

Proportional and Conditional Plot - October 22, 2010

Figure 3 is a top view showing an example finite-difference grid of the oil reservoir, which is represented by a single 90-ft-thick model layer. The cell containing the Macosko well has a horizontal dimension of 1 ft by 3 ft. The cell size increases away from the well to a maximum size of 169 ft. During history matching, the grid is reconstructed as the well coordinates (x_w , y_w) are varied. The simulation time step is 0.2 day. Well shut-in is simulated by setting the coefficient C in Equation 5 to zero.

History Matching

The parameter estimation program PEST version 10 (Doherty, 2004) is used to perform history matching—the adjustment of model parameters so that simulated pressures match measured pressures. (This procedure is also known as model calibration.) The estimated model parameters are shown in Table 2. PEST implements a nonlinear least-squares regression method to estimate model parameters by minimizing the sum of squares of the differences between

The simulation time step is 0.2 day.

$p_i = \text{measured pressure}(i)$

$\hat{p}_i = \text{simulated pressure}(M_i, P)$

PEST uses the Gauss-Marquardt-Levenberg method to minimize Q . Details of this method are given in the PEST user's manual (Doherty, 2004).

The pressure data used for history matching were measured during the Well Integrity Test, which began on July 15, 2010. At 2:30 pm Central Daylight Time, the final turn on the choke was closed and the Macosko well was shut in. Shut-in pressure was measured by two pressure gauges installed in the capping stack. Pressure data from the "PI-3K-C" transducer were nearly identical to the pressure data from the "PI-3K-G" transducer, except the latter gave a pressure reading that is approximately 100 psi lower than the latter. For history matching, shut-

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