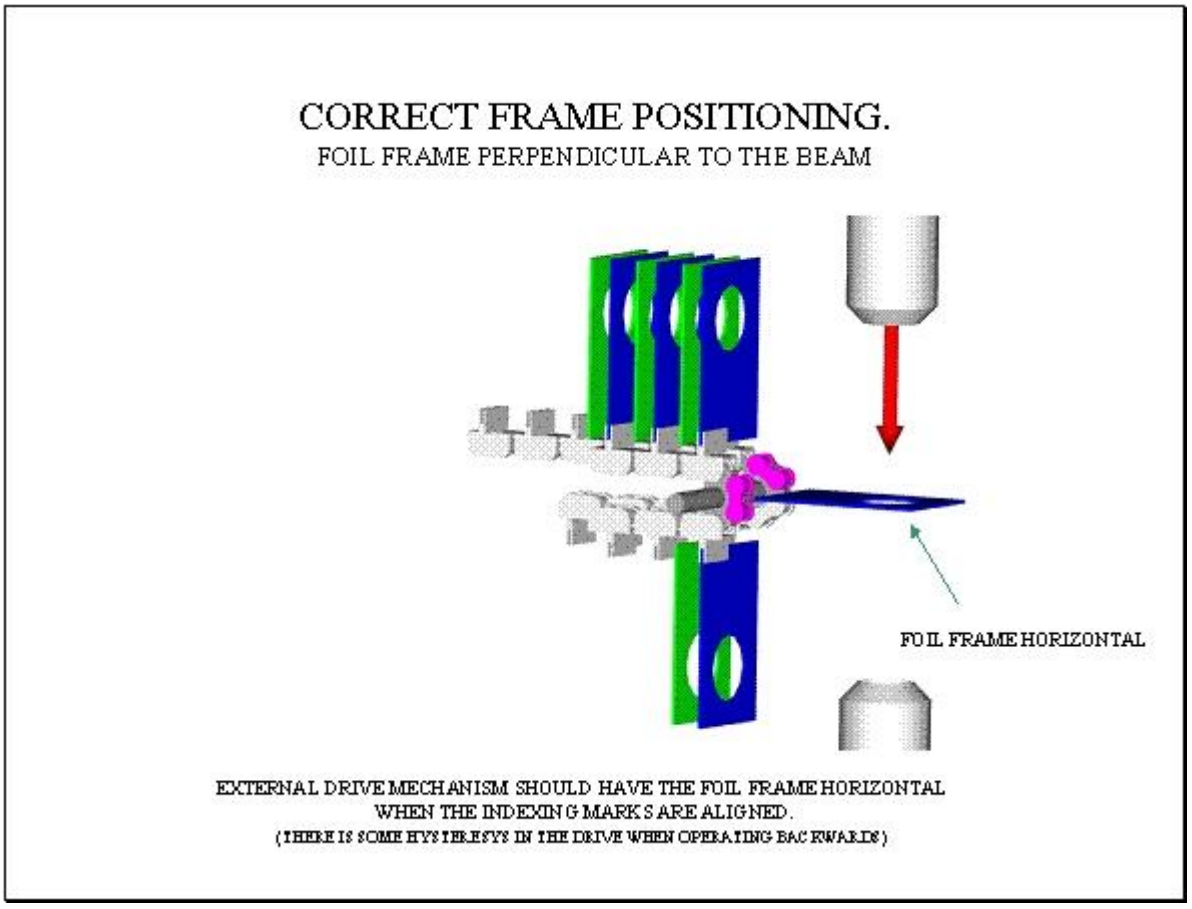

Diagram by Alistair Muirhead

The above diagram shows the correct position of the foil frames in relation to the external indexing marks of coloured masking tape on the drive pulley/body. Note the position of the joining links, shown here in purple for clarity. They do not support frame clips.

The terminal and mid section foil changers were loaded as per foil log, "FOILED 18" 8th February 2008.

MID SECTION SECOND STRIPPER

The second stripper had been thought to be behaving as if the foil frames had not fully cleared the beam path. The stripper was removed to check foil frame position versus the indexing marks and to repopulate with foils as necessary. The foil changer was set up on the bench and it was found that the indexation was indeed off by approximately 8 mm at the marks. This resulted in the foil

frame being about 30-40 deg off horizontal so the outer edge of the foil frame would possibly have been hit by a small portion of the beam. The indexation was rectified and the unit was reinstalled with a full load of foils.
RECORDS

Machine meter hours as of 18- 03-08.
Chain #1, 4543. Chain #2, 4543. Chain #3, 4543.
LE Shaft, 8315. HE Shaft, 8315 Charge volts, 5140

SERVICE PLATFORM SAFETY STOP UNIT

This pair of photocells, one above and one below the platform, monitor the entry port portion of the platform such that movement of the platform is stopped if something breaks the light beam. If a person were hanging through a tank port then the unit would prevent the platform from striking him. The unit requires repair or replacement and this will be done before the next opening.

INITIAL PERFORMANCE

The accelerator tube vacuum took much longer to recover than usual, a week instead of a couple of days and remained in the mid 10^{-7} torr range. The HE pressure did not recover to the normal 2-4x10^{-8} torr but stuck at 6x10^{-8} torr even after weeks and this improvement was associated with substantial tube conditioning. In the past, following having the tube open, conditioning to >15 MV would take only a few days and not require subsection conditioning. That was not the case this time. The HE tube started conditioning at only 8.8 MV instead of the ususal 12 MV and continued with unusual vigour, through subsection conditioning. The machine is finally running at 14.4 MV.

The possibility of an SF6 leak into the tube could not be directly eliminated because our residual gas analyser was not operational. We took as evidence that there was no leak, the fact that the pressure eventually improved though not to the historic value. A possibly related problem is that the two 60 l/s ion pumps in the terminal both read short-circuit current corresponding to a pressure of 2x10^{-6} torr even though pumps in adjacent volumes, separated from the 60 l/s pumps by impedences, read in the 10^{-7} to 10^{-8} torr range. At this stage, it is not clear if the high-pressure readings of the 60 l/s pumps are real or instrumental. If real, it could be related to the higher than normal pressure in the HE tube. Only a tank opening will resolve this.