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Dynamics and Control of a Hydraulically Driven Boring Plant

Friedrich G. Pfeiffer

AMM, TU-Muenchen, Muenchen, Germany

In civil and underground engineering very large boring plants are used for drilling holes into the ground having a size of about 30 m depth and .5 m diameter. Today such machines possess hydraulically driven cable winches, which control both, the lifting and the lowering of the heavy drilling tools. One problem of the control process consists in an interaction of the hydraulic control and the mechanical system dynamics generating sometimes self-excited vibrations with large amplitudes. Another problem is connected with the groundwater contact when the drilling tool comes down rather fast. Both features may lead to slack cables, which must be avoided, anyway. To solve these problems an adaptive control was designed and implemented into the process control system of the boring plant. All machines produced by a Bavarian company since that time are now in operation without any problems. Older plants have been modified correspondingly. The presentation will give an overview of the problems involved, of the models used to describe the dynamics of the hydraulic and mechanical components, of the control design and also of a couple of experimental verifications performed with a big boring plant.

View the extended summary