AUSTRALIAN NATIONAL UNIVERSITY
DEPARTMENT OF NUCLEAR PHYSICS
14UD TANK OPENING REPORT NO. 64

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Tony was seventy this year. For the last year or so, he has been able to devote more of his time to his property at Braidwood, leaving the field open for Bob Turkentine to assume full responsibility at the Laboratory. I feel Tony has done this, in the large part, because he wanted to give a younger man a go. The Tank Opening Reports, after a very long hiatus, have resumed without Tony's involvement. From time to time we hope that Tony will appear as a guest author.

Reason for tank opening:

The high energy stripper was stuck. Looking with the theodolite from under the analyzing magnet through the high energy accelerator tube toward a light source on top of the inflection magnet, we saw what appeared to be a high energy stripper foil frame hanging at 45° to its normal position. We believed that this could be blocking the mechanism, preventing foil changes.

Preamble

The 14UD was last closed on 17th November 1988. It operated for 656 hours during seventy-six days, including the Christmas holiday period. The machine ran at 15.57 MV for 27 hours without sparks.

The Tank Opening

Exploratory Tour

There was very little dust on any surface of the column. For the first time in several tank openings, the column did not have to be wiped before work could start. An unusually large number of sparks, thirty-three, were on rings in U13, while U14 had seven, U15 had twelve and U16, which is symmetrical to U13 had only three. It is likely that since the resistors in U14 fourteen produce a lower gradient, the absolute voltage and stress on U13 is higher.

And so to work!

Unit 19 was opened revealing the high energy stripper foil actuator in a jammed position. While the actuator could now be moved, we believed that a foil frame was about to fall off into the high energy tube, and so we decided to let the tube up to atmospheric pressure with dry nitrogen gas. After the high energy stripper was removed from the machine, we discovered that the illusion of the foil hanging at 45° was caused by pieces of broken foil folded back upon itself, making a very dense angular shape. This folded foil edge was mistaken for the edge of a foil frame. The foils were in the correct orientation, but even so, the stripper

mechanism was throughly checked for any stiffness. There was a problem with the actuator, at the end of its stroke. When the foil has been indexed into position, there is enough backlash in the foil counter and associated chain drive, to cause the actuator to ease back into the wrong path. Once this happens, the actuator cannot be reset correctly. To fix this problem, a spring loaded ball was installed in the housing of the actuator locating it into an indent on a flange on the output shaft. Now, at the end of the actuator's travel, the ball indent holds the scroll whilst the actuator resets itself.

Terminal Triplet

The variac feeding the "X" triplet seemed to have a dead spot. The variac contact was dirty. Unfortunately, "cleaning" it with 1200 emery paper removed the gold plating as well as the dirt. The variac was replaced with a new one with a somewhat lower power rating but more gold.

Roughing the Tube

The Tube was roughed after being opened from 10 a.m. to 2 p.m. The terminal foils were changed leaving every 20th position empty for gas stripper operation. The shorting rod clamp on top of the machine was found to have only two of its four clamping rings. The O-ring carriers were skimmed to ease their fit and 4 new O-rings installed.

The proximity of the stringers in Unit one and Unit two to the shorting rods was checked to see if this could account for nylon rod failure. The stringers were not too close.

Conclusion: Damage occurs only if the join between nylon rods is in a live Unit rather than a casting between two rod contacts.

Resistors

Resistors that have been in Unit fourteen since February 1988, were checked at 10 kilovolts and 3 volts. There were no open circuits, although testing resulted in a lower than nomimal resistance by about 12 1/2 %. This was attributed to deposits of conducting hygroscopic SF_6 breakdown products on the column ceramics and on the resistors themselves. Two resistors were removed and cleaned. They tested to within 2% of the nominal 800 megohms. Measuring high meg resistors in accelerators continues to be a problem. It should be much easier without breakdown products which almost entirely disappear when the corona point system is replaced with resistors.

Chains

Chain No. 2, installed on 21st September, 1988, has not needed to be shortened since installation and is running without any noticeable oscillation. Chains 1 and 3 have lengthened slightly since last inspection on the 22nd September 1988. It is believed that the holes in the metal pellets are continuing to elongate rather than that the nylon is stretching. Chains 1 and 3 have done 16,913 and 22,284 hours respectively. The Chains were not shortened or inspected further.

Shafts

The Terminal alternator on a low energy shaft had a worn bearing housing. This was evidenced by lots of black particulates in the terminal of the accelerator from the destruction of the bearing housing. The housings were sleeved and the alternators were reassembled. The marks on the rotor from running against the windings appear not to have affected the operation of the alternator.

Cleaning

The column was blown down with nitrogen and wiped down using chamois, with 50 to 1 solution of water to RBS detergent.

Charging Tests

Chain one has its normal characteristic of its current not going above 15 microamps when run in air. Chains two and three were very satisfactory. Machine doors closed on Friday 3rd February 1989. The Kinney Pump was started on Sunday and the machine was gassed up on Monday. Residual gas analysis of the accelerator was done from the pumping station at the high energy end of the machine. There was no sign of SF_6 in the vacuum space.

References: Earlier Tank Opening Reports are referred to by the notation (38/4) etc., meaning Report No. 38, page 4.

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