A pilot-scale bioslurry system was used to test the treatment of soils highly contaminated with 2,4-dinitrotoluene (2,4-DNT) and 2,6-dinitrotoluene (2,6-DNT). The treatment scheme involved a soil-washing process followed by two sequential aerobic slurry reactors augmented with 2,4-DNT- and 2,6-DNT-mineralizing bacteria. Test soils were obtained from two former army ammunition plants, the Volunteer Army Ammunition Plant (VAAP, Chattanooga, TN) and the Badger Army Ammunition Plant (BAAP, Baraboo, WI). Soil washing was used to minimize operational problems in slurry reactors associated with large particulates. The Eimco slurry reactors were operated in a draw-and-fill mode for 3 months and were monitored for the biodegradation of 2,4-DNT and 2,6-DNT, nitrite production, NaOH consumption, and oxygen uptake rate. Results show that soil washing was very effective for the removal of sands and the recovery of soil fines containing 2,4-DNT and 2,6-DNT. Bioslurry reactors offered rapid and nearly complete degradation of both DNT isomers, but require real time monitoring to avoid long lag periods upon refeeding. Results found a significant discrepancy between the measured DNT concentrations and calculated DNT concentrations in the slurry reactors because of solids profiles in the slurry reactors and the presence of floating crystal of DNTs. Based on the actual amount of dinitrotoluene degradation, nitrite release, NaOH consumption, and oxygen uptake were close to the theoretical stoichiometric coefficients of complete DNT mineralization. Such stoichiometric relationships were not achieved if the calculation was based on the measured DNT concentrations due to the heterogeneity of DNT in the reactor. Results indicate that nitrite release, NaOH consumption, and oxygen uptake rates provide a fast assessment of 2,4-DNT degradation and microbial activity in a slurry reactor, but could not be extended to a second reactor in series where the degradation of a much lower concentration of 2,6-DNT degradation was achieved.