

Connection of FEM with the Simulation-Based Reliability Assessment Method in Technical Practice

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This extended abstract reports about the connection of the Finite Element Method (FEM) with the Simulation-Based Reliability Assessment (SBRA) Method (i.e. a way of probabilistic numerical solution of the problems focused on mining, machine industry and biomechanics).

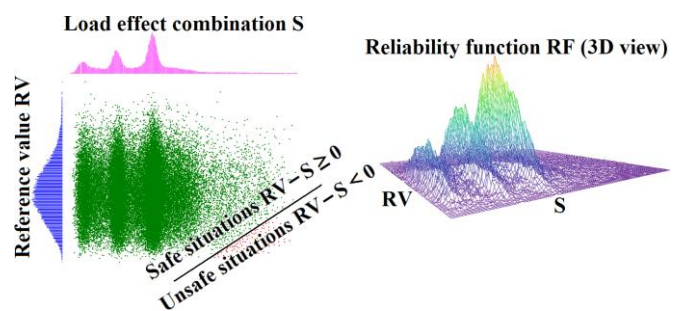


Fig. 1 Reliability Function $RF = RV - S$ (SBRA Method).

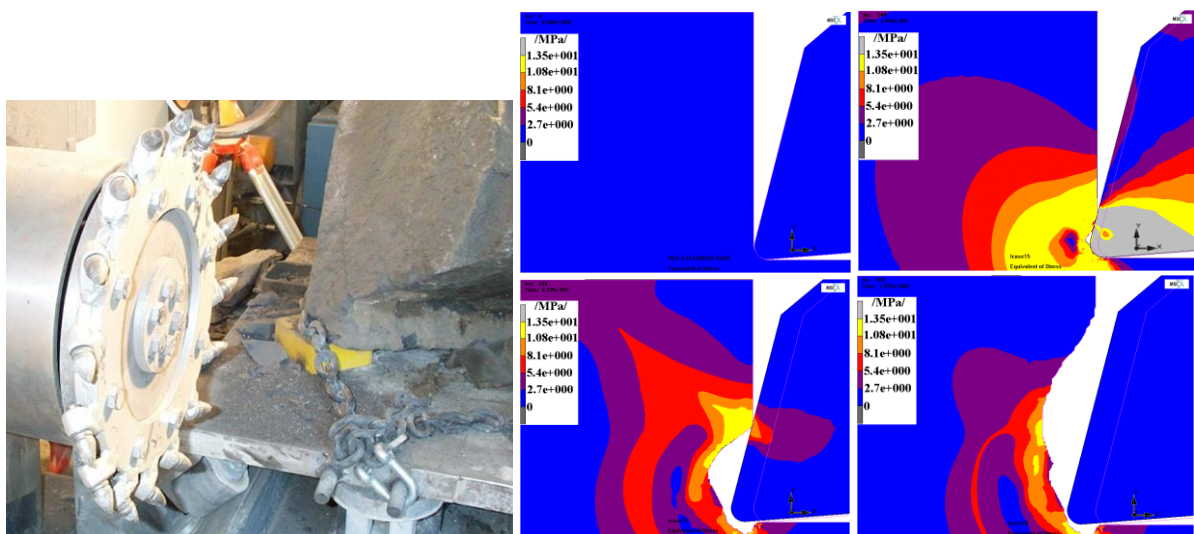


Fig. 2 Mechanical Interaction between Bits and Hard Rock (Ore Disintegration Process) and its Solution via FEM.

Theory and practical applications of SBRA Method (application of Monte Carlo simulations, see Fig. 1) are presented in the solution of the hard rock (ore) disintegration process (i.e. the bit moves into the ore and subsequently disintegrates it, the results are compared with experiments, new design of excavation tool is proposed, see Fig. 2 and 3), in the proposal design of machine for fatigue testing of railway axles (i.e. dynamic problem, see Fig. 4) and in the solution of designing of the external fixators applied in traumatology and orthopaedics (application for the treatment of open and unstable fractures or for lengthening human or animal bones etc., see Fig. 5). Applications of the SBRA Method connected with FEM in these areas are a new and innovative trend in mechanics.

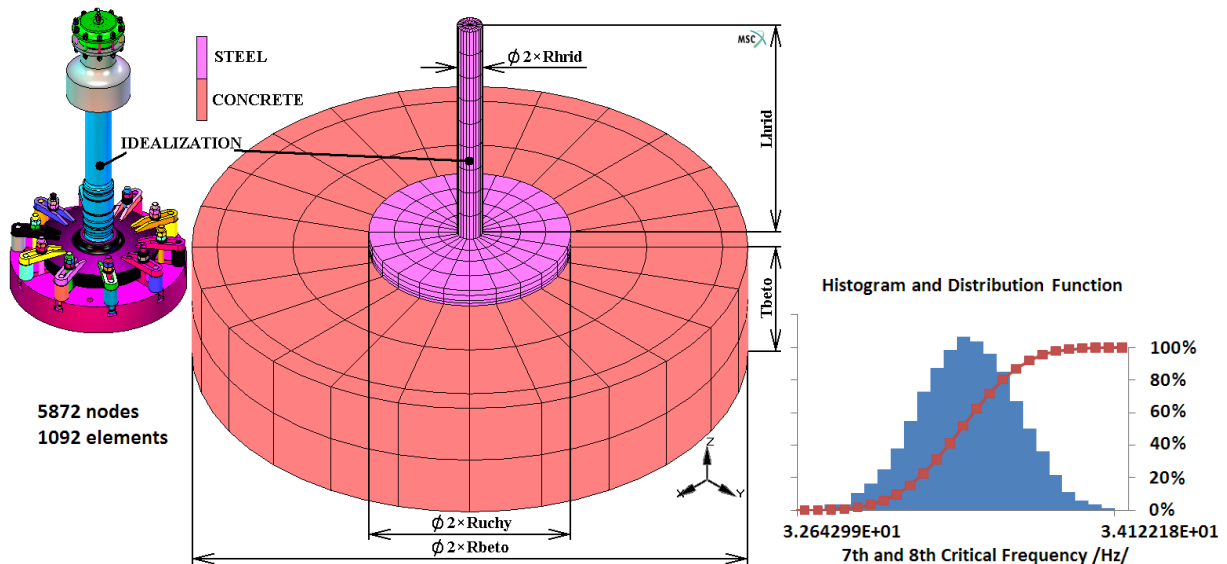


Fig. 4 Machine for Fatigue Testing of Railway Axles (FE Model and its Calculated Histogram for 7th and 8th Critical Frequency).

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Fig. 5 Design of external fixators a) based on metals - current design, heavier, expensive, etc. b) based on reinforced polymers - new design, lighter, cheap, more friendly etc.).

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