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Review of Suction Water Content Relationship of Bentonite-Sand Mixtures Considering Temperature Effects

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Bentonite-sand mixture is one of the candidate sealing/ buffer material for landfills, hazardous and high level radioactive waste repository. The long term satisfactory performance of bentonite sand mixture in terms of load bearing function, sealing function and buffer function is governed by hydro-mechanical response of material under elevated temperature conditions. The suction-water content relationship is one of the key parameter, which govern the thermo-hydro-mechanical behavior of compacted bentonite-sand mixture. This paper presents brief review of suction water content relationships of bentonite-sand mixture considering temperature effects. Numerous parametric models or equations have been developed for representing the soil water characteristics curve i.e. SWCC for isothermal conditions. The most frequently used equations for representing the SWCC are the van Genuchten (1980) and Fredlund and Xing (1994) SWCC equations. Various researchers (Romero et al. 2000; Villar and Lloret, 2004; Tang and Cui, 2005; Agus, 2005; Arifin, 2008) have reported the temperature effect on the water retention behavior of compacted bentonite-sand mixtures. The testing program, results and major conclusions made by above mentioned researchers were discussed in this paper. The changes in hydro-mechanical behavior due to elevated temperature are also discussed based on the suction components of soil which are influenced by temperature. As a general conclusion, total suction of the bentonite-sand mixtures is a function of mixture water content and mixture bentonite content or collectively a function of bentonite water content both at room temperature and at elevated temperature. At a constant temperature, different techniques for measuring suction results in different values of suction depending on accuracy of the sensor and calibration technique used as founded earlier by Agus (2005). The change in total suction due to change in temperature lower than 100 degree C is reversible.

Keywords: Waste Repositories, Bentonite-sand mixture, Soil Water Characteristics Curve, Swelling pressure, Total suction, Osmotic suction, Temperature.