

# A hybrid Picard-Newton acceleration scheme for non-linear time-harmonic problems

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## Abstract

Non-linear magnetic problems are commonly solved by iterative methods. This paper discusses the application of the Picard-method and the Newton-method in the context of solving time-harmonic problems. It is shown that the overall computation time can be decreased by initiating the non-linear solution process using Picard-iterations and by switching to Newton-iterations as soon as an estimator indicates that this is appropriate. The estimator relies on the equivalence between the Newton-method and the gradient based methods for minimizing non-linear multivariate functions. The developed hybrid Picard-Newton method is applied for the simulation of the short-circuit operation of a 400 kW four-pole induction motor. It is pointed out how the estimator can be used for solving multi-harmonic problems as well.

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