SIMULATION OF A SEQUENTIAL TUNNEL EXCAVATION ACCORDING TO THE NEW AUSTRIAN TUNNELLING METHOD

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Abstract. *The tunnel excavation procedure based on the New Austrian Tunnelling Method (NATM) is a complex process where the load bearing capacity of the surrounding ground is utilised in order to minimise the required support measures . This requires an optimal balance between the excavation of material and the timing of support installation. For the numerical simulation of the NATM process, often simplified two-dimensional models are used where inevitably a large number of assumptions and uncertainties with respect to the three dimensional effect of the stress distribution are made. A three dimensional model of the Bocac Tunnel, excavated in hard rock and stiff clay using the NATM, is presented. The numerical simulation is realised in KRATOS [1] using an adapted version of a simulation model for mechanised tunnelling that has been presented in [2]. This simulation model has been enhanced to represent the support measures involved in NATM tunnelling such as reinforced shotcrete, rock bolts, and pipe roofs. For the modelling of the surrounding ground an elasto-plastic Mohr-Coulomb model is employed. The Finite Element Model, created in GiD, contains all relevant elements of tunnel construction process: step by step partial excavation, primary and secondary support installation. The special design issues and prescribed demands of the construction technology contribute to the complexity of the model. The sequential excavation procedure with the exact order of installation of the different secondary support elements is simulated as well. The geometry and the mesh generation of such a complex model requires sophisticated tools for a precise and numerically correct representation of this model. Beside the model generation the representation of the simulation results will be presented.*

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