

Reliability Assessment and Warranty Forecasting of Repairable Systems using a New Limited Failure Population Approach

by

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Most engineering systems are repairable. If a system fails, a repair may occur to put the system back in service. The repair strategy affects the repair effectiveness, which in turn, determines the number of Expected Number of Failures (ENF). The latter is a critical measure in warranty forecasting, depot maintenance and inventory logistics, among others.

We have developed forecasting methods to predict the ENF, and its error bounds, for a repairable system, using observed data. The latter is used to estimate the parameters of a proposed modified Generalized Renewal Processes (GRP) reliability model. This GRP model accounts for the “clean-point”, “production-pattern”, “useful life” and Limited Failure Population (LFP) concepts. The latter is used to describe populations partitioned into defective and non-defective subpopulations.

The “production pattern” concept provides the failure propensity trend per Month Of Production (MOP) for all produced units. The “clean point” concept accounts for the case where a defective unit is detected and replaced with a new more reliable unit for all products produced thereafter. Both, “production pattern” and “clean point,” concepts are used to describe changes in the population statistical behavior. The “useful life” concept indicates the time after which a system is not worth repairing.