

AUSTRALIAN NATIONAL UNIVERSITY
DEPARTMENT OF NUCLEAR PHYSICS
14 UD TANK OPENING REPORT # 102
8th to 24th June 2006

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REASON FOR TANK OPENING

The main reason for the tank opening was the installation of computer control in the HE mid section, at the location of the second stripper. Other tasks included Terminal Stripper Foil renewal, Column Post replacement, checking the new black tyres on Chain #1 and the usual machinery and electrical tests.

PUMP OUT 7-06-06

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

SUMMARY OF WORK 8-06-06 to 23-06-06

- The Oxygen monitor was used to check the atmosphere within the tank prior to entry.
- The service platform and equipment were deployed.
- Initial inspection revealed black dust around chains # 1 and 2.
- Chain #1 had black marks on each link that align with the two halves of the nylon pulley running surface.
- No problems were evident during HV electrical testing of the spark gaps.
- The LE shaft was found to be OK and the HE shaft had a noisy bearing in Unit 17.
- Chain #1 was found to have an oscillation of about 15mm in Units 24 and 25.

- Chains #2 and 3 ran very smoothly.
- The charging volts were run up and all was found to be OK.
- The column was wiped down with water and RBS.
- The column was very dirty around Chain #1.
- The HE mid section was opened and it was noticed that the new shorting wire loops, fitted last opening, were still in excellent condition.

The new control box was trial fitted into position to check clearances and attachment issues. Modification of the tubular spark shield, that connects the box to the tube, was required and this was commenced in the workshop. The terminal stripper foil changer was removed for repopulation and it was noted to be on foil #180

- The old second stripper drive, HE mid section ion pump box and all associated parts were stripped out.

9-06-06

- The terminal stripper foil changer was replenished and reinstalled.
- The noisy shaft bearings in casting of Unit #17 were replaced.
- The mid section ion pump box, which also houses the mechanical foil position readout, was modified to improve EMI/RF protection. The new ion pump power supply and resistor set were installed in the box.

13-06-06

- Refurbished posts were installed in Unit #4 using 0.4mm thick shims.
- The ion gauge was removed from the tube beneath the tank to investigate problems with tube vacuum readings.

14-06-06

- The new Group 3 and suppressor power supply box was again trial-fitted with the new tubular spark shield and all was found to be OK.
- Since Chain #1 had been mechanically unstable during tests the idlers were checked. The down side idlers in Unit #19 were found to allow approximately 3mm lateral movement of the chain. The idlers were adjusted to usual clearances of 0.5 to 1 mm.
- Fitting the new electric drive motor bracket to the second stripper body required that 3 end flange bolts be removed. It was thought that this could be done whilst the unit was still under vacuum but loosening the first bolt caused a vacuum reading excursion of several ranges accompanied by a similar blood pressure excursion.

- The HE tube was fully vented in order to check if any second stripper foils had been broken and to fit the bracket.
- Unfortunately, the venting was a mess because the HE tube isolation valve shut without being noticed. The end result, after much anguish and embarrassment, was that the HE was subjected to much more turbulence than normal which could decondition the tube.
- The used second stripper foils were replaced.
- Unit #4, the location of the refurbished posts, was re-ringed using 0.417" long screws.

15-06-06

- The second stripper electric drive motor mount was fitted and the output drive sprocket details finalised.
- The motor and countershaft were fitted for keeps.

16-06-06

- The tank crew met for breakfast and readied for a big day.
The new fibre optics junction box was mounted on the mid section deck support posts.
- The modified ion pump/foil counter box and the Group 3 box were refitted and the conduits terminated. The wiring was then installed.
- Modified fibres were run ready for termination.
- The old HE stripper pneumatic lines were removed.

19-06-06

- The optical fibres were terminated and polished.
- The wiring of the whole mid section installation was terminated and tested.

20-06-06

The ¼" thick aluminium deck was modified and refitted above the new installation.

- Chains #2 and 3 were cleaned.

21-06-06

- The HE end of the column was cleaned and re-ringed. The oiler was removed from Chain #1. We meant to do it last time.
- The HE Mid section ion pump Dell power supply was found to be faulty. It probably had been this way for some time. The box was removed and the supply changed.

- The terminal was cleaned and closed and casting covers refitted.

22-06-06

- The shafts had been run overnight and it was thought that the bearings in Unit 21 were a bit noisy and it was decided to replace them.
- The inductors in the bottom of the machine were cleaned and adjusted.
- The corona needles were replaced.
- The remaining two oilers were topped up.
- Unit #18 was found to have a loose stringer on the tube end.
- Unit #15, Tube 4, Gap1 was found to have a burnt lead and banana socket.
- The column was blown down with air, wiped with RBS and water and the HV gap test done.
- Charging tests were performed and the machine closed.

23-06-06

- During gassing up, the volts were run up with only 25 psia of SF6 and, unsurprisingly, the machine sparked at 6.5 MV. It was a stupid mistake to run up to that voltage with so little SF6 in the machine. The safe operating voltage at 25 psia is 3.5 MV!!
- It was subsequently noticed that control of the second stripper was lost. This was attributed to the effect of the pressure. It was decided to re-open the machine and the pump out began immediately. (TOR 103)

CHAIN #1

There was a light dusting of black powder around Chains #1 and 2.

Chain #1 appeared dry and was dry to touch. Remember, chain #1 has the new black nylon anti-static tyres.

The pellets of Chain #1 had a residue like black stain that aligned to the area of contact with the pulley. The deposit was easily removed by wiping with an acetone-moistened rag.

Chain #1 had not been de-oiled when the black pulleys were installed so there would have been an oil residue present for a period of time.



The small amount of dust generated during operation, initially while oil was present, would have become trapped in the oil forming a slurry that would have dried over time. It was concluded that the black deposit found on the pellets had developed while the oil on the chain was drying, whereas, the dust was generated after drying, and not trapped in oil.

BLACK DEPOSITS

This was the dust found lying about the areas of chains 1 and 2. Since the amount of dust was modest, particularly in light of the 1873 hours run, it was decided to run on without oil and further test operation with the oil free black pulleys.

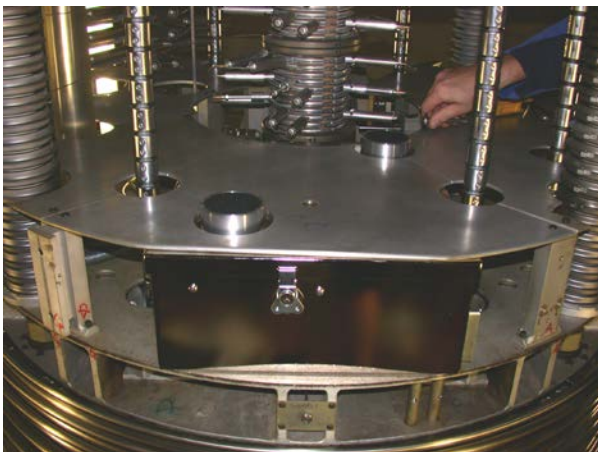
SECOND STRIPPER

The second stripper upgrade commenced as soon as preliminaries were done with.

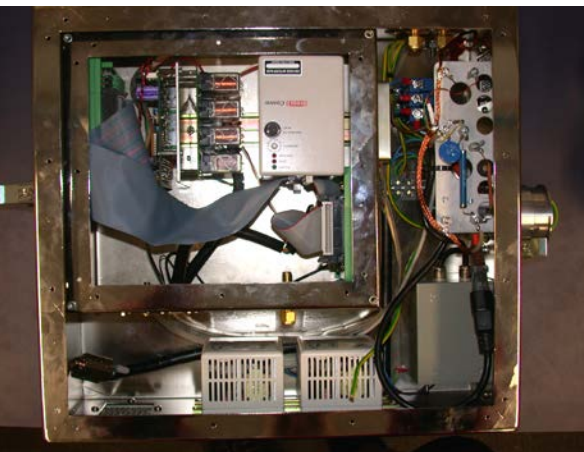
Early checks found that preparations were adequate to allow full commitment to removing the redundant equipment without regard to ever putting it back in.

The die was cast so to speak.

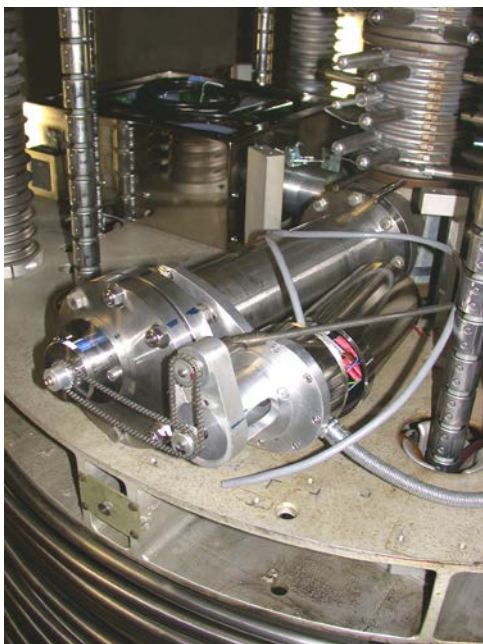
Other maintenance tasks were fitted in around the priorities of checking, making and fitting of the many different aspects of the second stripper upgrade.



INSTALLED



OPEN



The tasks involved, fitting a new enclosure containing the Group 3 gear and the suppressor supply. Modifying the existing ion pump supply enclosure to better withstand EMI/RF energy.

Fitting the new drive motor assembly to the stripper body.
Routing all wiring and fibre optic conductors, including modifications where necessary.

NEW DRIVE MOTOR

POSTS

Refurbished column posts were fitted to Unit #4.

The posts required 0.4mm shims.

Post#	Position
317	A
224	B
344	C
297	D

TERMINAL FOIL CHANGER

The foil changer was reloaded with a mix of foils as follows.

The first 100 are Ablation foils to cater for high intensity Au running. Then, #101 blank, 13 ANU, 5 Ablation.

#120 blank, 14 ANU, 5 Ablation. This 19-item group repeats after each blank at; #140 blank, #60 ...#80 and so on up to 280 in total.

SHAFT BEARINGS

Units # 17, 21 had new bearing sets installed.

Both these sets were replaced during TO 94 and have accumulated 18,525 hours of use.

Interestingly, there are 15 sets still running at over 55000 hours. These were fitted in November 1995 and that was the last time the whole inventory was replaced at one opening. Since then, bearings that sound a little noisier than the general population are replaced at each tank opening.

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

Machine meter hours as of 2- 06-06.

Chain #1, 41512. Chain #2, 41390. Chain #3, 41424.
LE Shaft, 56216. HE Shaft, 55168

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

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

SF6 INVENTORY

ANU GREEN monitors all potential sources of SF6 emissions and the Department has been requested to furnish records of its SF6 inventory. The 6 month, or at each opening, average mass of SF6 based on monthly temperature and pressure readings, will be recorded in each TOR along with the calculated loss.

SF6 in the system 31-05-06 21300 Kg.
Loss 25 Kg +- 50 Kg

SPARE PARTS

The following spares need to be ordered;
4 Black Pulley rims.
Shimstock contact bands

INITIAL PERFORMANCE

The machine was pumped out because of a spark induced control failure. The machine was opened Saturday 24th for (TOR103).