Computer Supported Equipment Replacement Management

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Abstract –Replacement of equipment is needed when it is not economical to continue further due to increased cost of maintenance, repair cost, operating cost etc. In the current work, software has been developed to computerize the implementation of replacement policy for equipment whose maintenance cost increases with time and not considering money value to determine replacement age and average yearly cost at the time of replacement. It results in minimization of time to manually determine replacement age and consider cases involving fixed, variable and zero resale or scrap value of equipment. The cost of equipment, maintenance cost and scrap value are taken as input parameters for the software to compute optimal replacement age and average yearly cost at the time of replacement.

Keywords- Replacement analysis, optimum replacement age, replacement policy.

I. INTRODUCTION

Replacement analysis is carried out when the need arises to replace the equipment due to reduction in operating efficiency, increase in maintenance and operating cost or due to technological obsolescence [1]. New approach using optimal replacement policy with stochastic maintenance and operation cost is proposed [2]. Optimum replacement strategies are adopted for some of repair replacement models [3]. Optimal maintenance and replacement policy is also introduced for a deteriorating system with increased mean down time [4]. The GUI based software which can access the database of maintenance cost records of various existing machines and their cost and scrap value to automatically compute replacement age is not available.

Software has been developed using Visual Basic and MS Access to computerize the implementation of replacement policy for equipment whose maintenance cost increases with time and not considering money value to determine replacement age and average yearly cost at the time of replacement. The maintenance cost and resale price or scrap value and other pertinent information related to the equipment can be stored in database. This data can be subsequently retrieved during replacement analysis for an existing machine.

It can also perform replacement analysis of new machines by taking the estimated maintenance cost, cost of machine and scrap value to find the optimum replacement age.

II. REPLACEMENT POLICY FOR ITEMS WHOOSE MAINTENANCE COST INCREASES BY NOT COUNTING MONEY VALUE WITH FIXED RESALE VALUE

The startup screen shown in Fig.1 shall be used to implement the replacement policy for items whose maintenance cost increases with time and not counting the money value by clicking on the button. User can apply the replacement policy for an existing machine by pressing the button in the screen as shown in Fig.2.

It navigates to the next screen as presented in Fig.3 to enable the user to choose one of the three options for feeding resale price or scrap value of the equipment.

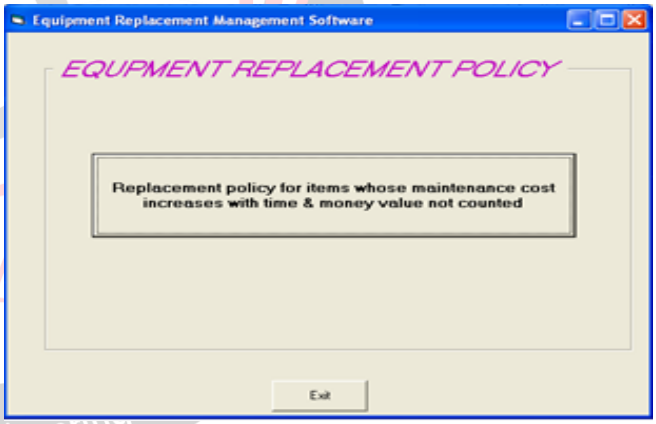

Fig.1 Replacement policy

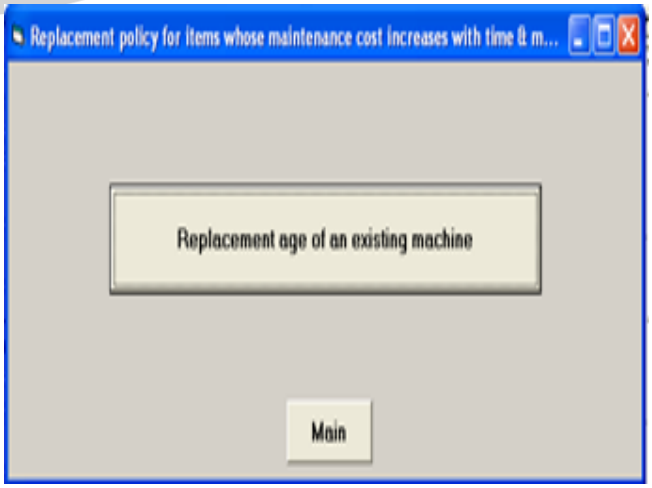

Fig.2 Screen to select replacement age of n existing machine

 DOI : 10.18231/2454-9150.2018.0306

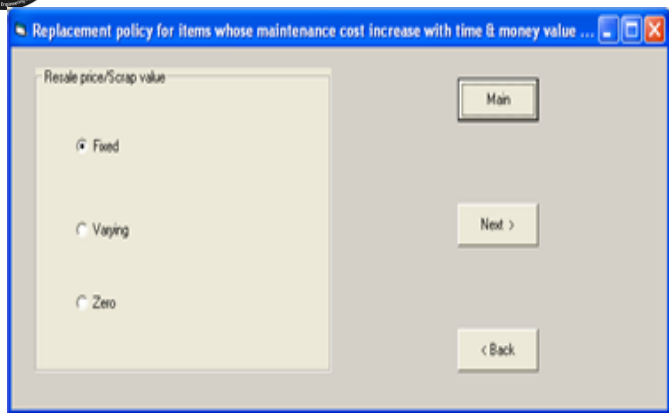

Fig.3 Screen to choose Fixed Resale price / Scrap value

The screen shown in Fig.4 will be displayed in case the user has chosen the fixed resale price. The data such as cost of machine, Resale price or scrap value of machine are retrieved using the machine number from the database.

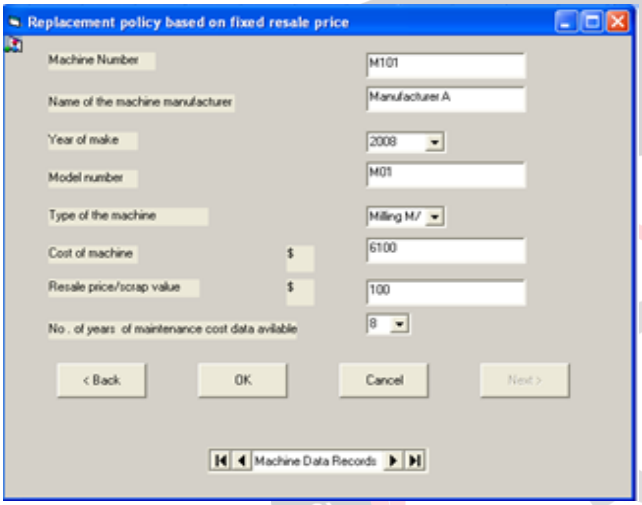

Fig.4 Replacement policy based on fixed resale price

The user can navigate to the next screen as displayed in Fig.5 to retrieve the maintenance cost data related the selected machine by navigating through data control. The user can press *OK* button to commit the data and enable the *Report* button. Report button can be pressed to see the replacement report shown in Fig.6 presenting optimum replacement age and average yearly cost at the time of replacement for the selected machine.

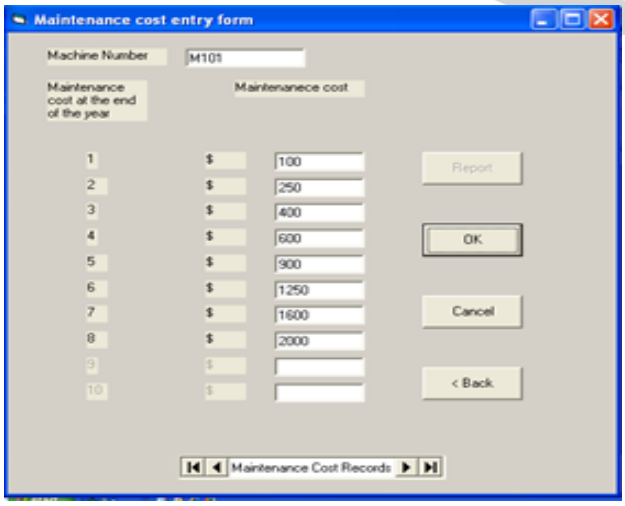

Fig.5 Maintenance cost data entry form

III. REPLACEMENT POLICY FOR ITEMS WHOOSE MAINTENANCE COST INCREASES BY NOT COUNTING MONEY VALUE WITH VARYING SCRAP VALUE

The user can select second option in the screen as shown in Fig.7 in case the equipment is having varying resale price. Next button navigates to the screen as displayed in Fig.8. The user has to retrieve the varying scrap and maintenance cost data related to typical equipment from the database for replacement analysis which has already been stored or enter data as shown in Fig.9 and Fig.10.

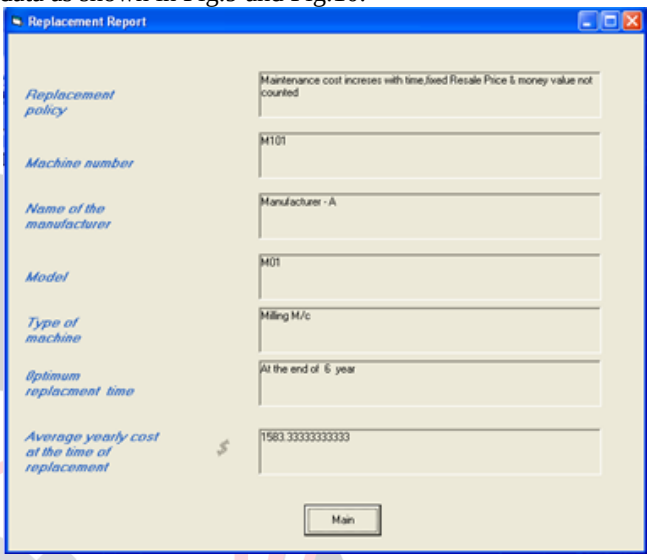

Fig.6 Replacement report

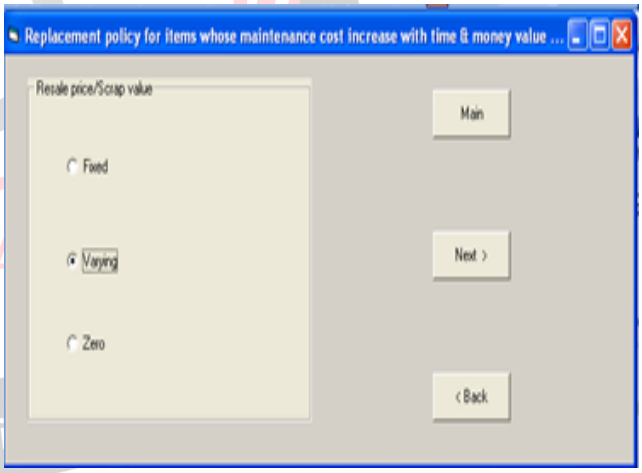

Fig.7 Screen to choose varying resale price / scrap value

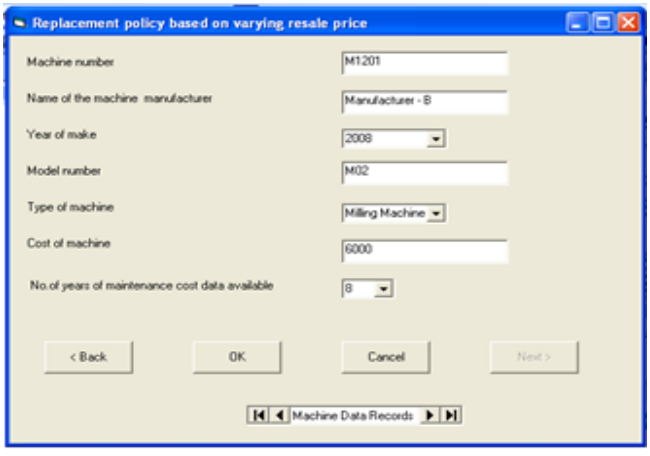

Fig.8 Replacement policy based on varying resale price/ scrap value

 DOI : 10.18231/2454-9150.2018.0306

Report button can be pressed to see the optimum replacement age, average yearly cost at the time of replacement of the equipment selected for analysis is presented in Fig.11.

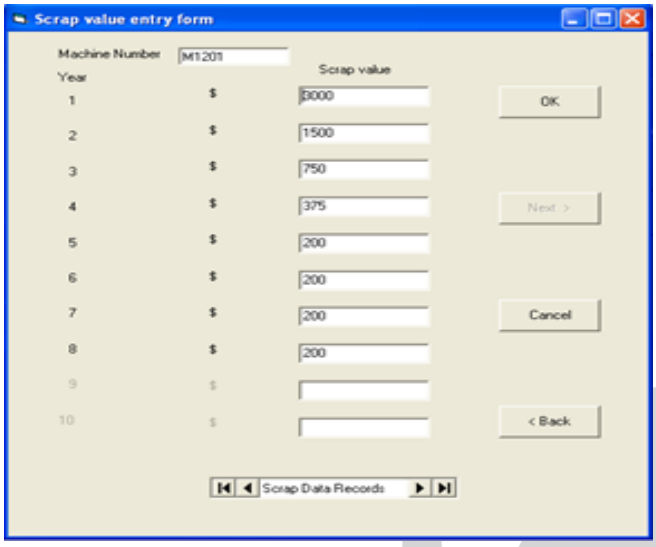

Fig.9 Scrap value entry form

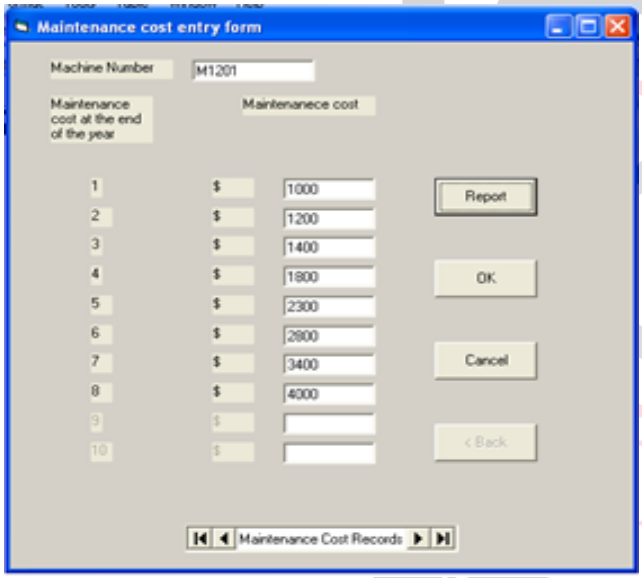

Fig.10 Maintenance cost entry form

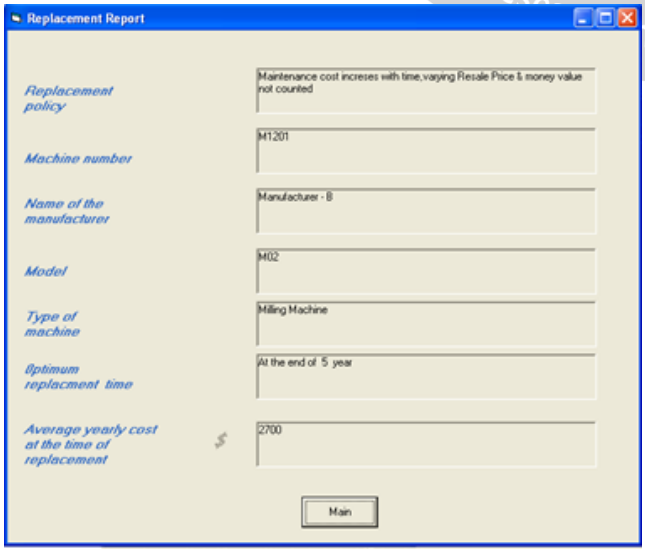

Fig.11 Replacement report

IV. REPLACEMENT POLICY FOR ITEMS WHOOSE MAINTENANCE COST INCREASES BY NOT COUNTING MONEY VALUE WITH ZERO SCRAP VALUE

The user can select third option in the screen as shown in Fig.12 to perform the replacement analysis of the equipment having zero scrap value. Next button navigates to the screen as shown in Fig.13. The user has to retrieve the maintenance cost data related to typical equipment from the database for replacement analysis which has already been stored or enter data as shown in Fig.14. Fig.15 shows the replacement report showing optimum replacement age and average cost of replacement of the typical equipment chosen for replacement analysis.

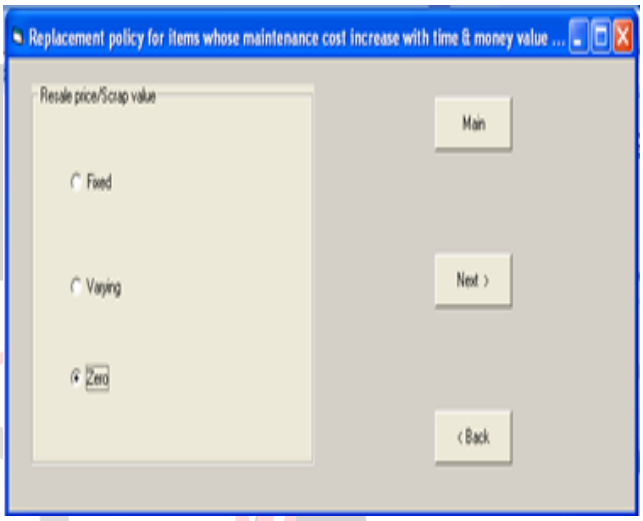

Fig.12 Screen to choose Zero resale price /scrap value

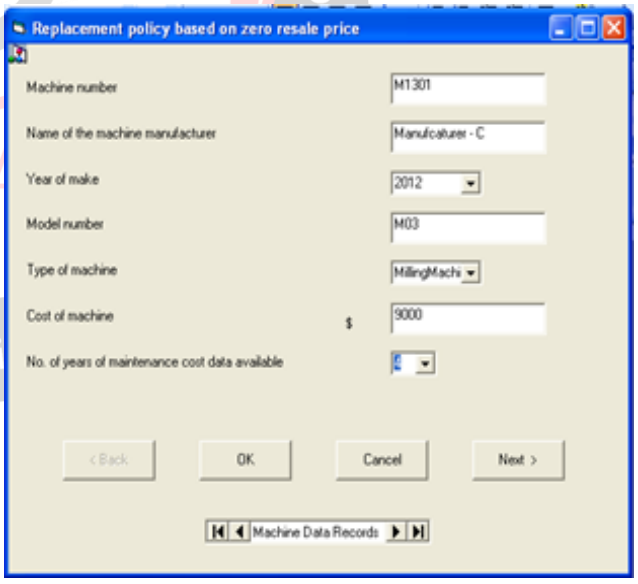

Fig.13 Replacement policy based on zero resale price/ scrap value

 DOI : 10.18231/2454-9150.2018.0306

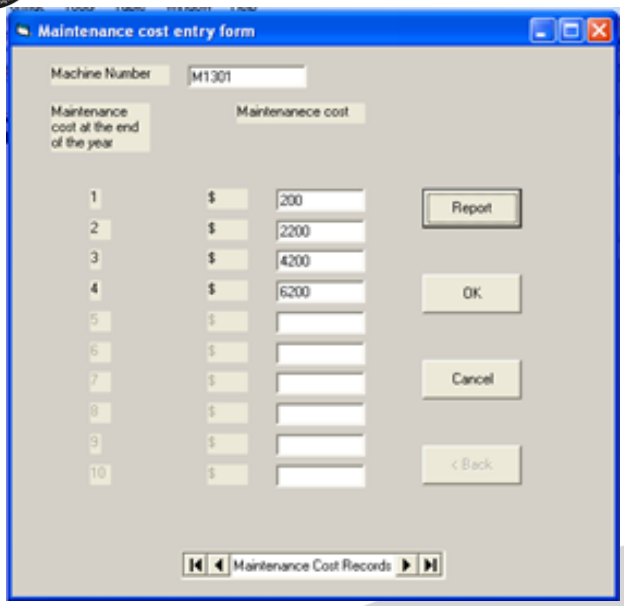

Fig.14 Maintenance cost entry form

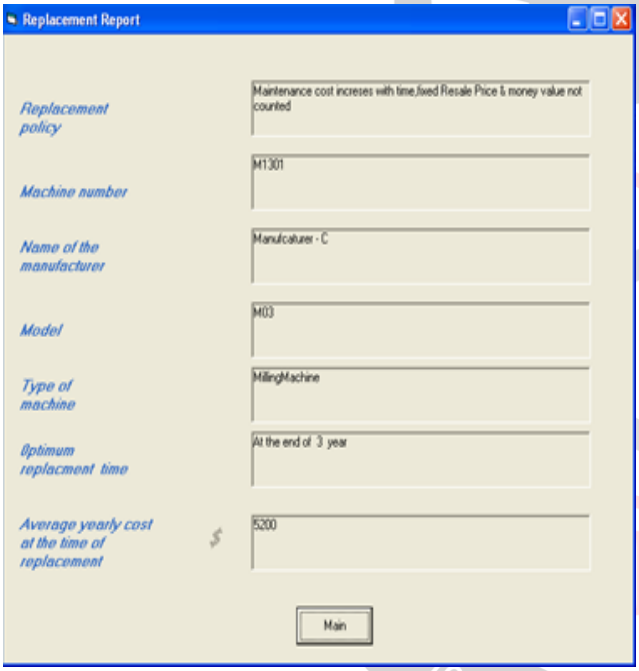

Fig.15 Replacement report

V. RESULTS

Replacement age of machine i.e. M101 is computed by retrieving cost of machine, maintenance cost data and fixed resale price as shown in Fig.4 and Fig.5. The optimum replacement age is at the end of 6th year since maintenance cost in 7th year ($1700) exceeds average yearly cost for 6 years ($1583.33).

The cost of machine and maintenance cost data for 8 years, varying resale prices of Machine (M1201) are retrieved as shown in Fig.8, Fig.9 and Fig.10 respectively. By clicking the report button, computation is performed to find average cost; and comparison is made between maintenance cost and average cost. The optimum age of replacement of machine M1201 is reported at the end of 5th year as shown in Fig.11 due to maintenance cost in 6th year ($2800) is more than average cost for 5 years i.e. ($2700).

The cost of machine and maintenance cost data of machine M1301 are retrieved and optimum replacement age is computed in the similar way by considering zero scrap value and replacement age is found to be at the end of 3 years as reported in Fig.15.

VI. CONCLUSIONS

Equipment replacement software has been developed to computerize the implementation of replacement policy for equipment whose maintenance cost increases with time and not considering money value to determine replacement age and average yearly cost at the time of replacement. It results in the minimization of time to manually determine replacement age for cases involving fixed, variable and zero resale or scrap value of equipment. It enables to retrieve maintenance cost records from database for existing machines to determine optimum replacement age. The estimated maintenance cost shall be entered for a new equipment to determine its replacement age. It helps in taking purchase decisions in short time by performing replacement analysis using the GUI based software.

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 DOI : 10.18231/2454-9150.2018.0306