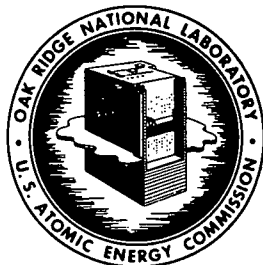


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SUBJECT: RUN SUMMARY OF HRT-CP-7

TO: W. D. Burch

FROM: R. H. Winget

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RUN SUMMARY OF HRT-CP-7

Purpose

To determine how effectively the hydroclone removes solids of low concentration.

Summary

In this run, the hydroclone reduced the solids concentration of the circulating stream by a factor of ~25/hour to a minimum concentration of <0.005 mg/ml. Although only 11 grams of solids were added, 69% were recovered. However, a leak at the flange of the 400-A pump terminated the run and made the material balances of solids, liquid and uranium indeterminate.

Procedure

The difficulty with freeze plug No. 12 thawing was eliminated by adding a two-foot extension in line 1106 between FP-12 and the tee at the suction of P-1. After completing this piping change, a total of 21.34 liters of UO_2SO_4 , containing a total of 0.878 grams of suspended solids previously drained from the solids loop (from run CP-6) was charged to the system. The system was brought up to 270°C and 1300 psig by 2000 on 11/14/56, and the first sample taken immediately. At 2045, 5.1 grams of solids were added and a sample taken 15 minutes later. These solids contained 40% Fe_2O_3 , 45% ZrO_2 , 13% Cr_2O_3 , and 0.2% by weight of CuO . Fifty percent of these particles were less than 0.7 microns in size. Eight samples were removed during twenty-four hours of operation following this initial solids addition. The first four samples were taken at two-hour intervals and the second four at four-hour intervals. A second addition of 5.1 grams of solids was then made and the same sample schedule repeated; however, after eight hours of operation following this second addition, the main pump flange on the 400-A pump began to leak and the run was terminated. The solids loop and the chemical plant were drained into separate containers and sampled for uranium and total suspended solids. Both systems were rinsed and the solutions analyzed to obtain a material balance.

Results

The data for the run are shown in Table 1. In Fig. 1, the concentration of solids in the circulating system is plotted against operating time of the hydroclone. The calculated solids concentration immediately following the initial 5.1-gram addition was 0.20 mg/ml compared to 0.177 mg/ml found by analysis. In just two hours, the concentration dropped a factor of 12.7. Two additional hours of hydroclone operation at a flow of 0.75 gpm further reduced the concentration of solids by a factor of 2. The lowest concentration of solids, 0.002 mg/ml, was reached six hours after the initial addition of solids. This value, represents only one mg of material found by weighing the residue after filtering a 500-ml sample. The second addition of 5.1 grams of solids was made twenty-four hours after the initial addition. In only two hours, the concentration dropped by a factor of 40 compared to 12.7 in the initial addition. The concentration of solids in the final four samples gave an average concentration of 0.004 mg/ml.

These final concentrations of about 0.005 mg/ml of solids were the values expected from experiments in the Y-12 loop and this run was the first time the chemical plant had attained these low concentrations. The only equipment change made for run CP-7 was the installation of the two-foot extension in line 1106. Freeze plug No. 12 held all during the run without any difficulty.

TABLE 1

Grams Solids Added	Conc. Solids (mg/ml)	Sample Code	Time Sample Pulled After Hydroclone in Operation (hrs)	Solu- tion Temp. (°C)	Pressure in System	Time, Date Sample Pulled
None	0.087	CFH-7-2	1	279	1325	2000, 11/14
5.1 grams	.177	CFH-7-4	2	282	1325	2100 "
None	.014	CFH-7-6	4	280	1350	2300 "
None	.007	CFH-8	6	279	1320	0100, 11/15
None	.002	CFH-10	8	283	1340	0300 "
None	.005	CFH-12	10	283	1330	0500 "
None	.008	CFH-14	14	290	1450	0900 "
None	.021	CFH-17	18	300	1625	1300 "
None	.003	CFH-19	22	292	1600	1700 "
None	.004	CFH-7-21	26	288	1525	2100 "
5.1 grams	.200	CFH-7-23	28	287	1500	2300 "
None	.005	CFH-7-25	30	289	1500	0100, 11/16
None	.005	CFH-7-27	32	290	1500	0300 "
None	.005	CFH-7-29	34	290	1500	0500 "
None	.002	CFH-7-31	36	290	1500	0700 "

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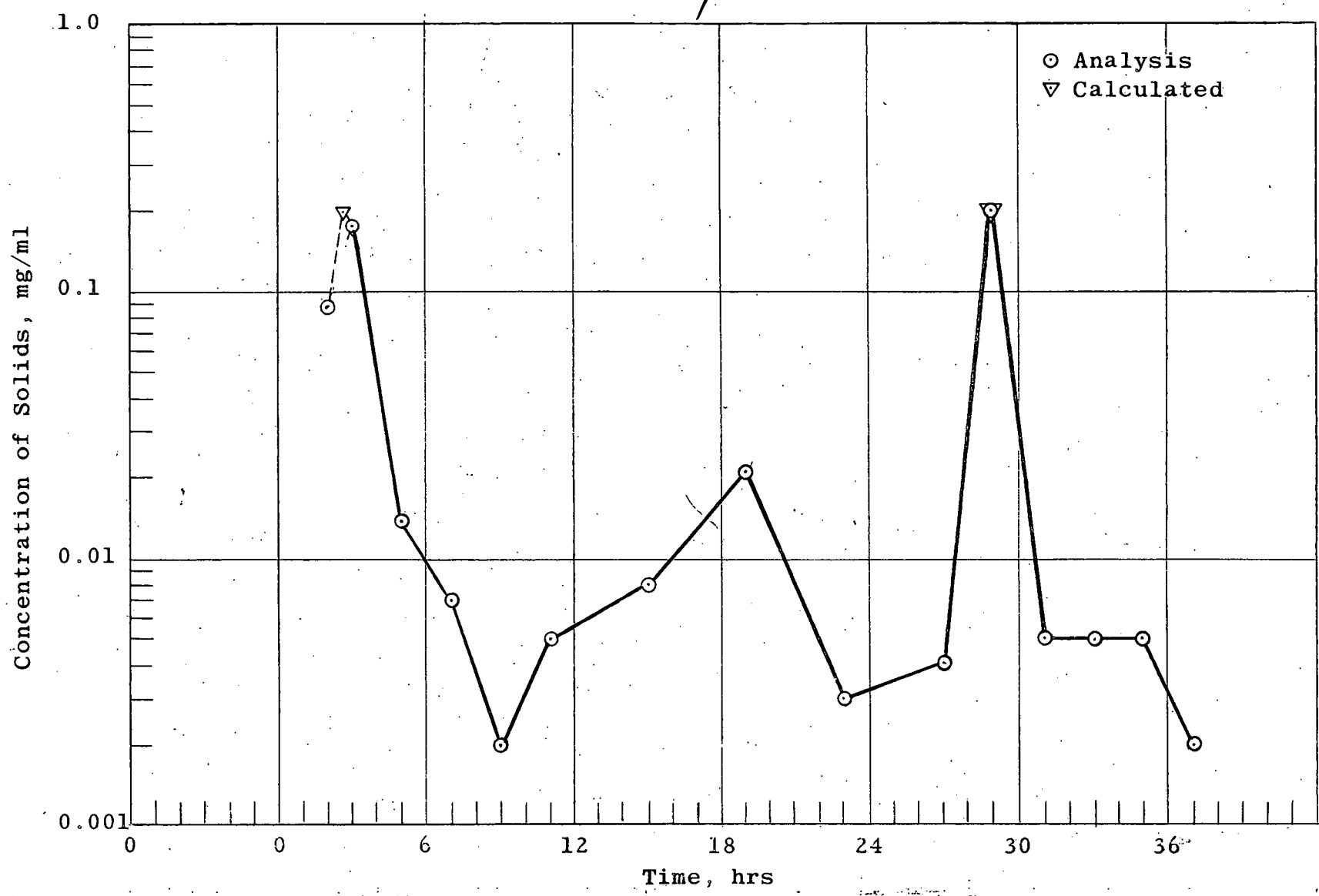


Fig. 1. HRT-CP-7 SOLIDS CONCENTRATION vs OPERATING TIME OF HYDROCLONE

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A total of 11.078 grams of solids was added to the system with 5.585 grams recovered for an over-all solids recovery of 50.5%. The condensate added to the system for pressure testing prior to the start of the next run, when drained, contained an additional 1.775 grams of solids which brought the material balance for solids to 68.8%. The concentration factor was 101.

Of the 36.2 liters of solution charged to the system, 33.3 liters were recovered which includes an estimated 2 liters lost from the system by failure of the 400-A pump flange to give a volume recovery of 92%.

The total Ni in solution by analysis of flowing stream samples varied from a high of 0.87 grams to a low of 0.45 grams. Chloride was found present in only two of the flowing stream samples. The initial sample pulled showed 0.66 ppm and the sample pulled after the initial solids addition gave 4 ppm; however, this analysis is questionable since chloride concentration in the solids should have given in the order of 0.1 ppm.

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