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FINAL REPORT PROCESS TEST MR-105-2

ORIFICE SELECTION DURING REACTOR

OPERATION

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FROM

R. D. SCHILLING

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FINAL REPORT PROCESS TEST MR-105-2
ORIFICE SELECTION DURING REACTOR OPERATION

Ref: Document, HW-25032 "Process Test MR-105-2 Orifice Selection During Reactor Operation."

INTRODUCTION

A marked reduction in 100 Area operation cost may be achieved by a more efficient utilization of the process water at the reactors. An estimated \$110,000 saving each year for one area could be achieved from a 4000 gpm reduction in water flow at the existing header pressures.

This process test was devised to demonstrate the operational feasibility of an orifice selecting device which would permit a more efficient distribution of the water to the process tubes. This device, which was designed to permit a controlled variation in the water flow to each process tube, was installed on a single tube on the B Reactor and has been tested during reactor operation to determine its practicability. This report presents the test results and conclusions of this study.

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SUMMARY AND CONCLUSIONS

The test established that a practical orifice selecting device can be made and used to control the water flow rate to a process tube at either of two accurately calibrated rates with no loss of accuracy in flow measurement. With the selector tested, there was no flow restriction during the orifice transition. The pressure fluctuations during the change were small in magnitude, and caused no operational problem. The test demonstrated that orifice selection is feasible from operating considerations and indicated that this feature should be adopted if other factors justify their use.

DETAILS

The double orifice assembly, which is shown in the attached sketch, was installed without difficulty on tube 1981-B, a B metal column, during the outage of August 27, 1952. The selector was equipped with a 0.140 and a 0.175 orifice and was operated a number of times while the reactor power level was approximately 300 MW.

Pressures

The panellit pressure and the tube temperature were closely observed during and following each orifice change. The observed pressures are as follows:

	<u>Header 19$\frac{1}{2}$</u>	<u>0.175</u>	<u>0.140</u>	<u>Max. Dur- ing Change</u>	<u>Min. Dur- ing Change</u>
Control Room psig	377	73 $\pm$ $\frac{1}{2}$	61.5 $\pm$ $\frac{1}{2}$	80 $\pm$ 2	61.5 $\pm$ $\frac{1}{2}$ *

- * Controlled by 0.140 orifice

These data show that the panellit pressure of the test tube was never lower than the value for the smallest orifice size. This indicates that the flow through the tube did not decrease below the 0.140 orifice value during the change. The maximum pressure during a change shows that the flow increased during a transition. There were no oscillations of the pressure in making or following the transition from one orifice to the other.

These panellit pressures are considerably lower than those normally observed for these orifice sizes. This indicates an incomplete pressure recovery downstream of the orifice jet, which is probably a result of the jet striking the mixing chamber wall.

The daily variations of panellit pressure of the test tube during the test period were consistent with those of adjacent process tubes which indicates no abnormal pressure drop increase in the tube or plugging in the selector.

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Temperatures

No definite temperature variation could be attributed to an orifice change because of the low heat generation of the B metal column and the normal variations of the temperature indicator.

Examination

A visual examination of the internal surfaces of the selector and "O" rings following approximately 900 hours of operation revealed no wear, corrosion or erosion effects. The brass parts were tarnished.

CONCLUSION AND RECOMMENDATIONS

It is concluded that an orifice selecting system on the reactors is feasible from operational considerations. Such a system should be adopted if other factors such as installation cost, effects on production scheduling and temperature effects on production tubes will justify its use. It is further suggested that subsequent tests be made on one or more uranium tubes to ascertain water and packing temperatures effects.

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