

## **PTTC Focused Technology Workshop**

### **“Designing and Forecasting Waterfloods using ReservoirGrail”**

**August 29, 2006; Columbus, OH**

#### **Workshop Summary**

Rod Hall of GrailQuest Corp. led a well-attended workshop at the Ohio Geological Survey on the purpose and operation of ReservoirGrail, a computer program for calculating and mapping original oil in place, and to predict oil and water production from wells during water injection in a field. Beginning with a structure map, elevation of the oil/water contact if appropriate, a map of net pay or permeability, well locations, and per-well or per-lease production data, the program computes the original quantity of hydrocarbon in place across the field, and the hydrocarbon remaining.

The user can view a map of remaining oil within the field to determine the best places to site injection wells. From critical parameters such as water injection rate and characteristics of any new producing wells, the program predicts the flow of water and oil and displays quantity of oil at each stage of the water injection. Well-by-well performance is calculated as well as total production from the field. The user can try any number of what-if scenarios in trying to maximize production.

This is an art as much as a science. The instructor brought a sample dataset that we all used to try to optimize production. One pair of attendees was able to beat the instructor's best efforts in regard to maximizing oil production.

The program ran very quickly relative to the size of the problem. The instructor explained that the software does not attempt to calculate the movement of fluids through the reservoir as done by a flow simulator. Data input requirements are minimal; that combined with the speed of the program means that the user can get answers to a range of scenarios within minutes or hours, depending on the number of what-if situations run.

The workshop was definitely hands-on, as each attendee running the software. Some of us with laptop computers were given a copy of the software with a two-day license so we could show people back at the office.

#### **Evaluation Forms**

Nineteen attendees, most of whom received a workshop flyer by direct mail, submitted an evaluation form. Sixteen were from industry (12 operators; 4 service & consultants) and 3 from state or federal government. The majority of these 19 attendees gave the workshop the highest mark (5 of 5) for program expectations, speakers & facilities and organization. Most of the others rated the workshop as 4 out of 5 for these

same three criteria. Two would have paid more for the workshop; no one thought our price was too high.

One person thought that the instructor moved too fast at times, others would have preferred more time on waterflood candidate selection and case studies.

PTTC received some very favorable comments as well. "PTTC is a very important resource to the producers in the Appalachian basin. Information and ideas are disseminated far beyond attendees through word of mouth, oilfield gossip, service and suppliers and through the normal migration of employees. Appalachian producers are smaller independents without the resources to have in-house research & technical staff. The basin has a large resource base near to markets that can help domestic energy needs with the right nurturing and support. WE NEED PTTC."

Those who responded also offered suggestions for future workshops. Among the suggested topics were: fractured reservoirs; core/reservoir analysis; waterflood applications; NORM identification and remediation; gas storage; reservoir fluids/chemistry (brine & crude oil); treating & preventing formation (paraffin, scale and gyp) and wellbore (salts & hydrates) damage; reservoir evaluation in existing wellbores; and technology & methods to identify behind-pipe reserves.

Fourteen of the 19 had attended other PTTC workshops, and 8 replied that they had used new technologies based on knowledge gained through one of these workshops. Four offered to share technological innovations or best practices with others. Only waterflooding was listed as a technology that they would share.

#### Attendance List

Nineteen people pre-registered for the workshop and all of them attended along with two walk ins. These numbers do not include the instructor, Rod Hall, nor Mark Hoffman, PTTC staff member.