

Study of Decision Support Programs for Maintenance Strategy of Electric Power Equipment (II)

Background

In sections responsible for the maintenance of electric power equipments, there is a need to rationalize inspection, maintenance and renewal strategies of service-aged equipments in order to cut maintenance costs and form a rational renewal plan for the many equipments that were installed in the high-growth period. One solution is to incorporate economic evaluation, which has not been systematically made up to now. From this viewpoint, there is a great deal of interest in the asset management technique and its concrete introduction, and convenient decision support programs are being developed in CRIEPI.

Objectives

This study aims to develop support programs for overhaul planning and renewal strategy compilation based on the proposed method *¹, which evaluates according to average maintenance cost.

Principal Results

1. Support program for overhaul planning

This supports overhaul planning of equipments whose annual maintenance cost increases with operating time (e. g. transformer) (Fig. 1). Its features are as follows:

- (1) Relationship between annual maintenance cost and age is specified by three parameters, (i) constant base cost, (ii) starting age of cost increase, (iii) cost increase rate (linear increase is assumed), in order to be applicable to the characteristics of various equipments.
- (2) As overhaul condition, periodic/same scale and non-periodic/different scale are selectable.

2. Support program for renewal strategy compilation

By classifying and accumulating maintenance expenses along operation time, average maintenance cost during the life can be evaluated. This program supports selection of renewal timing (economic life) of GCB (Gas-insulated Circuit Breaker) by evaluating average maintenance cost and operation period (Fig. 2). Its features are as follows:

- (1) The maintenance expenses are classified into (i) expense increasing with operation time (e. g. painting of tank surface), (ii) expense needed periodically (e. g. periodic inspection), (iii) expense needed non-periodically (e. g. legal inspection and exchange of control units) and (iv) accidental expense (e. g. failure cost). By accumulating these expenses, the life cycle cost is calculated, and relationship between average maintenance cost and operation time is derived. Appropriate renewal timing can be estimated from this characteristic.
- (2) Annual necessary maintenance cost is illustrated during operation time. It supports budget planning.

Future Developments

Evaluation programs including economic indicator for maintenance strategy of various equipments according to their characteristics will be developed, and a synthetic support tool (programs) for maintenance strategy with condition evaluation by diagnosis will be investigated.

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Reference

T. Takahashi, et al, 2008, "Study of decision support programs for maintenance strategy of electric power equipment Part II - Decision support tools for maintenance strategy by evaluating average repairing cost" CRIEPI Report H07013 (in Japanese)

* 1 : T. Takahashi, et al, 2007, "Study of decision support programs for maintenance strategy of electric power equipment - Proposal of diagnostic database application and repairing cost evaluation method," CRIEPI Report H06014 (in Japanese)

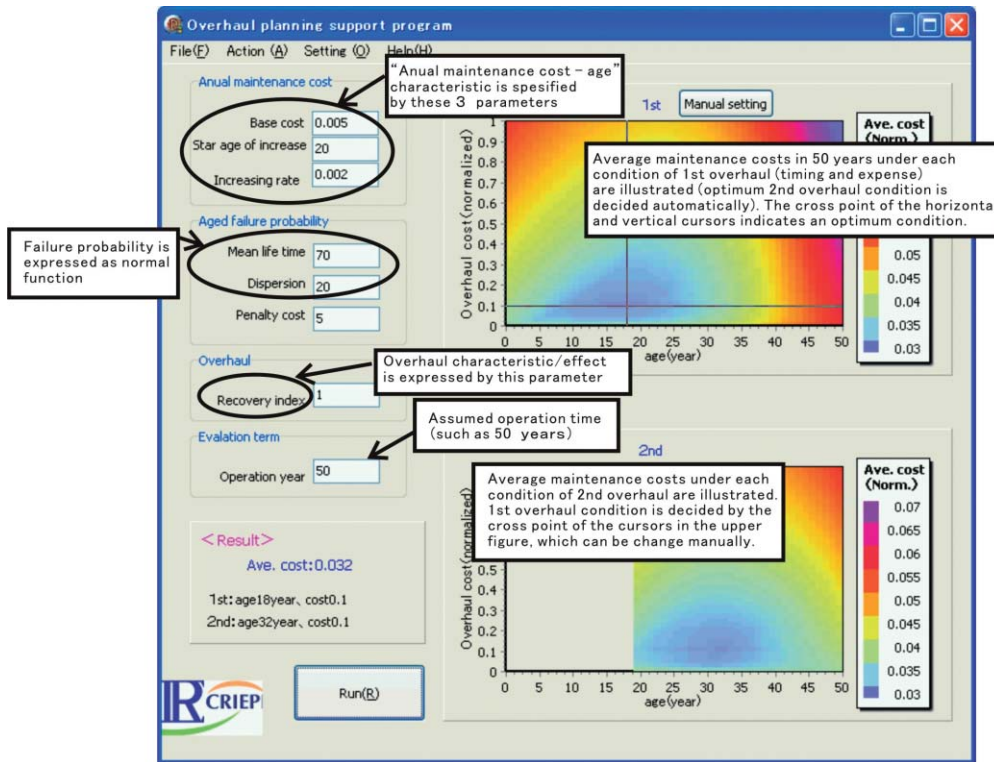


Fig.1 Display of support program for overhaul planning
(Costs are standardized according to cost of equipment)

By inputting characteristics of annual maintenance cost, failure probability and so on, low cost condition of overhaul strategy (timing and expense) can be examined with average maintenance cost during the assumed (expected) operation period.

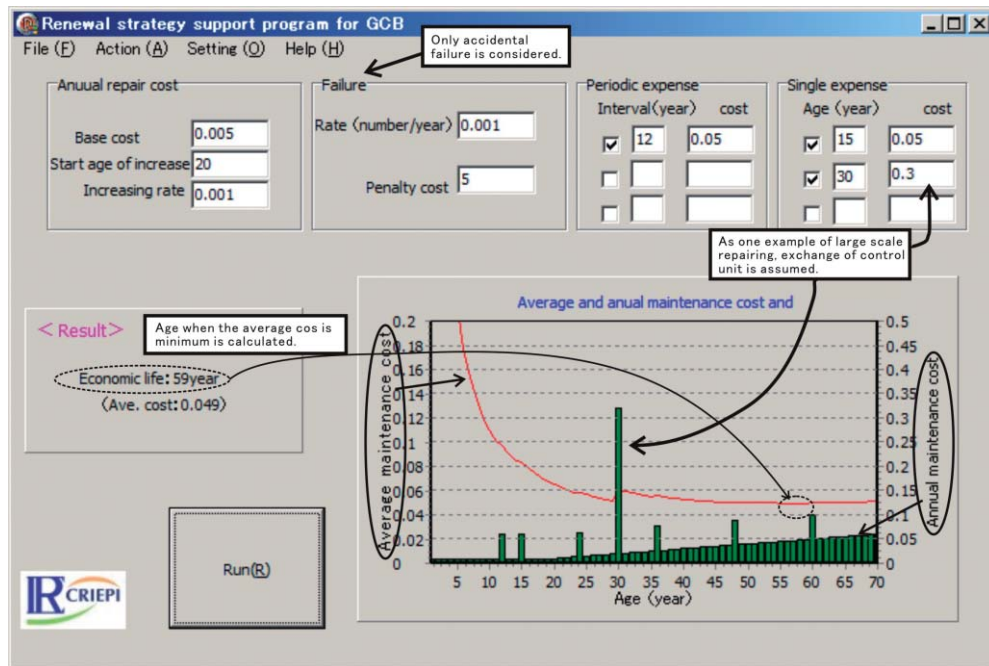


Fig.2 Display of support program for renewal strategy

By inputting necessary costs (annual repair cost, failure cost, periodic and non-periodic expense) over time, relationship between average cost and operating years is calculated. The number of years where the mean required cost is a minimum is suggested as the time for renewal (economic life).