

Computer Supported Replacement Management Considering Money Value

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Abstract – Replacement of equipment or machine may be needed when the cost of maintenance and repair, operating cost increases which makes its continuation uneconomical. In this work, software was developed to computerize the implementation of replacement policy for equipment whose maintenance cost increases with time and money value changes at constant rate to determine replacement time and weighted average cost of the equipment. It helps in reduction of time to determine replacement age of the selected machine and to compare two machines in order to choose the best machine to purchase considering money value.

Keywords- Replacement analysis, optimum replacement time, weighted average cost, money value

I. INTRODUCTION

Replacement of machine or equipment may be needed due to increased maintenance and operating costs, technological obsolescence, and deterioration etc. Depreciation in money is considered in the replacement policy [1]. The classical Bayesian approach has been used for replacement decisions [2]. Fuzzy approach was adopted for strategic replacement analysis [3]. A new approach was proposed to solve replacement problem under dynamic technological environment [4]. Nair, Suresh K., and Wallace J. Hopp [5] considered available replacement technology and technological obsolescence to compute optimal equipment replacement decision. Al-Chalabi, Hussan, et al. [6] developed an optimization model based on operating and maintenance costs, purchase price and machine resale value to identify economic life time of mining drilling machine. Rajagopalan, S [7] developed a model considering replacement of capacity, expansion and disposal along with scale economy effects. Aven, Terje, and Rommert Dekker [8] presented a general framework for optimal replacement of models.

Replacement management 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 considering money value to determine replacement age and weighted average cost of an existing machine.

The maintenance cost and other information related to an existing machine / equipment can be retrieved from database for subsequent replacement analysis. The best machine shall be chosen by comparing weighted average costs of two machines. New machines are compared by

entering estimated maintenance cost of machines, worth of money per year and cost of machine.

II. REPLACEMENT POLICY FOR ITEMS WHOSE MAINTENANCE COST INCREASES WITH TIME AND THE MONEY VALUE CHANGES WITH CONSTANT RATE

Fig.1 shows the start up screen to implement the replacement policy for items whose maintenance cost increases with time and there is change in the money with constant rate by clicking on the button. User can apply the replacement policy on an existing machine or choose best machine by comparing an existing machine with a new machine by clicking an appropriate button in the screen as shown in Fig.2.

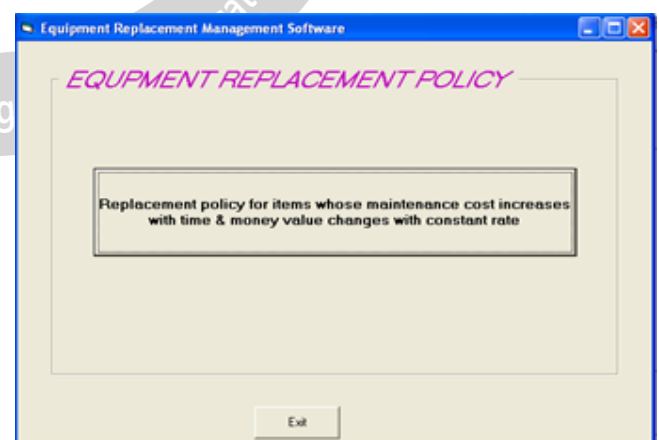


Fig.1 Replacement policy

The user can retrieve or enter the cost of machine, number of years maintenance cost data available, money worth per year and other pertinent information related to machine in the screen as shown in Fig.3. The user can commit the data by pressing *OK* button which enables *Next* button. Next

button can be pressed to navigate to the next screen as displayed in Fig.4.

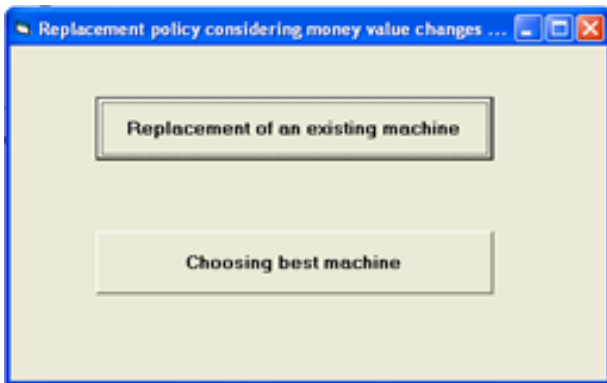


Fig.2 Screen to select replacement age of an existing machine

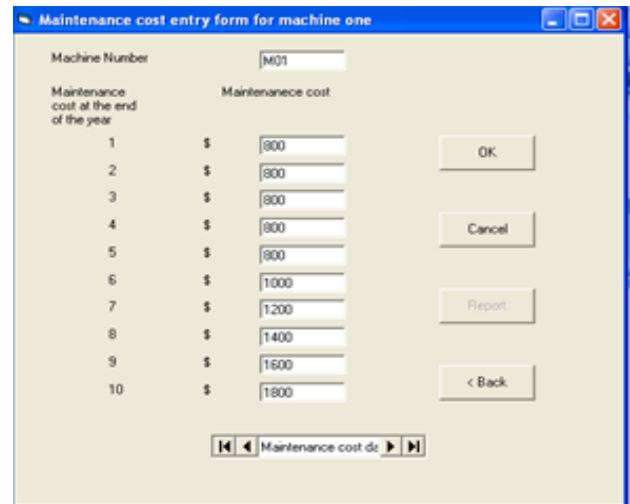


Fig.4 Maintenance cost data entry form

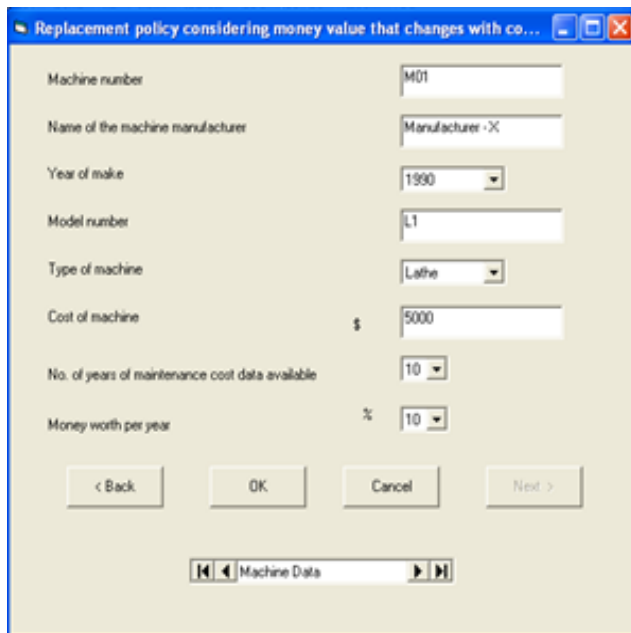


Fig.3 Replacement policy considering money worth per year

The maintenance cost data of the machine chosen for analysis shall be retrieved by navigating through data control with name *Machine Data*. The user can commit the data by pressing *OK* button which enables *Report* button. The user can press *Report* button to compute replacement age and weighted average cost and generate the report as shown in Fig.5.

III. CHOOSING BEST MACHINE CONSIDERING MONEY VALUE

User can press *choosing best machine* button to compare two machines / equipment considering money value as shown in Fig.6.

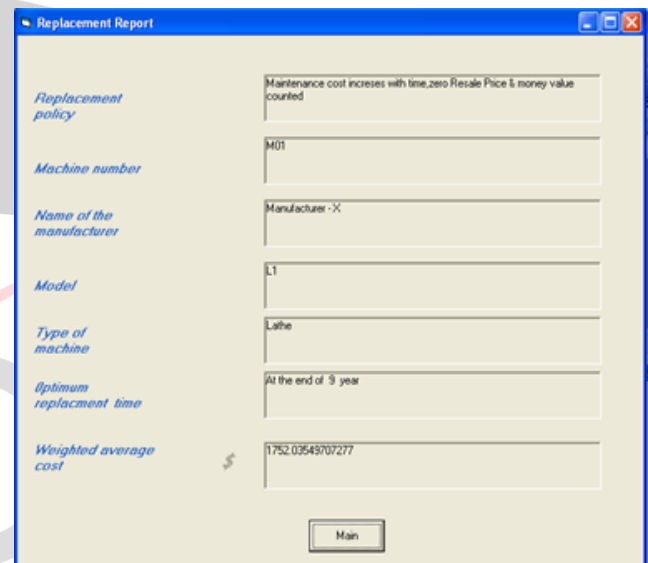


Fig.5 Replacement report

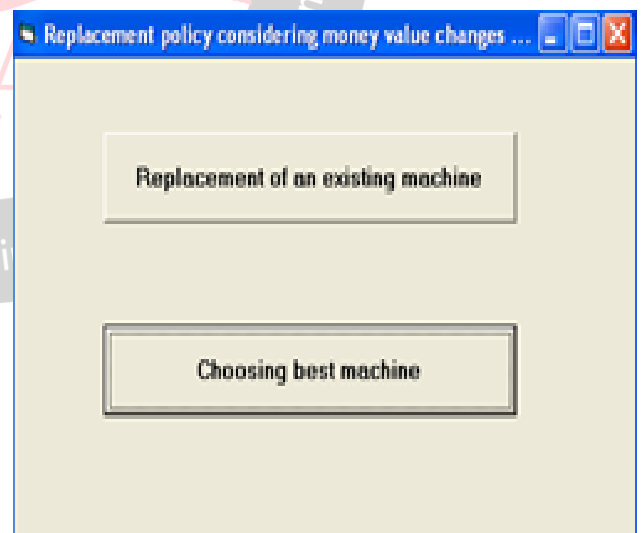
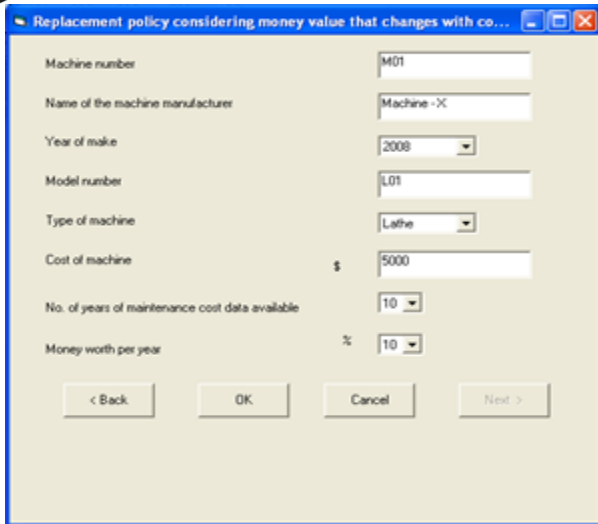


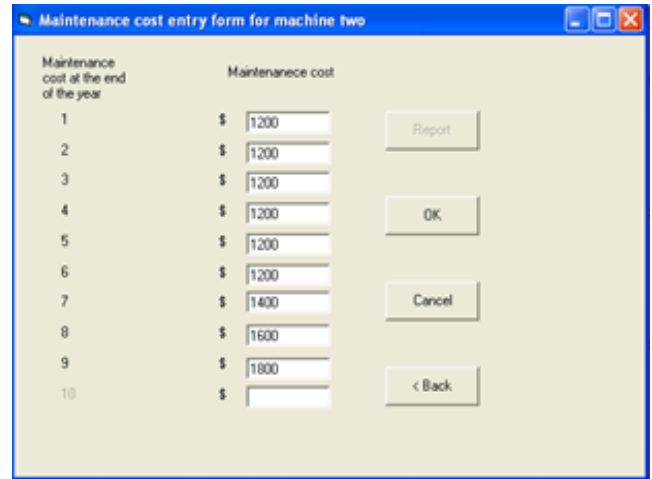
Fig.6 Screen to choosing best machine

The user can enter the Machine1 details and maintenance cost data as shown in Fig.7 and Fig.8 respectively.



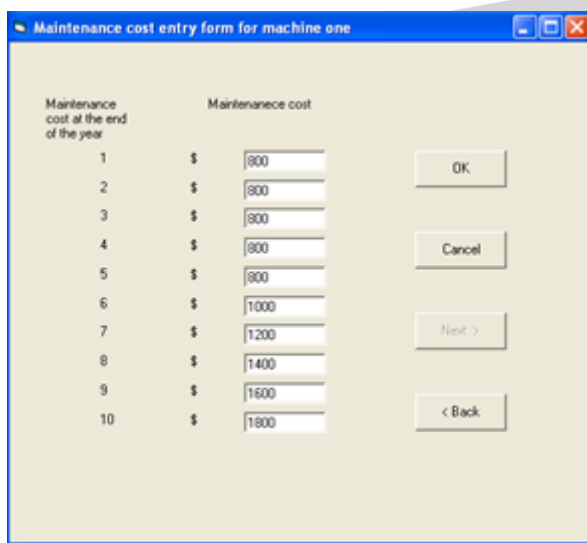
Machine number: M01
 Name of the machine manufacturer: Machine -X
 Year of make: 2008
 Model number: L01
 Type of machine: Lathe
 Cost of machine: \$ 5000
 No. of years of maintenance cost data available: 10
 Money worth per year: % 10

Fig.7 Screen to enter Machine 1 details



Maintenance cost at the end of the year	Maintenanece cost	
1	\$ 1200	Report
2	\$ 1200	
3	\$ 1200	
4	\$ 1200	OK
5	\$ 1200	
6	\$ 1200	
7	\$ 1400	Cancel
8	\$ 1600	
9	\$ 1800	
10	\$	< Back

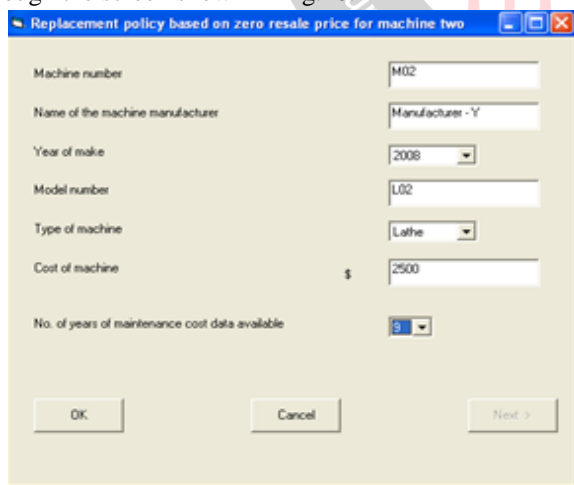
Fig.10 Screen to enter Machine 2 maintenance cost data



Maintenance cost at the end of the year	Maintenanece cost	
1	\$ 900	OK
2	\$ 800	
3	\$ 800	
4	\$ 800	Cancel
5	\$ 800	
6	\$ 1000	
7	\$ 1200	Next >
8	\$ 1400	
9	\$ 1600	
10	\$ 1800	< Back

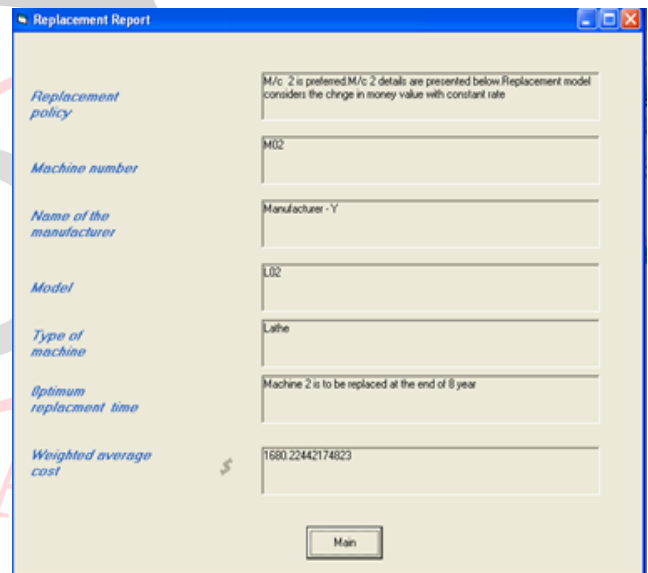
Fig.8 Screen to enter Machine 1 maintenance cost data

Machine 2 details are to be entered as shown in Fig.9. Maintenance cost records of machine 2 have to be supplied through the screen shown in Fig.10.



Machine number: M02
 Name of the machine manufacturer: Manufacturer -Y
 Year of make: 2008
 Model number: L02
 Type of machine: Lathe
 Cost of machine: \$ 2500
 No. of years of maintenance cost data available: 5

Fig.9 Screen to enter Machine 2 details



Replacement policy
 M/c 2 is preferred M/c 2 details are presented below Replacement model considers the change in money value with constant rate

Machine number: M02
Name of the manufacturer: Manufacturer -Y
Model: L02
Type of machine: Lathe
Optimum replacement time: Machine 2 is to be replaced at the end of 8 year
Weighted average cost: \$ 1680.22442174823

Fig. 11 Replacement report considering money value

IV.CONCLUSIONS

Replacement management software has been developed to computerize the implementation of replacement policy for equipment whose maintenance cost increases with time and considering money value to determine replacement age and weighted average cost of a machine.

It helps in the reduction of computational time to find replacement age and weighted average cost of a selected machine and also to compare two new machines with estimated maintenance costs to choose the best machine. In the current analysis, machine 2 is preferred since its weighted average cost i.e. \$1680.22 is less than \$1752.03 prevailing for machine 1.

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