© 2018 IJSRSET | Volume 4 | Issue 10 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Replacement Problem Using Fleet Management

C. Raagashree [1], K. Sangeetha[2]

[1]M.Sc Student, Department of Mathematics, Dr. SNS Rajalakshmi College of Arts And Science, Coimbatore, Tamil Nadu, India

[2]Assistant Professor, Department of Mathematics, Dr. SNS Rajalakshmi College of Arts and Science, Coimbatore, Tamil Nadu, India

ABSTRACT

Fleet constitute the most important production means in transportation. Fleet management can include a range of functions such as vehicle financing, maintenance, vehicle telematics (tracking and diagnostics) driver management, speed management, fuel management and healthy and safety management.

Keywords : Replacement Problem for Equipment, Definitions and Fleet Management Problem.

I. INTRODUCTION

The term OR was introduced in 1940 in UK during 2nd world war military management called on scientist from various disciplines they organized themes to solve various strategic problems and they gave suggestions to improve and achieve a remarkable progress .The systematic and scientific study of the operation of the system is called operation research Many industrial managers were attracted and use OR techniques to solve executive problem.

In 1950 OR was recognized as a subject in many universities it became a part of the academic part of the academic syllabus in the department of mathematics social work commerce and engineering .In India OR was introduced in 1949 at regional research laboratory at Hyderabad in 1953 OR unit was launched at Indian Statistical Institute at Calcutta OR was applied in various fields such as national planning and survey developing country economy OR themes in industrial sector.

OR is the application of scientific methods techniques and tools to problems involving the operations of a system so as to provide those in control of the system with optimum solution to the problem.

OR is useful to directing authority in deciding authority in deciding optimum allocation of various limited resources such as men, machine, materials, time, money etc for achieving the optimum goals.

OR is useful to production specialist in designing, selecting and locating sites determining the number of size scheduling and sequencing the production trends by proper allocation of machines and calculating the optimum product.

OR is useful to the marketing managers in determining how to buy, how often to buy, when to buy and what to buy at the minimum possible cost distribution points to sell the products and choice of the customers minimum per unit sale price the customer preference relating to the color packaging etc for various products and size of the stock to meet the future demand choice of different media and advertisement.

OR is useful to the personal administration in finding out skilled persons at minimum cost number of

persons to be maintained on full time basis in a work load the optimum manner of sequencing personal to a variety of jobs. OR is useful to the financial controller to find out a profit plan for the economy determining the optimal replacement policies find out the long term capital requirements.

II. PRELIMINARIES

2.1 VEHICLE TRACKING:

The most basic function in fleet management system is the vehicle tracking component. This component is usually GPS based but sometimes it can be based on GLONASS or a cellular triangulation platform. Once vehicle location direction and speed are determinend from GPS components, additional tracking capabilities transmit this information to a fleet management software application. Methods for data transmission include both terrestrial and satellite

2.2 MECHANICAL DIAGNOSTICS:

An advanced fleet management systems (FMS) can connect to vehicles onboard computer and gather data for the user .Data such as mileage and fuel consumption are gathered into a global statistics scheme.

2.3 DRIVER BEHAVIOUR:

Highly developed fleet management and vehicle telematics system collect a full range of data in real time and for transport and fleet managers. By combining received data from the vehicle tracking system and the on board computer it is possible to form a profile for any given driver (average speed, frequency of detours, breaks, severity of manoeuvres, choice of gears, etc).This data can be used to highlight drivers with dangerous habits and to suggest remedial training applicable to the issues or to ensure that drivers are meeting KPI's.

2.4 FLEET MANAGEMENT SOFTWARE:

Fleet management software enables people to accomplish a series of specific tasks in the management of any or all aspects relating to a company's fleet of vehicles. These specific tasks encompass all operation from vehicle acquisition to disposal .Software depending on its capabilities allows function such as recording driver and vehicle details the tracking of procurement cost ,scheduling of maintenance and servicing tasks import of fuel transaction and measuring of fleet performance via reports and charts.

2.5 MANAGEMENT OF SHIPS:

Fleet management also refers to the management of ships while at sea .Shipping fleet management contracts are normally given to fleet management companies that handle aspects like crewing, maintenance and the day to day operation. This gives the ship owner time to concentrate on cargo booking.

2.6 FLEET SECURITY AND CONTROL:

Recent advances in fleet management allow for the addition of over-the-air (OTA) security and control the fleet vehicles. Fleet security and control includes security of the vehicle while stopped or not in the operation and the ability to safely disable a vehicle while in operation. This allows the fleet manager to recover stolen or rogue vehicles while reducing the chance of lost or stolen cargo. The additional Fleet Security and control to a fleet management system gives a fleet card manager preventative measure to address cargo damage and loss.

2.7 REMOTE VEHICLE DISABLING SYSTEM:

Remote vehicle disabling system provide users to remote locations ability to prevent an engine from starting, prevent movement of a vehicle and to stop or slow an operating vehicle. Remote disabling allows a dispatcher or other authorized personnel to gradually decelerate a vehicle by downshifting, limiting the throttle capability or bleeding air from the breaking system from a remote location. Some of these systems provide advance notification to the driver that the vehicle disabling is about to occur. After stopping a vehicle, some systems will lock the vehicles breaks or

will not allow the vehicle engine to be restarted within a certain time frame

Remote disabling system can also be integrated into a remote panic and emergency notification system. In an emergency, a driver can send an emergency alert by pressing a panic button on dashboard or by using a key-fob panic button if the drive is within close proximity of truck. Then the carrier or other approved organization can be remotely alerted to allow a dispatcher or other authorized personnel to evaluate the situation, communicate with driver and potentially disable the vehicle.

2.8 FLEET REPLACEMNT AND LIFECYCLE MANAGEMENT:

The timely replacement of vehicles and equipment is a process that requires the ability to predict asset lifecycle based on costing information, utilization, and asset age. Organizations prefer to use new fleet as a strategy for cost reduction where the used fleet is sold that a new fleet is maintained.

Funding requirements are also an issue, because many organizations, especially government, purchase vehicles with cash. The ad hoc nature and tradition low funding levels with cash has put many operation in an aged fleet. This lack of adequate funding for replacement can also result in higher maintenance cost due to aged vehicles.

2.9 DUTY OF CARE:

In the UK, in April 2008, the corporate Manslaughter Act was strengthened to target company directors as well as their drivers in cases of road deaths involving vehicles used on business. The police have said they now treat road death as 'an unlawful killing' and have the power to seize company records and computers during the investigations. They will bring prosecutions against company directors who fail to provide clear policies and guidance for their employees driving at work. Unfortunately in UK a number of businesses are failing to meet their duty of care. In particular prosecutions can be brought against company directors for failing to meet their duty of care and allowing HGV driver hours to exceed the legal limits. Directors and business owners may not be aware that privately owned vehicles used for business journeys are treated exactly the same as company owned vehicles. Directors have an equal responsibility under the law to ensure the vehicles are also roadworthy and correctly insured. It is vital that every company has a 'Driving at work' policy in place covering every element of their business vehicle operation, no matter how few vehicles are involved and who owns them. Every employee driving for business is required to sign up to the policy .In this way the directors can reduce the risk of being prosecuted.

III. REPLACEMENT PROBLEMS

The replacement problems are concerned with the situations that arise when some items such as men machine electric bulbs etc need replacement to their decreased efficiency failure or breakdown such decreased efficiency or complete breakdown may either be gradual or all of a sudden

The replacement problems arises because of the fallowing factors

1. The old item has become worse or require expensive maintenance
2. The old item has failed due to accident
3. A more efficient design of requirement has become available in the market
4. The problem of replacement is to decide the best policy to determine the age at which the replacement is most economical instead of continuing at increased cost due to factor like maintenance
5. The objective is to find the optimum replacement period

3.1 TYPES OF REPLACEMENT SITUATIONS:

i. Replacement of items that deteriorate with time
Example: machine tools planes

ii. Replacement of items which do not deteriorate but fail after certain amount of use
Example: electric bulbs radio tubes for items which do not deteriorate but fail all of a sudden

3.2 TYPES OF REPLACEMENT POLICIES:

1. INDUVIDUAL REPLACEMENT POLICY:

Under this policy an item is replacement is replaced immediately after its failure

2. GROUP REPLACEMENT POLICY:

When this policy we take decision as to when the issue must be replaced irrespective of its fact that items have failed or have not failed with the provision that if any item fails before the replacement time it may be individually replaced

3.3 REPLACEMENT POLICY FOR EQUIPMENT WHICH DETERIOATES GRADUALLY

Purchase price=value remaining after n years +maintenance cost for n years

C=the purchase price for equipment

S=the scrap value of equipment at the end of n years

f (t)=the maintenance cost of the equipment in year t

T=total cost of maintenance of equipment for n year

Optimum replacement period is the corresponding minimum value of T_A

Year	f (n)	$\sum$ f (n)	C-S	T	T_A
1	1800	1800	1600	3400	3400
2	2200	4000	2450	6450	3225
3	2700	6700	2900	9600	3200
4	3200	9900	3000	12900	3225
5	3700	13600	3000	16600	3320

T_A is minimum for n=3

Car should be replaced every 3rd year

$$\text{Total cost } T=C-S+\sum_{t=1}^{n} f(t)$$

$$\text{Average cost } T_A=1/n[C-S+\sum_{t=1}^{n} f(t)]$$

Optimum replacement period is the corresponding minimum value of T_A

Fleet cars have increased their costs as they continue in service due to increased direct operating cost (gas and oil) and increased maintenance (repairs, tyres, batteries etc) the initial cost is Rs.3500 and the trade in value drops as time passes until it reaches a constant value of Rs.500.Given the cost of operating maintaining and the trade in value determine the proper length of service before cars should be replace:

Year of service	1	2	3	4	5
Year of trade In value	1900	1050	600	500	500
Annual open Cost	1500	1800	2100	2400	2700
Annual maintenance Cost	300	400	600	800	1000

Solution:

Given C=Rs3500

S (n) =year and trade in value

f (n) =operating cost +maintenance cost

IV. CONCLUSION

The fleet complement problem can be considered on a level of single vehicles or on a level of entire fleets. It makes a significant difference in the way budget limitation mean available fund that can be spent on replacement vehicles.

V. REFERENCES

[1]. Prof. Britten, A., 1971, Decision making in vehicle management, report no. S.15 of Local Government Operational Research Unit of the Royal Institute of Public Administration, United Kingdom.

[2]. Christer, A., Good body, W., 1980, Equipment replacement in an unsteady economy, Journal of the Operational Research Society, 31(6), 497-506.

[3]. Eilon, S., King, J., Hutchinson, D., 1966, A study in equipment replacement, Operational Research Quarterly, 17(1), 59-71. Glasser, G., 1969, planned replacement: Some theory and its application, Journal of Quality Technology, 1(2), 110-119.

[4]. Hartman, J.C., 1999, A general procedure for incorporating assets utilization decisions into replacement analysis, The Engineering Economist, 44(3), 217-238.

[5]. Jardine, A., Buzacott, J., 1985, Equipment reliability and maintenance, European Journal of Operational Research, 19, 285-296. Nakagawa, T., 1984, A summary of discrete replacement policies, European Journal of Operational Research, 17, 382-392.

[6]. Redmer, A., 2009, Optimization of the exploitation period of individual vehicles in freight transportation companies, Transportation Research Part E, 45(6), 978987 (DOI: 10.1016/j.tre.2009.04.015).

[7]. Redmer, A., 2014, Strategic vehicle fleet management - the make or buy problem, Log Forum - Scientific Journal of Logistics, 10(2), 205-212.

[8]. Redmer A., 2015, Strategic vehicle fleet management - the composition problem. Log Forum 11 (1), 119-126 (DOI: 10.17270/J.LOG.2015.1.11).