

Pre-decisional and Confidential Draft - October 22, 2010

Figure 3 is a map 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 Macondo well has a horizontal dimension of 1 ft by 1 ft. The cell size increases away from the well to a maximum size of 100 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 is the i measured pressure [M(L⁻¹T⁻²)], and

p_i^m is the i simulated pressure [M(L⁻¹T⁻²)].

PEST uses the Gauss-Marquardt-Levenberg method to minimize Φ . 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 2:20 pm Central Daylight Time, the final turn on the choke was closed and the Macondo well was shut in. Shut-in pressure was measured by two pressure gages installed in the capping stack. Pressure data from the "PT-3K-1" transducer were nearly identical to the pressure data from the "PT-3K-2" transducer, except the former gave a pressure reading that was approximately 100 psi lower than the latter. For history matching, shut-