RESPONSE TO R. ELLINGTON'S COMMENTS ON
"SWEEP EFFICIENCY MODELING OF MODIFIED IN-SITU RETORTS"

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There are two major points to the comment by R. Ellington. The first is that tracer data is of "limited value in predicting retort operating behavior," and the second is that Retort 5 had a much poorer sweep efficiency than we predicted.

The first point we disagree with. Tracer data and supporting model calculations can provide very useful information as to the permeability distribution within a retort bed and the likely path the retorting front will take (given a particular inlet gas configuration and ignition sequence). In fact, ideally one should use the information from the tracer tests analysis to determine the best method (or at least optional methods) for igniting the retort and injecting reactant gases. Retort 5 provides an excellent example of this. Even a cursory examination of the Retort 5 tracer data shows a large channel near the middle front of the retort. Therefore, during processing one would probably avoid igniting and injecting gases near the central area of the retort and instead attempt to establish and spread the retorting front from the walls and back of the bed. The point is that the tracer data coupled with model calculations would have provided a very good prediction of the Retort 5 performance. I'd be very surprized if the engineers at OOSI ignored this information in developing their processing plan.

The second part of Ellington's comment we cannot argue with. Our intent in analyzing Retort 5 was merely to illustrate, with a practical example, how critical the problem of sweep efficiency can be. We point out on page 91 that:

> "It is important to note that the above results are preliminary and based on a simplistic model used to characterize the bed porosity based solely on the tracer data."

The goal of our discussion was to show that a 20% retort yield (as in Retort 5) does not necessarily mean that 80% of the oil was lost or degraded, but instead that a large portion of the shale rubble was not processed. The only reason that we relied solely on the tracer data was due to a lack of any detailed description of the Oxy 5 retorting operations. (The comment by Ellington is longer and more complete than the entire retorting-phase description given in Occidental's Retort 5 summary report.)

One final comment needs to be made concerning Figure 1a and 1b presented in Ellington's discussion. These are only partial plots of the data and therefore perhaps slightly misleading. We have included copies of the entire data to illustrate this point (Figures 1 and 2, attached). Note that the exit temperature does increase up to date 6/5 but then appears to reach a steady state (between 200-300^{0}F) for the remainder of the run. Also, the oil production does not go to zero on 6/5 (as Ellington's Figure 1a implies), but instead oscillates around a value near 50 bbl/day (at times reaching 100 bbl/day). Although some of these results may still be consistent with Ellington's comment, a more complete description of the operation of Retort 5 would be useful; hopefully Occidental will be able to provide this in the future.

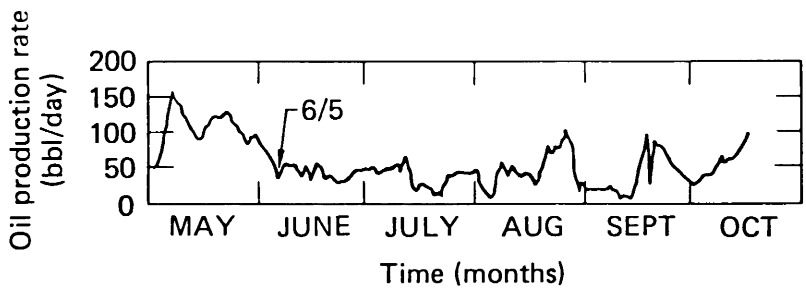

FIGURE 1: Oil Production Rate vs. Time; Occidental Retort 5.

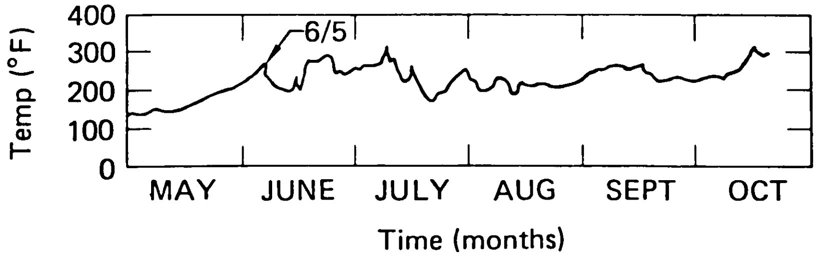

FIGURE 2: Offgas Temperature vs. Time; Occidental Retort 5.