

Thermal Consolidation Process of Multiphase Medium Consisting of Elastic Skeleton, Water, and Water Vapour

Tomasz STRZELECKI and Anna UCIECHOWSKA

Wrocław University of Technology, Institute of Geotechnics and Hydrotechnics,
Wrocław, Poland; e-mails: tomasz.strzelecki@pwr.wroc.pl,
anna.uciechowska@pwr.wroc.pl (corresponding author)

A b s t r a c t

In the process of coal gasification, the phase transition from water to water vapour takes place as a result of high temperature. Thus, the parameters of the fluid flowing through the pores of the elastic skeleton change in a significant way. The goal of this work is to calculate the fluid flow process at a variable temperature using Finite Element Method and to determine the soil consolidation process taking place under its own weight and temperature changes. The mathematical model of thermal consolidation for a Biot body accounts for the phase transition of a liquid. Numerical calculations for a homogeneous and isotropic porous medium, consisting of two conventionally accepted layers, were carried out using the FlexPDE v. 6 software. The obtained results are a first approximation of the actual processes taking place under complex geological conditions. They make it possible to determine, in approximation, the range of the phase transition and the influence of water vapour filtration on soil consolidation.

Key words: thermal consolidation, coal gasification, thermoelasticity.