GL00574

PRELIMINARY DRAFT

Appendix H

PARTICLE METER TESTING

(Battelle Pacific Northwest Laboratories)

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Mr. Chuck Snyder
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Dear Chuck:

SALTON SEA SCIENTIFIC DRILLING PROJECT JUNE FLOW TEST -
SUMMARY OF PACIFIC NORTHWEST LABORATORY (PNL) PARTICLE METER TESTING

As you requested, I have prepared a short summary description of our field test work during the June flow test. We have completed part of the data analysis, but a detailed report will not be done until next fiscal year after we are able to finish the particle analyses. The PNL field team was Bob Sullivan (mechanical equipment), Bob Robertus (solids identification), and Cecil Kindle (particle meters).

<u>TEST OBJECTIVES</u>

The objectives of the Pacific Northwest Laboratory field test were:

- Establish the suspended solids content of the brine from the bottom of the separator immediately after flashing and after a 2-hour hold time.
- Characterize the chemical and size characteristics of the suspended solids.
- Evaluate an on-line computerized ultrasonic particle counter in a high-solids brine.
- Evaluate the effects of scale deposits on the optical window of a laser particle counter.

<u>EXPERIMENTAL APPROACH</u>

A schematic diagram of the experimental equipment is given in Figure 1. Brine from the bottom of the main steam separator was run through a 1/2 NPT line about 125 ft to the PNL test stand. A brine flow of 5 to 10 gpm was maintained in this line to reduce the residence time before measurements in the test stand to about 30 seconds.

Brine entered the test stand and was split into two streams. One stream was available for immediate flow through the laser optical window, an ultrasonic

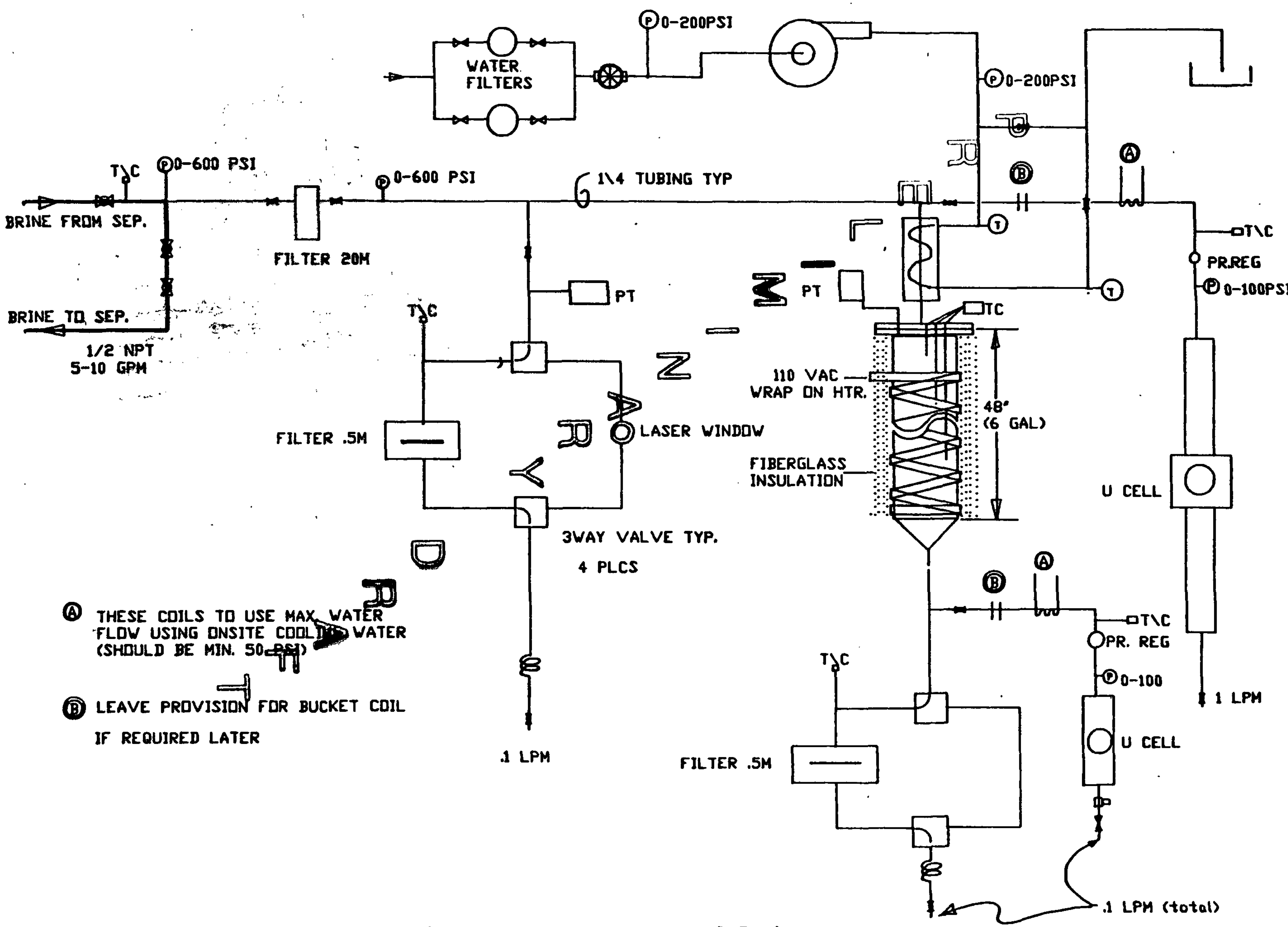

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FIGURE 1. Experimental Equipment

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detector (U cell, Figure-1), and also could be run through a weighed filter for measurement of the suspended solids content. Samples of both brine and solids were also collected for later analyses. The second stream was directed into a heated 6-gallon vessel to hold the brine at temperature for 90 to 160 minutes to allow precipitation, and then either filter the brine for weighed samples or direct the brine through a second ultrasonic cell.

Because of the short time available to build the test stand, an existing piece of equipment used at the Heber Binary Plant was reworked. This system was sized for 1/4-inch tubing and valves. This small diameter caused plugging difficulties in the test stand. It would have been better to use larger valves and tubing for the test stand, but this was not possible within the time and cost constraints.

During May and early June, two visits were made to the site. In June, after set up and check-outs of the system, the test was started on June 8 and continued until June 15.

This geothermal well has one of the highest solids contents in the world. Thus it was anticipated that some scaling and plugging problems would be encountered during the test. The 20 micron filter (shown in Figure 1) was intended to remove large particles, but this filter plugged in the first 20 minutes of flow and was removed for the balance of the test. With the coarse filter out, larger particles were able to get into the rest of the test system and produced a number of flow interruptions. It was originally planned to run a series of precipitation tests at four different temperatures. However, plugging problems required running the lag time tests at just the test stand inlet temperature. It was possible to run the test stand for several hours before cleaning was required.

<u>RESULTS</u>

Only preliminary results are available at this time. It was found that the solids content of the brine at the test stand inlet varied over a wide range of 166 to 670 mg/l. On June 10, the inlet solids content was 314 mg/l, increasing to 421 mg/l after 159 minutes of holding time. On June 13, the inlet solids content was 166 mg/l, increasing to 484 mg/l after 120 minutes holding time. The high inlet solids content of the brine indicates that even after just 30 seconds after flashing in the separator a substantial solids content has already formed in the brine. The data probably have a fairly wide scatter due to both varying solids content and difficulties in washing residual soluble salts out of the salt cake on the filter media.

Solids have been analyzed using X-ray diffraction, a scanning electron microprobe, and X-ray fluorescence. As expected, silica was the major constituent of the solids. Barium sulfate was identified, and compounds of lead, arsenic, strontium, zinc, calcium, antimony, zinc, and silver were detected. No quantitative work has been completed on the sample compositions or particle sizes.

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The ultrasonic particle counter operated successfully under severe scaling conditions and is usable in its current form. A lot of particle counts versus time data were obtained. The transducer was successful in detecting increases in particle loading when flow stopped and particle nucleation and growth occurred. In general it was much easier to get particle data using the ultrasonic instrument than it was to use the manual sampling and weighing procedures. There is a temperature limit of 180°F on the current ultrasonic transducer which was operated in the 100-125°F region for this test. PNL plans further work to increase the temperature limit of the transducer.

The window of the laser particle counter quickly became coated with solids and was totally obscured in two days of operation. Since window clarity was also a problem when the laser particle counter was operated on a binary plant at Heber due to oil films, it appears that the laser counter approach would require almost continuous maintenance and would not be suitable for geothermal plant use until a solution is found to keep windows transparent.

We plan to complete the data analysis next fiscal year and write a complete report then. The scope of the report will depend on final FY89 budgets.

If you have any questions, please call.

Very truly yours,

Don

D. W. Shannon
Chief Scientist
Corrosion and Metallurgy Section

DWS:pl

xc: Gladys Hooper