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SUBJECT: FUEL PURGE PUMP COOLER PERFORMANCE TEST
HRT Test No. II. A 68 a and b

TO: R. Van Winkle

FROM: D. F. Frech

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FUEL PURGE PUMP COOLER PERFORMANCE TEST
HRT Test No. II. A 68 a and b

Summary

A fuel purge pump cooler test indicates that performance is satisfactory. According to the test data, the purge rate may be computed from cooling water heat gain to an accuracy of about 15%.

Procedure

The purge pumping rate was determined by running both fuel purge pumps with an inventory of condensate in the fuel condensate tank, and opening valve HCV-336 so that purge water was drawn from the condensate tank. Weight in the condensate tank was recorded at 5-min intervals for 30 min. The computed purge rate was 4.67 lb/min. Steam was turned on the fuel dump tank evaporators to give an evaporation rate equal to the purge rate. To minimize the condensate inlet temperature at the purge pump cooler, the recombiner condenser cooling water was turned on full. The minimum purge inlet temperature was 64°C. Purge pump cooler cooling water was adjusted to give a condensate exit temperature of 50°C. The following data were recorded on page 82 of the HRT Data Log Book: purge inlet and exit temperatures, cooling water inlet and exit temperatures, and the cooling water flow from FI-833. Next, the recombiner condenser cooling water was reduced to provide successive purge inlet temperatures of 70, 80, and 90°C. Purge exit temperature was held at 50°C. The test results shown on the attached sheet were compared to design criteria.

Results

Purge water was cooled to the required 50°C in all runs, indicating the performance of the cooler is satisfactory. It was not convenient to test the operation of the cooler at the maximum design cooling water temperature of 29.4°C; however, test data indicate the cooler will operate effectively under that condition.

The "Calculated Purge Rate" is the purge rate computed from the cooling water heat balance. Assuming the true rate was 4.67 lb/min for each run, as noted above, the error was 1.9 to 15.6%.

At the conditions of Run 4, an over-all heat transfer coefficient of 320 Btu/hr-ft²-°F would be calculated, using the same method of calculation as was used in the design specifications for this heat exchanger. The observed over-all heat transfer coefficient was 304, which is 5% less than calculated.

DFF:be

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FUEL PURGE PUMP COOLER PERFORMANCE TEST DATA

	Design Specification	Test Results			
		1	2	3	4
CW Inlet Temp., °C	(85°F Max) 29.4	24	24	25	25
CW Exit Temp., °C	None	52	48	50	45
CW ΔT, °C	---	28	24	25	20
CW Rate, % on FI-833, 100% = 1.44 gpm	---	22.5	34	46	84
CW Rate, gpm	1.2	.3	.5	.7	1.2
CW Heat Gain, Btu/min	150	136	176	248	362
Purge Inlet Temp., °C	100	64	70	80	90
Purge Exit Temp., °C	50	50	50	51	50
Purge ΔT, °C	37.6 avg.	14	20	29	40
Purge Rate, lb/min	1.53	4.67	4.67	4.67	4.67
Over-all Heat Transfer Coefficient, Btu/hr-ft ² -°F *	201	214	210	255	304
Calculated Purge Rate, lb/min	----	5.40	4.89	4.76	5.03
Error, lb/min	----	+ .73	+ .22	+ .09	+ .36
Error, %	----	+ 15.6	+ 4.7	+ 1.9	+ 7.7

* Based on Inside Diameter.