

**AUSTRALIAN NATIONAL UNIVERSITY
DEPARTMENT OF NUCLEAR PHYSICS
14UD TANK OPENING REPORT NO 68**

24 July - 3 Aug 1989

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Reason for Tank Opening

Broken nylon shorting rod stud.

Preamble

The 14UD was closed 30 June 89. It soon ran at 14.4MV but a spark after 22 hours, initiated a "silent spark" condition, that is, the terminal drops approx 4MV and resistor currents drop but no other indications are seen. After another spark, glitches appeared on the NMR trace. After much shorting rod shuffling, the 14UD ran quietly with Unit 27 shorted.

Following a spark at 14.25MV with Unit 27 shorted, we started seeing sparking on NMR trace again. More shorting rod shifting led us to believe that the shorting rod contact block in the bottom of the top casting in Unit 27 had failed. Moving the shorting rod up by 35mm allowed the rod to engage the top contactor block in the top casting Unit 27 bypassing the problem.

July 17

We lost the top contactor Unit 27 after a spark at 13.1MV. To overcome this, Units 26 and 27 were shorted.

July 18

The final death knell came after a spark at 11.67MV. It was whilst we were rearranging shorting rods in the LE end that the discovery of the broken nylon stud was made. At this point we conceded that we would have to go into the 14UD.

Tank Opening 24 July

The smell of breakdown products was too strong for us to go into the tank so we allowed it to ventilate overnight.

The most obvious thing that was noticed when we got into the top of the 14UD was bits of ceramic lying on castings from U1 to U7. The owner of the ceramic was post A un Unit 1. Post C in Unit 1 had such severe spark marks that they extended down the side of the spark gap electrodes. This post had held the stringer, one of which was on the wrong electrode. These posts were replaced, with post A being put in upside down so that the stringers could be put on the post on the opposite side to the rotating shaft.

All stringers are now relocated onto post A, that is, further from the shorting rods. Their shape has also been altered to remove sharp bends on which corona marks have been seen.

Unit 27

The shorting rod contact block had come completely adrift from the casting. A new block was mounted onto the outer surface in the top of the unit without the brass gauze gasket.

The lead connecting the post resistors across gap 4 had been blown out and was laying in the bottom of the tank with its plug end blackened.

Resistors

We noted that spark marks on tube resistor leads often coincided with the sharp edges of the holes in casting inside diameters.

To shield the sharp edges, aluminium discs 2 inches in diameter were installed in the casting over the holes and were held in place by means of a screw and a bridge piece at the back of the hole. To further improve clearance and remove sharp edges from within the casting area, "ball end" leads were used. These leads consisted of 3/16 inch bronze balls, soft soldered to gold plated banana plugs. The balls had holes drilled in them at right angles to the banana plug into which the leads were soft soldered.

All 8 gap tube sections were equipped with ball leads as well as at least 4 gaps either side of flanges in 11 gap tube sections.

All plugs and sockets were checked for blackening and were replaced with gold insert nuts where necessary.

Casting Covers

All shaped casting covers were taken out of the 14UD and sanded down taking care to remove any burns.

DC idlers

The up side of chains 1, 2 and 3 had lost their contact springs. These idlers were fitted with new springs.

Terminal Foil Stripper

The terminal foil stripper was repopulated and its actuation checked OK.

Oilers

It was decided to establish once and for all the reason for pools of oil on the tank floor greeting us every time we opened the 14UD. There seemed no end to the faults we found.

1. Sparked holes in main supply tube,
2. Compression fittings loose,
3. Silver solder joints leaking,
4. Capillary feed tube not entering reservoir,
5. Oil reservoir high enough so the supply tube would drain its oil onto the chain wheel, rather than back into the reservoir when oiler turned off.

Reservoirs were lowered by 1.5 inches and capillary tubes were extended to the bottom of the reservoirs. Sparked holes were brazed and the leaky solder joints re-done.

We are satisfied that what could be done has been done to confine the broadcasting of the oil.

Chains

To see if any of the charging chain slippage was due to incorrect tension, the following tests were done to the 3 chains.

A spring balance was attached to the platform and then hooked onto the drive motor shaft. With the chain split and held away from the charging pulley, the platform was moved up until the counterbalance arm was supported horizontally. All chains had 2 kg lead weights at the end of their counterbalance arms and with this configuration the readings were:

Chain 1	130 lbs
Chain 2	76 lbs
Chain 3	128 lbs

After moving weights the readings for the counterbalance were:

Chain position 1	165 lbs
Chain position 2	142 lbs
Chain position 3	160 lbs

Electrical Checks

When we test stringer to stringer the combined resistance of an 11-gap tube and its equivalent column is 3934 M Ω which will give us a current of 7.6 μ A at 30 kV. For an 8-gap tube its combined resistance is 2800 M Ω giving a current of 10.7 μ A at 30 kV.

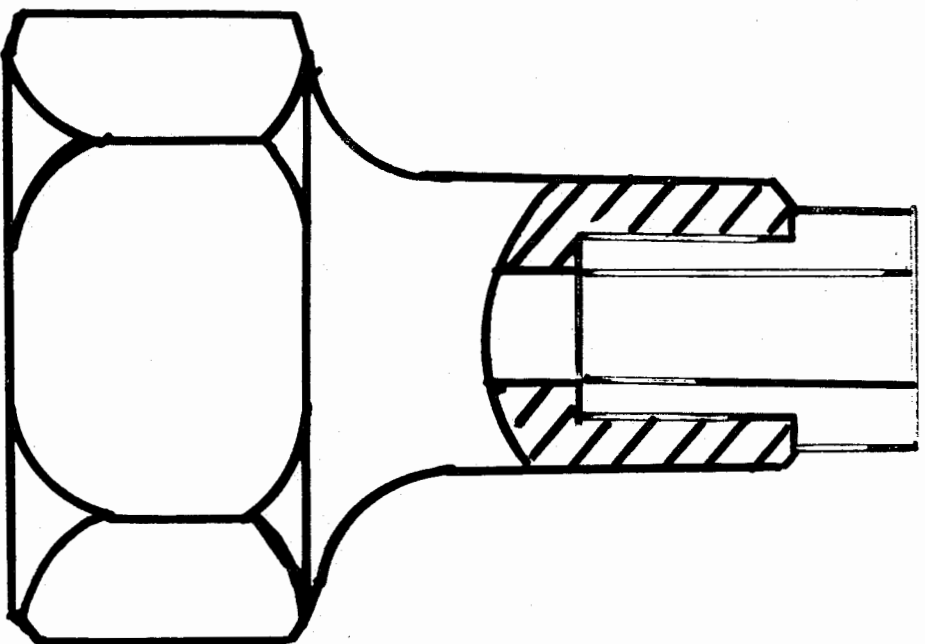
The readings we do get at 30 kV are 8.0 to 8.4 μ A for the 11-gap tube and 11 μ A for 8-gap tube.

Close

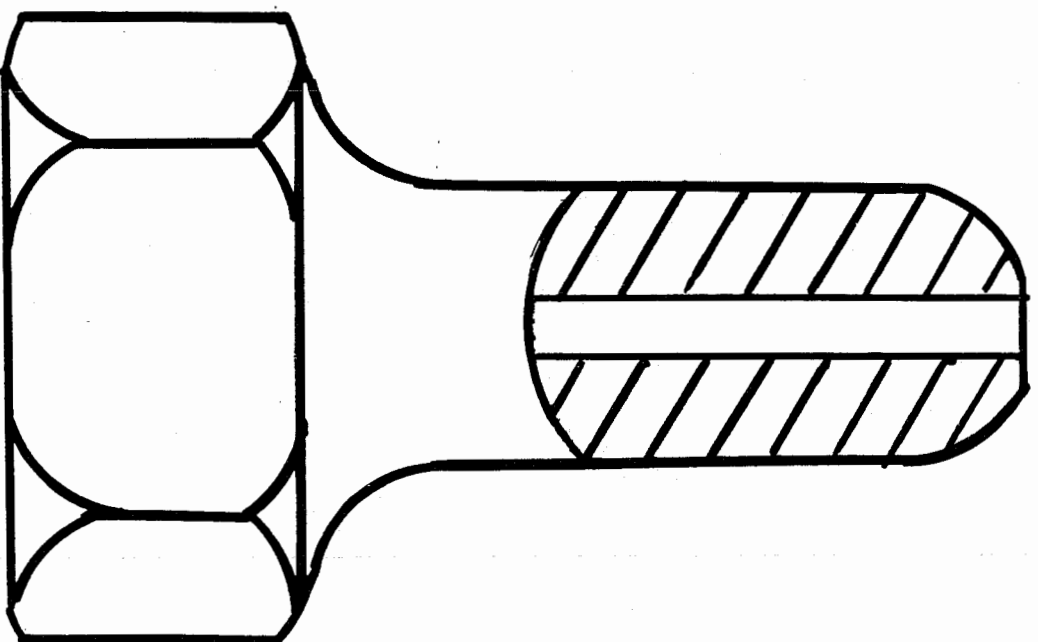
Tank buttoned up 3 August 89 after the column was wiped down with chamois and our favoured solution of RBS 25 detergent and water.

14 December 1989

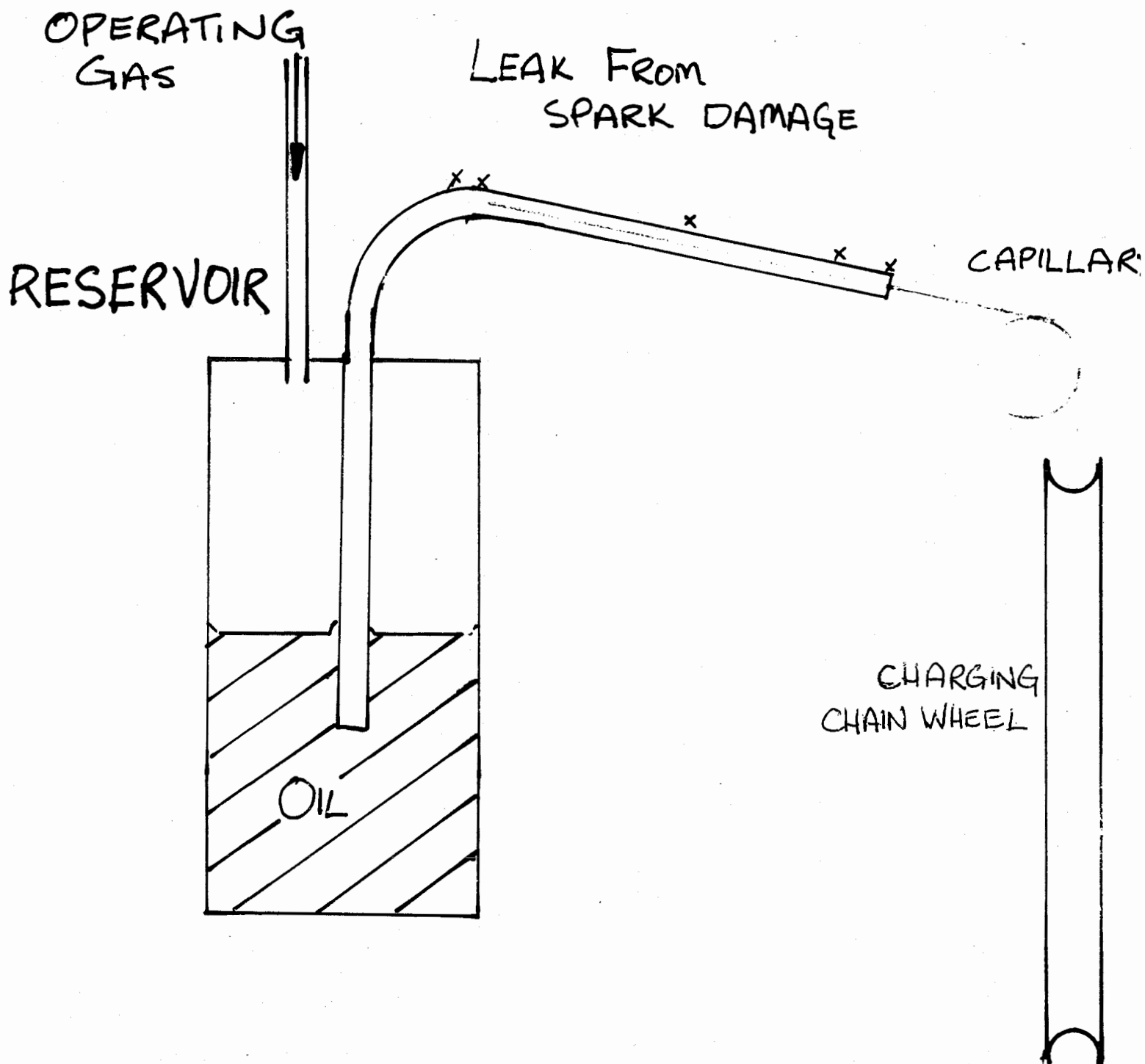
24th October 89



ALUMINIUM NUT WITH GOLD
PLATED INSERT



ALUMINIUM NUT



3rd AUG 89

14 UD Log GVM 1989

