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SUBJECT: RUN SUMMARY OF HRT-CP-5

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RUN SUMMARY OF HRT-CP-5

Purpose

To determine how effectively the 400-mill hydroclone removes injected simulated solids of low concentrations in the HRT Chemical Plant.

Procedure

The 400-A feed loop located in B cell was filled with approximately 35 liters of 0.02M H_2SO_4 containing 8.5 g/l of UO_2SO_4 and 26.5 grams of $CuSO_4 \cdot 5H_2O$. The loop was brought up to temperature and a side stream of 0.75 gpm was sent through the chemical plant through the 400-mill hydroclone with the P-1 pump. Solids (1.82 grams) in 500 ml of simulated soup solution were added to the system at the beginning of each eight-hour period (regular shifts) and 500 ml samples were pulled with increasing time increments after each addition of solids. The loop solution inventory was kept constant by charging the sample bomb with the volume equivalent to that volume removed as the sample. By increasing the time interval between solids addition and sampling, the time required for the hydroclone to significantly reduce the solids concentration was studied. A total of six additions of solids was made over the forty-eight-hour run. These solids prepared by the Chemical Development Section of the Chemical Technology Division, contained 40% Fe_2O_3 , 45% ZrO_2 , 13% Cr_2O_3 , and 0.2% by weight of CuO .

Results

Table 1 shows how the concentration of solids varied with time of hydroclone operation and solids addition. The concentration of solids immediately following the initial addition of 1.82 grams of solids was calculated to be 0.0572 mg/ml. The initial sample pulled 15 minutes after the hydroclone was in the system gave a concentration of 0.09 mg/ml of solids which suggests that additional solids were removed from the pipe walls deposited during previous runs. The sample pulled 4-1/4 hours after the initial solids addition gave 0.026 mg/ml solids for a reduction factor of 3-1/2 in the solids content during this period of hydroclone operation. The only other samples from an eight-hour cycle which showed the expected decrease in solids concentration were those taken during the fourth solids-addition cycle. In this cycle, samples taken one hour and five hours after solids addition showed an eightfold reduction in solids concentration. The remaining results did not provide the information desired;

TABLE 1

Grams Solids Added	Conc. Solids (mg/ml)	Time Sample Pulled After Each Solids Addition	Solution Temperature (°C)	Pressure in System (psi)
1.82 (1st Add.)	0.09	15 minutes	232	1000
None	.026	4 hrs, 15 min.	240	1275
1.82 (2nd Add.)	*	30 minutes	220	1100
None	.04	4 hrs, 30 min.	250	1200
1.82 (3rd Add.)	.019	45 minutes	250	1325
None	.02	4-3/4 hrs	250	1300
1.82 (4th Add.)	.07	1 hour	260	1625
None	.009	5 hours	248	1390
1.82 (5th Add.)	.053	1-1/2 hrs	260	1325
None	.022	5-1/2 hrs	245	1275
1.82 (6th Add.)	.064	2 hours	258	1350
None	*	6 hours	245	1275

*Sample used before suspended solids were requested.

namely, to determine how long it took the hydroclone to drop the solids concentration appreciably and to determine the equilibrium value for solids concentration after several hours of hydroclone operation. This run will be repeated in an attempt to obtain the objectives outlined in this test.

At the conclusion of the 48-hour test, the loop and the chemical plant were drained and sampled to obtain a material balance on solids and volumes. A total of 10.92 grams of solids was added to the system during the test. The solution drained from the loop produced 0.75 grams of solids or 6.97% of the total added. The solution drained from the underflow pot system contained 2.5 grams of solids or 22.9%. The loop plus the chemical plant were then rinsed to produce an additional 4.03 grams of solids or 36.9%. Thus the over-all material balance of the total solids added was 68.3% recovery, which includes the correction for solids lost by means of sampling. The solution inventory showed 93.7% of the initial volume recovered. The uranium recovery was 84.5%. However, a part of the apparent loss is known to result from sample discrepancies which could not be rechecked.

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