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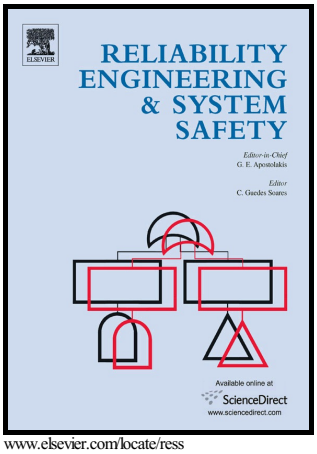

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Abstract

A complex multi-component system consists of finite number of non-identical components that can be realized as maintained components with different maintenance modes. We distinguish between four component models: non-repairable components, repairable components with corrective maintenance, repairable components with latent failures that are identified by means of preventive maintenance and component with preventive maintenance policy in which the component is restored (either repaired or renewed). The paper describes a new method for optimal maintenance strategy of a complex system respecting a given reliability constraint. It is based on our previously developed direct analytical method that enables exact reliability quantifications of highly reliable systems with maintenance. The method takes into account complex systems with maintained components, including all above models. Cost-optimization problem is solved where decision variables are changeable maintenance parameters that are optimally selected from a set of possible realistic maintenance modes. As a discrete maintenance model in this paper is considered such a model, where each maintained component can be operated in one or few discrete maintenance modes. One maintenance mode is characterized by fixed decision variables that affect maintenance cost of the mode. If a system hypothetically contains k components with 5 independent maintenance modes, in total we have 5^k maintenance configurations of the system, from which the optimal is found. The optimization method is demonstrated on real system from practice – a complex power distribution network.