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FINAL REPORT - PROCESS TEST MR-105-3
EVALUATION OF LARGER CROSSHEADER SCREEN
OPENINGS FOR B, D, AND F REACTORS

COPY 1 OF 10

INTRODUCTION

The installation of crossheader pressure gauges on the reactors has shown that excessive pressure drops occur across some crossheader screen assemblies, and that the pressure drop across the four inch assemblies in the B, D, and F Reactors is significantly greater than the six inch assemblies at the DR and H Reactors.

Since the inlet water system pressure is limited to the 4.5 psi discharge pressure of the secondary pumps, the reduction of pressure resistance downstream of that point would result in higher reactor flow rates and increased boiling limits. (1)

This test was initiated to determine if four inch crossheader screens having equal and 50% greater free-area than DR - H screens would significantly reduce the crossheader screen pressure drops at the B, D, and F Reactors, and to obtain information regarding cone screen plugging rates with larger size screen openings. (2)

- (1) HW-23861, "Tube Temperature Limits - Boiling Considerations", by R. G. Vanderwater.
 (2) HW-25008, "Process Test MR-105-3, Evaluation of Larger Crossheader Screen Openings for B, D, and F Reactors", by R. R. Bloomstrand.

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SUMMARY AND CONCLUSIONS

Crossheader screens having free-area equivalent to and 50% greater than DR - H screens were tested at the B Reactor to determine if larger screen openings would materially reduce pressure drops across the four inch crossheader screen assemblies at the B, D, and F Reactors. The frequency of plugged cone screens with larger crossheader screen openings was also investigated.

Increasing the free-area of the four inch crossheader screens had no significant effect on crossheader pressures as they remained essentially unchanged for six months. Cone screens plugged on three occasions in tubes which had crossheader screens of 50% greater free-area than DR - H type screens, but no significant plugging was observed in tubes with crossheader screens equivalent in free-area to DR - H screens.

Therefore, it is concluded that the use of larger free-area crossheader screens at the B, D, and F Reactors would offer no advantages over present screens as long as the existing four inch crossheader screen assemblies are used. It appears, however, that the pressure drop at that point could be reduced by the substitution of larger crossheader screen assemblies, such as the nominal six inch assemblies used at the DR and H Reactors, particularly if process water flow rates were to be substantially increased.

DETAILS

A. Inlet Water System Characteristics

The front face piping from the riser to the tube inlet at the various reactors is not radically dissimilar except that the crossheader screen assemblies (housing and basket strainer) at the DR and H Reactors are larger than at the B, D, and F Reactors. Nominal six inch assemblies are used at DR and H Reactors and four inch assemblies are used at the B, D, and F Reactors. The crossheader screens (strainers) now in use are 30 mesh stainless steel supported by eight mesh backup screens. Cone screen openings are significantly larger than 30 mesh.

At nominal riser pressures of 400 - 405 psig, crossheader pressures at the B Reactor range from 380 to 399 psig; H Reactor crossheader pressures range from 394 to 403 psig at a nominal 410 psig riser pressure.

B. Test Screen Construction

Two types of larger mesh crossheader screens of equivalent strength to those presently in use were tested. A pair of four inch screens having the equivalent free-area of six inch DR - H screens were constructed of 20 mesh, 0.015 inch diameter stainless steel wire supported by six mesh, 0.054 inch diameter stainless steel wire backup screens. A second pair of four inch screens having 50% greater free-area than the six inch DR - H screens were fabricated using 16 mesh, 0.018 inch diameter stainless steel wire supported by six mesh, 0.054 inch diameter stainless steel wire backup screens.

C. Test Procedure

The test was performed at the B Reactor. A pair of 20 mesh screens were installed on crossheader 21 $\frac{1}{2}$, and a pair of 16 mesh screens were installed

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on crossheader 25 $\frac{1}{2}$. Two thoroughly cleaned regular 30 mesh screens were installed on crossheader 23 $\frac{1}{2}$ for control purposes. Installation of the screens was completed on 8/3/52. Riser pressure, header pressures and selected panellit pressure data were routinely secured from 8/3/52 to 1/3/53.

RESULTS

The installation of larger free-area crossheader screens had no significant effect on the pressure drop across the screen assemblies at the B Reactor. Crossheader pressures remained essentially unchanged as illustrated in Table I in the appendix.

During the same period, panellit pressures behaved normally, with no apparent change in film formation rates as a result of the possibility of larger particles passing through the screens; also purges appeared no more effective than usual. There was indication that the use of 16 mesh screens would result in more frequent cone screen plugging as three (3) plugged cone screens occurred on crossheader 25 $\frac{1}{2}$ during the approximate six month duration of the test. No plugging was noted on crossheaders 21 $\frac{1}{2}$ and 23 $\frac{1}{2}$.

It was also evident that there is a large pressure drop associated with the four inch crossheader screen assemblies which could become excessive in the event that process water flow rates were significantly increased.

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APPENDIX
TABLE I
105-B PRESSURES

<u>Date</u>	<u>Average Riser Pressure (psig)</u>	<u>Crossheader No. Screen Mesh</u>	<u>Crossheader Pressures (psig)</u>		
			<u>21½ 20</u>	<u>23½ 30</u>	<u>25½ 15</u>
8/4/52	397		379	381	380
8/14/52	401		384	385	384
8/21/52	399		383	383	381
8/26/52	400		385	384	383
9/1/52	399		382	384	382
9/8/52	401		383	384	383
9/12/52	400		384	384	383
9/19/52	400		382	383	383
9/27/52	400		385	384	384
10/4/52	400		383	383	383
10/10/52	401		385	387	386
10/18/52	400		382	384	384
10/21/52	400		383	384	384
10/25/52	401		384	384	386
10/25/52	404		390	388	390
11/2/52	400		384	384	384
11/8/52	400		386	383	386
11/15/52	400		383	381	381
11/18/52	400		383	382	385
12/2/52	402		387	387	388
12/6/52	402		387	387	389
12/13/52	402		388	386	388
12/27/52	401		388	387	389
1/3/53	403		391	392	390

Plugged Cone Screens During Test: Crossheader 25½ - Three (3)
Crossheader 23½ - None
Crossheader 21½ - None

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