Optimal Replacement Policy under a General Failure and Repair Model: Minimal versus Worse Than Old Repair

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SUMMARY

We analyze the optimal replacement policy for a system subject to a general failure and repair model. Failures can be of one of two types: catastrophic or minor. The former leads to the replacement of the system, whereas minor failures are followed by repairs. The novelty of the proposed model is that, after repair, the system recovers the operational state but its condition is worse than that just prior to failure (worse than old). Undertrained operators or low quality spare parts explain this deficient maintenance. The corresponding failure process is based on the Generalized Pòlya Process which presents both the minimal repair and the perfect repair as special cases. The system is replaced by a new one after the first catastrophic failure, and also undergoes two sorts of preventive maintenance based on age and after a predetermined number of minor failures whichever comes first. We derive the long-run average cost rate and study the optimal replacement policy. Some numerical examples illustrate the comparison between the as bad-as-old and the worse than old conditions.

Keywords: Maintenance, Generalized Pòlya process, worse-than-minimal-repair, optimum policy

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