**AUSTRALIAN NATIONAL UNIVERSITY**
**DEPARTMENT OF NUCLEAR PHYSICS**
**14UD TANK OPENING REPORT NO 70**

**3 SEPTEMBER – 18 SEPTEMBER 1989**

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## Preamble

The 14UD ran very well following the last opening, going to 13MV without any sparking, and with a little conditioning, experimenters were able to run at 14.5MV.

With the mandatory spark at 8 am and 5 pm, the 14UD was running faultlessly until an unscheduled spark at 14.46 MV. This triggered a tube vacuum failure in the LE end, the pressure going to $4 \times 10^{-4}$ torr whilst the HE went to $4 \times 10^{-7}$. Tests that were carried to pinpoint the leak were:

1. Run the lower shaft only. This made the HE pressure go from $8 \times 10^{-7}$ torr to $2 \times 10^{-8}$ torr. We are only able to use the HE ion gauge because the LE pressure is too poor to run LE gauge.

2. Upper Shaft running only HE pressure went to $1.3 \times 10^{-6}$.

3. Running the midsection sublimer pump made the HE pressure worse.

We expect to find a leak in the near vicinity of LE midsection , opening up due to vibration caused by running LE shaft. This makes the midsection sublimer pump pellet outgas due to the $SF_6$ getting into the system. Hence the large pressure rise when sublimer pump is run.

A scan with the residual gas analyser shows a large peak at mass 128. 124 hours running time has elapsed since 14UD was closed on 1 September 1989.

## Tank Open 12 September

With a helium leak head installed at the LE pumping station on top of the 14UD tank, we went straight to the midsection and started leak chasing. It took a few minutes to find the leak on a tube to flange weld, that carries the 10 ℓ/sec ion pump. See diagram at end of report.

We suspect the leak came about because of the vibration in the midsection associated with the midsection alternator, plus the fact no pump support bracket had been installed during the tube upgrade in 1988.

## Removing LE Midsection Tube Manifold

To accommodate the tube lifting device, resistors in two tube sections were removed above the LE midsection. The spreaders on the bellows sitting on top of the LE tube were released to allow the tube to be lifted up for the removal of the midsection tube pump manifold.

With the tube clear of the top of the manifold, we removed all screw studs. This allowed us to move the manifold to one side, rotate it 90°, and withdraw it between the midsection castings. The 10 ℓ/sec ion pump body was left on the manifold during the manifold's removal.

One improvement we made for the re-installation of the manifold, was to cut screw driver slots in all removed screw studs, saving our fingers a lot of awkward twiddling

## Repair and Installation

The cracked weld was re-run on the inside of the flange and leak chased. With its clean bill of health, the installation was as follows:

1. With ion pump attached, the manifold was put into the midsection with its axis horizontal and then rotated 90° to allow it to sit on the LE tube.

2. Put V-electrode in the bottom of the tube above manifold.

3. With gaskets taped to lifting ring, use centering jig to place it on top of manifold.

4. Lift manifold with centering jig attached and engage top tube section, then bolt joint up.

5. The same technique was used to position the bottom lifting ring as for the top.

6. The top tube sections were lowered allowing the centering jig to locate on the common flanges. A small sigh of relief could be heard after bolting the flanges together.

Our biggest sigh of relief came after leak chasing and our certificate of vacuum worthiness was given.

We are pleased to say that eventually we do learn from our mistakes and in this case, we supported the 10 l/sec ion pump from the manifold itself. This overcomes any vibration that may be introduced into the casting, and be transmitted via a bracket to the pump.

We heater taped two tube sections above and one below the LE midsection, in conjunction with the sublimer pump bakeout.

All vacuum joints that were opened have been re-torqued and a final leak chase done.

In keeping with our motto of improving on improvements, a new shielded 10 L/sec ion pump cable was made and fitted by the older author.

**Chains**

Two links were taken out of chain number 1. We removed the charred bodies of the resistors from the chain pick offs.

**Sublimers**

We took the opportunity of the tube being vented to service the HE sublimers. This involved new sublimer pellets and wire brushing the inside of the pump body.

After tightening up a loose grub screw on the midsection current indicating potentiometer, we checked the calibration of the pump.

| Meter | Current |
|---|---|
| 10 | |
| 7 | 44 amps |
| 6.5 | 33 amps |
| 6 | 30 amps |

**Cleaning**

Chamois and water, plus RBS was used to wipe down the column after being blown down with nitrogen.

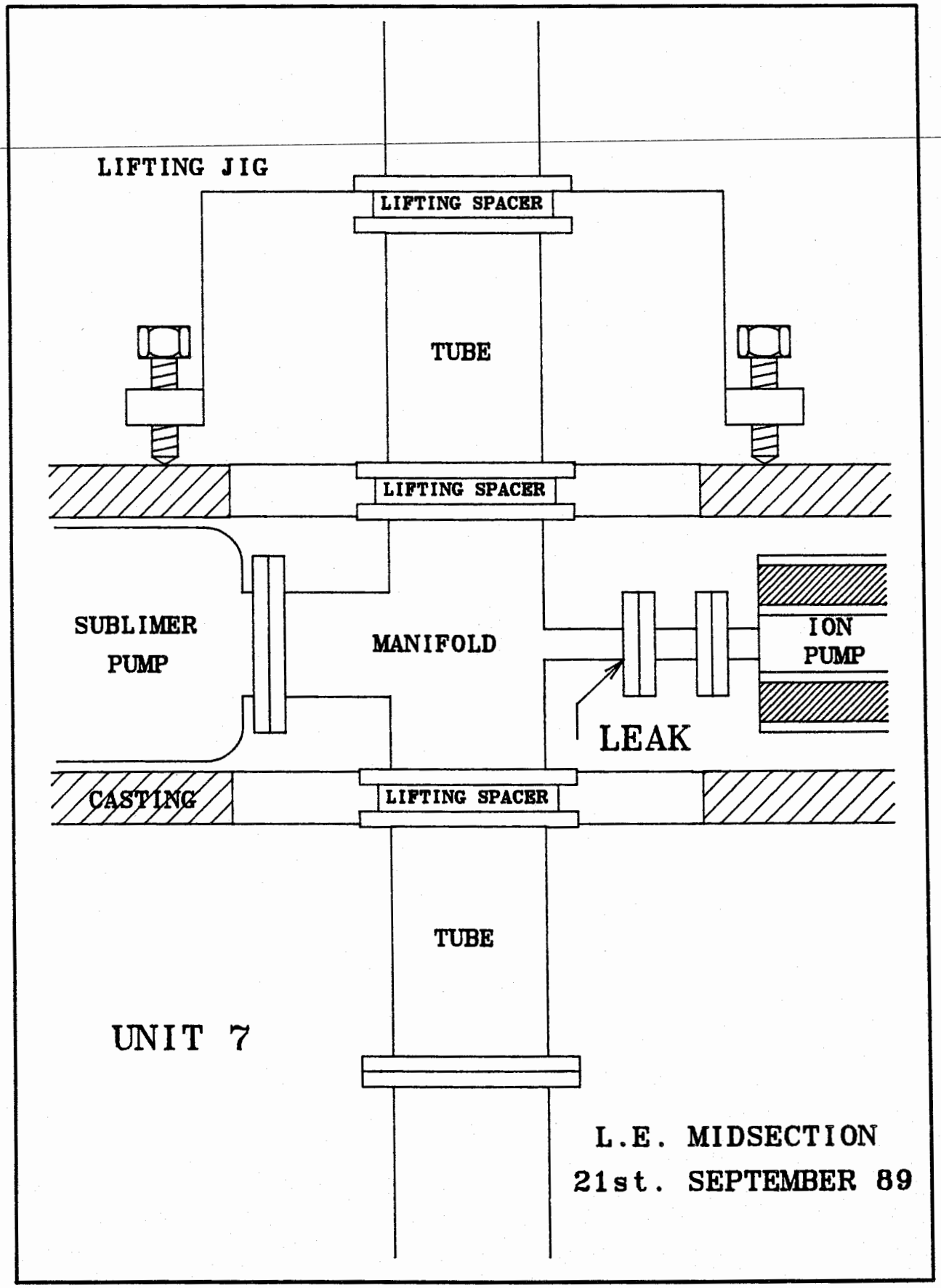
**Tube Vacuum Test**

The 14UD tank was evacuated and tube pressures were as follows:

| | Tank PSIA | HE TORR | LE TORR |
|---|---|---|---|
| Tank evacuated | 0.7 | $4.7 \times 10^{-8}$ | $7.6 \times 10^{-8}$ |
| Tank vented | 13.8 | $5.0 \times 10^{-8}$ | $8.8 \times 10^{-8}$ |

The tank was evacuated again and filled with $SF_6$ to 86 psia. Whilst $SF_6$ is going into the 14UD tank, we monitored the tube vacuum at the LE end with the residual gas analyser. No sign of SF peaks nor air peaks found.

Phew!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