Dewatering a Clay Soil Slurry using Electrokinetics

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Abstract

Dewatering of a London clay slurry is studied using the electrokinetic process. A laboratory-scale dewatering apparatus was developed based on a 236mm long and 143mm diameter cylindrical perspex cell. Three types of electrolytes were investigated: deionised water, tap water and sea water (up to 3.5% sodium chloride). For each experiment, clay slurry was poured into the cell and sandwiched between two geosynthetics (with conductive titanium wires embedded in them) and a back pressure of 75 kPa applied. The testing programme specifically addressed treatment of 50 mm thick specimens. A maximum voltage gradient of 4 V/cm was applied to induce the movement of water within the specimen for a time period of one hour.

Results showed that the direction of electroosmotic flow was from the anode to cathode. The higher the voltage applied, the greater the volume of evolved gases due to enhancement of the processes associated with gas emissions such as electrolysis. Higher voltages also resulted in more energy consumption and better water removal. The power consumed (expressed as kWh) in all experiments was reasonably low. Decreases of up to 55% moisture content were realised. Further analysis indicated that superior dewatering was achieved with saline clay samples. The improved dewatering was due to the additional ionic concentration of NaCl, which enhanced the conductivity of the cell. It is concluded that:

1. Electrokinetic processes contribute significantly to dewatering of clay slurries.
2. Relatively small concentrations of electrolytes may prove beneficial to electrokinetic dewatering of clays.

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