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MINUTES OF MEETING OF MTA ACCELERATOR COMMITTEE HELD MAY 10, 1951

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RESEARCH SERVICE BRANCH
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MINUTES OF MEETING OF MTA ACCELERATOR COMMITTEE
HELD MAY 10, 1951

Present: UCRL: Baker, Brobeck, Gordon, Frank, Kilpatrick, Nunan,
Lofgren, Longacre

CR&D: Avery, Chaffe, Fossati, Hildebrand

AEC: Fidler, Fleckenstein, Moore, O'Donnell

Hildebrand asked Nunan to discuss his work on methods to reduce X-rays from the drift tube surfaces. Nunan said that a magic formula for cleaning drift tubes has been discovered which reduces by a factor of 1000 the X-rays produced from the surfaces of drift tubes. The procedure is as follows: Wash with wet rag and Dutch Cleanser; rinse with tap water; wipe off. Add chromic acid and rinse with water. Add mixture of 1/3 nitric acid and 2/3 acetic acid and rinse with water and finally rinse with CP acetone. Once a drift tube has been cleaned with the above method it appears that oxidation does not cause the X-ray level to increase again. Several other methods to reduce the X-ray level were tried, including heating, but none was successful. Since it is not known which ingredient of the magic formula is responsible for the cleaning the formula will be varied in an attempt to understand the phenomena and to reduce the effort in cleaning. Lofgren suggested that the lard oil used in machining process might be the source of trouble. To prevent diffusion pump oil from reaching the vacuum chamber a double-bounce liquid air trap is placed in the manifold leading directly into the tank and a refrigerated baffle is placed just above the diffusion pump. It was found by placing a liquid air finger beside the drift tube in the tank that oil could still be collected. When a liquid air finger is substituted for the liquid air baffle the X-ray level could not be reduced even though the magic formula was used. Upon replacing the original baffle the X-ray level was reduced. The consensus is that liquid air baffles appear to be necessary and would be expensive to install and operate for Mark I. More work should be done to determine the need for such baffles.

The X-ray level with drift tubes sanded with No. 80 grit and cleaned with the magic formula was about 10 times higher than the X-ray level with smooth drift tubes cleaned with the magic formula.

Lofgren suggested that it might be possible to use a baffle system with less costly warmer temperature materials such as solid CO₂ with a liquid.

Nunan explained the relation between radiation and power. It was found by placing a Zeus meter 87 centimeters from a calibrated source in back of 1/4" steel that 74 mr per hour at this distance corresponds to 77 microamps pulsed beam.

The drift tubes used in the model tests have end areas 1/280 times the Mark I drift tube areas so that 77 microamps in the model corresponds to $77 \times 200 = .0214$ amps in Mark I. Since the end to end voltage in Mark I is 47×10^6 volts, the product of $.0214 \times 47 \times 10^6 = 1$ megawatt electron loading in Mark I. With drift tubes cleaned by the magic formula and with the two bounce liquid air baffle, the electron loading extrapolated to Mark I is now 1 KW, whereas before the magic cleaning process the loading was about 1 megawatt. It was found that the shape of the drift tube had little effect on the total X-rays produced.

Frank presented data obtained using a different test tank and liquid air baffle system. A double bounce liquid air trap was placed in the manifold at the entrance to the tank and a second liquid air trap was placed in the horizontal section of the manifold. This second trap consists of parallel tubes arranged to prevent a straight line path for molecules.

Using hemispherical drift tubes machined without the use of any oil, the X-ray level remained low. This is comparable to Nunan's value with drift tubes cleaned with the magic formula. After leaving the drift tube, thus cleaned, in the tank under vacuum for one week, no increase in the X-ray level was found. Using the magic formula on the above drift tube gave no change in the X-ray level. Precaution was taken to have a tank free from any contaminants, especially glyptal. Mercury pumps are now being placed on this tank to study their effect on the X-ray level.

Baker said that the B-1 cavity ball was heated for 3 hours at 300° C but the X-rays remained high. A re-heating for the same time interval did not effectively change the X-ray level. The magic formula will be tried on the B-1 ball at the next shutdown.

Hildebrand asked if the conclusion is that heating is a poor substitute for cleaning and should be left out of both machines. Lofgren thought that nothing should be left out but other things tried. It was his opinion that the baffle should be designed for liquid air and could be used with other cooling materials if they are found to be satisfactory.

Hildebrand brought up the question of whether the air going into the Mark I tank should be filtered from both the moisture and dust stand-points. The consensus is that glass wool filter units would be satisfactory to keep out the dust and that the liner and drift tubes

could be kept above the dew point by circulating warm water in the cooling tubes, thereby preventing moisture condensation. If this were done it would not be necessary to dry the air entering the tank. Hildebrand stated that the aluminum spraying would be finished by the end of this month and that it should be possible to check the tightness of the vessel in about 6 weeks.

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