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SUBJECT: THOREX PILOT PLANT: RADIATION EXPOSURE RECEIVED BY
MAINTENANCE PERSONNEL WHILE INSTALLING A FEED PUMP IN CELL 5

TO: F. L. Culler

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1.0 INTRODUCTION

A hydraulic drive unit for a Lapp pulsafeeder pump which pumps radioactive feed solution to the extraction column in the Thorex Pilot Plant was removed from the pipe tunnel and installed in Cell 5. This cell contains the dissolver, feed adjustment equipment, extraction column, rework equipment, and other equipment for processing highly radioactive solutions. The equipment is shielded one from another, either as a single unit or as a group of closely associated pieces, by concrete- or lead-walled cubicles so that should repairs be necessary only that portion of the equipment requiring repair need be decontaminated.

Since this modification represents a test of the practicality of this type of shielding arrangement, the radiation exposure received by the maintenance personnel who worked on this job should be of interest to design engineers and others engaged in radiochemical processing.

2.0 SUMMARY

Two days were spent in removing the pump from the pipe tunnel and installing it in Cell 5. Ten men worked a total of 75.8 man-hours in making this change. During the time spent on this job, each maintenance person wore a special film badge which was issued to the person before he entered the pipe tunnel or cell and was returned each day after the person had completed his work on this job. The films were developed and read immediately after the job was completed.

Cell 5 was surveyed with a soft-shell cutie pie before work was begun in Cell 5. In the area where the drive unit and intermediate head was to be installed (adjacent to and outside the remote-head cubicle) in Cell 5, the radiation level was 25 mr/hr, permitting a working time of 4 hr.

The film badge measurements showed that two electricians received a total exposure of 100 mrep each; however, these electricians also helped to remove a contaminated (8-10 r/hr) centrifuge from Cell 7. It is believed that this exposure was received during removal of the centrifuge and not during the pump installation. The other eight persons working on this job received no exposure, not even on the open window portion of the film badge. Although this is almost unbelievable, there is no reason to believe that these data are not valid because these men were checked by health physics surveyors during each day to be sure that they wore the film badges.

3.0 DESCRIPTION OF PUMP REMOVAL AND REINSTALLATION

The Thorex Pilot Plant has two feed pumps: S-4-P which is the main feed pump, and S-4-PS which is a spare pump. Both pumps are Lapp pulsafeeders. Before this change was made, the drive units for both pumps were located in the pipe tunnel and the remote heads were located in lead-block cubicles in Cell 5.

The drive unit for the spare pump was selected for the change, because being used less frequently than the main pump, the remote-head cubicle for the spare pump had a lower radiation level than the main pump cubicle and was situated adjacent to where the drive unit was to be installed.

As originally installed in the pipe tunnel adjacent to Cell 5 wall, the hydraulic line from the pump passed through the cell wall, through the extraction column (N-1) cubicle in Cell 5, and to the intermediate head. On February 9 and 10, the drive unit was removed from the pipe tunnel and installed in Cell 5 outside

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of and adjacent to the spare pump remote-head cubicle. The intermediate head was mounted directly on the pump, and the water line from the intermediate head to the remote head was shortened.

4.0 RADIATION EXPOSURE OF MAINTENANCE PERSONNEL

This job took two days to complete. A survey of Cell 5 on February 9, before the job was started, showed a background of 25 mr/hr (outside the remote-head cubicle) in the area where the work was to be done. The working time for maintenance personnel was 4 hr.

Ten men worked a total of 75.8 man-hours, and during this time each person wore a special film badge to measure the exposure received while working on this job. Eight of these persons received no exposure, and two electricians received 100 mrep (Table 4-1).

The electricians also worked in Cell 7 during this period, helping to remove a centrifuge from the cell, and it is believed that virtually all of the exposure received by these men was received during removal of the centrifuge and not during the pump change. (The centrifuge was unshielded and was contaminated to 8-10 r/hr by solids in the bottom of the bowl).

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Table 4-1

Exposure Received by Maintenance Personnel
While Relocating the Feed Pump

Craft	Special Badge No.	Date, Feb.	Man-Hours Worked	Exposure Received ^a		
				Open Window	Shield	PTR
Electrician	1	9	7.5			
		10	11.25	170	70	100
Electrician	2	9	7.5			
		10	7.75	170	70	100
Pipefitter	15	9	2.25			
		10	7.75	0	0	0
Pipefitter	16	9	2.25			
		10	7.75	0	0	0
Millwright	3	9	3.25			
		10	1.25	0	0	0
Millwright	13	9	3.25			
		10	1.25	0	0	0
Electrician	18	10	3.50	0	0	0
Lead Burner	17	10	1.0	0	0	0
Lead Burner	8	10	1.0	0	0	0
Welder	14	10	7.25	0	0	0

a. Measured with standard film badges. Open window reading - shield reading = probable total reading (PTR), mrep.

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