Earthquake-induced site effect in the oil field deposit of Absheron peninsula (Azerbaijan)

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Absheron peninsula (Azerbaijan) area was hit by the strong Caspian earthquakes on November 25, 2000 with Mw6.1 and 6.2 magnitudes. The seismic networks successfully recorded the foreshock, main shock and many aftershocks at respective locations. By using probabilistic analysis, magnitude of design earthquake for the current study in the oilfield was taken as 6.3. From this concept design (scenario) earthquake, accelerations were estimated for the distance of 35 km. In the second phase of the study, soil amplification factors and site characteristics data from boreholes were determined and estimated. In the next phase, the study uses synthesized accelerograms formed on the basis of simulation of the seismic wave propagation processes through ground layer aiming to determine the quantitative characteristics of seismic effect on the oilfield region. Soil amplification values estimated by empirical relationships in terms of shear wave velocities are in the range of 0.7 and 1.9 values. Shear wave velocity (Vs, 30) values are 100 and 110 (m/s). The PGA values for the study area were evaluated by considering the local site effects. Peak ground acceleration varies between 100 – 380 gal. On the basis of the empirical relationship between MSK-64 and peak ground acceleration, the special distribution of intensity of the design earthquake with intensity of >8 is represented. Finally, the study presents possible relationship between seismic effect and daily oil recovery which states the direct proportional characteristics.

Keywords: ground classification, oilfield, scenario earthquake, Vs30, amplification factor, peak ground acceleration