ANALYSIS OF EVALUATION METHODS IN ROAD PAVEMENT MANAGEMENT

Pritam Dey[1], Pinaki P. Nayak[2]

[1]*PG Student, Department of Civil Engineering, Sharda University*
[2]*Assistant Professor, Department of Civil Engineering, Sharda University*

Abstract- The different evaluation methods act as the major factor in road pavement management. The local authorities played a vital role in the fulfilment of the various functional and analytical problems and specifications. Here, mainly questionnaire based paperwork has been carried out in an effective manner, keeping the perspectives of the different authorities that played a vital role in the completion of the desired goal. The main goal was to take their feedback in the form of a questionnaire and analyse them between each other to determine the various concords and norms that they usually follow. The questionnaire is based on some phenomenon's depending on certain factors and conditions from various review papers, journals, etc. such as functional class of road pavement, pavement type, condition such as ride quality, distress, friction of road pavement, deflection of road pavement, costs, history, traffic loads on road pavement

Keywords- Pavement management system (PMS), cracking, deformation, cost, traffic parameters, etc.

I.   INTRODUCTION

An efficient transport system is a pre-requisite for sustainable economic development of a country. The highways play an important role in the development of a country and also improve the living standard of the people. The road development programs envisaged for the country involve large amount of money, manpower, materials and machinery not only for the construction of new roads, but also for the improvement of the existing road network. Road transport is the most widely used system of transportation. This mode of transportation carries 85 % of the passenger traffic and 70% of the freight traffic.

So, in addition to the wide and efficient road network, the quality of the roads should be as per the best available standards. Presently there is no system to monitor and assure the quality and quantity of the work. The machinery used for the construction of a highway does not have any check on the various ingredients of the material used and thus the quality and quantity of the product are not assured. The highway construction materials are carried through tippers, trucks etc. but there is no system available to monitor an Engineer, to check the fuel consumption of the vehicles, theft of fuel, if any, unnecessary halt of the vehicles which leads to delay in the completion of a project.

For a stronger management on the standard, the machinery used for construction of the highways has been updated in order that it will have associate automatic check on the standard of the merchandise. The Vehicle pursuit System, Fuel sensing element and world Positioning System; are employed in the development of a route and consequently a model has been developed for the right observance of the vehicles throughout the execution of versatile pavements.

In the road management method, associate analysis of road pavement conditions is one amongst the foremost vital aspects needed to ensure adequate useful standards and an appropriate maintenance programme. Associate awareness of pavement conditions is critical so as to be able to programme short, medium and long maintenance works inside a scientific management system; Pavement Management System, which allows obtainable resources to be optimized guaranteeing that useful standards and pre-established safety standards area unit are forever met. The importance of road network management supported by the implementation of a PMS could be a construct that's presently accepted by nearly all those countries that invest resources, not such a lot into the building of latest roads, as into analysis to keep up existing pavements in fitness. For this reason, over the previous few years, completely different researches dedicated to road knowledge assortment technology have investigated some way of rising surface distress knowledge assortment procedures, with the aim of demonstrating that distress measurements taken manually or captured by machine-driven pictures area unit consistent, as area unit the distress indices that ensuing from them.

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In this study we tend to area unit in the main focus in Indian road pavement management system. Thus, for correct maintenance, first, it's necessary to look at and clarify the factors of that deterioration. Then, observance and evaluating of the condition of pavement ought to be done sporadically to secure its performance for road network maintenance and management. The developing countries have lost precious infrastructure value billions of bucks through the deterioration of their roads. If they are doing not right away begin to try and do way more to preserve their roads, they're going to lose billions a lot of giant road networks, designed at nice expense, are below maintained and a lot of heavily used and abused than expected.

Generally, to gauge asphalt pavement once in commission, useful deterioration like topical cracking, deformation, wear, and low bearing of every layer or some such structural deterioration were thought-about. In several developing countries, related to road management system counselled from supporting countries, paved surface analysis systems and structural analysis systems are applied. In these systems, visual scrutiny is conducted to the visual things like crack, potholes then on, specialised measuring system equipped during a survey vehicle is employed to gauge the evenness and deflection that require quantitative analysis.

II.   LITERATURE REVIEW

Collop & Cebon (1995) gave a conclusion that a model is capable of making deterministic pavement damage predictions resulting from realistic traffic and environmental loading [1]. It actually concluded that the whole life performance model (WLPPM) based of pavement surface-roughness components can be smoothed out, and traffic loading can be improved.
Sebaaly (1996; 1999) gave a conclusion on bituminous concrete overlays have been formulated to evaluate Alligator cracking, rutting, depression and swell distress [2; 3].
Jain et al. (2000) concluded on a study that was conducted on pavement management system for rural roads and developed a rational approach for low cost pavement management system [4]. Nagakumar & Veeraragavan A (2000) reviewed the various factors that contribute to the stresses due to combined action of traffic & climatic factors [5].

Chai et al. (2004) made a preliminary calibration of HDM-4 (Highway Development Management) was done for North-South Expressway in Malaysia [6]. The factors considered in this were roughness, age & environmental data.

In 2013, Rao & Thombare created new method of rehabilitating asphalt pavements knows as ultra-thin white topping (UTW) [7]. In 2014, Girimath, S. B. and Fellow, P., conducted Pavement management system for urban roads [8].

In 2015, Gupta, P. K. & Kumar R., concluded development of optimum maintenance and rehabilitation strategies for urban bituminous concrete surfaced roads [9].

III.   METHODOLOGY

The methods was used to get the valuable replies from the different organisations is merely based on a general survey by providing them with a questionnaire each. Questionnaires have been prepared on methods of pavement management system (PMS) depending on factors and conditions given below as per the various review papers, journals, etc.

1. Functional class of road pavement.
2. Pavement type, etc.
3. Condition- Ride quality, distress, friction of road pavement.
4. Deflection of road pavement.
5. Costs.
6. History.
7. Traffic loads on road pavement.

Similarly, for costs section we take;

1. Planning & Estimating (P&E).
2. Design.
3. Construction.
4. Preventive and routine maintenance.
5. Rehabilitation/ resurfacing/ reconstruction.
6. Salvage.

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But as per road pavement history some more important aspects were also needed to be considered like;

1. Initial construction data which mainly comprises of date, cost, material, structure, etc.
2. Preventive maintenance consists of date, treatment, cost, material, structure, etc.
3. Rehabilitation consists of date, treatment, cost, material, structure, etc.
4. Reconstruction consists of date, treatment, cost, material, structure, etc.

IV.   ANALYSIS OF SURVEY DATA

The data was collected from the various organisations and then analysed. Here, at the first instinct we see that *ORGANISATION 1* shows their interest/involvement with road pavement management as the questionnaire were given to them to get their feedback in the required topic.

1. They generally view the importance of road pavement management in high value.
2. Considering the role played by them in road pavement management they do basic materials research, rehabilitation option selection, and parameter research, traffic loading, development of guidelines, evaluate specific application issues, and Commercial evaluations.
3. In the future of Road Pavement management they said that the stimulation and advanced computer analysis should be used.
4. Benefits of Road Pavement Management they viewed improper materials design methods, Development of performance-related specifications, better understanding of variability, Warranty contracts, and Weather databases.
5. The main opportunities to disseminate Road Pavement Management research information are general engineering conferences, focused transportation conferences and journals, conferences like WCPAM (World Conference on Pavement & Asset Management).
6. They also related some load characteristics to road pavement management, they are; applied wheel load, tyre inflation pressure & type, suspension system, speed, overloading, pavement roughness.
7. Similarly, they also related some environmental data to road pavement management, they are; pavement temperature, rainfall, aging, drainage, depth to bedrock.
8. The environmental parameters that are controlled during road pavement management are pavement temperature, water application (method), aging (method), subgrade moisture, drainage.
9. Some aspects of pavement engineering they evaluated that may enhance construction and rehabilitation of pavements are Gradients, Durability, Traffic accommodation, Compaction, Quality assurance and quality control, Surface drainage, Sub-surface drainage.
10. They do not predict approaches for road pavement performance/maintenance.

Firstly, from *Organisation 1* they showed their interest in the questionnaire that was given for analysis from which it is clearly mentioned that they do carry out the Road Pavement Management process effectively. They support in all basic materials research, as well as in rehabilitation option, traffic loading etc. which generally plays a vital role in the organisation. They also view the importance of road pavement management in a generally higher value then the rest. They also depicts in stimulation and advanced computer analysis that should be used in distant future.

They also viewed some benefits of road pavement management which improves material design methods, development of performance-related specifications etc. So it can be concluded that the considerations made in a better road pavement management to function for longer periods of time, they undertake all kinds of gradients, durability, quality assurance & control etc. which places them in a good position for over viewing maintenance/management projects.

Secondly, we see that *ORGANISATION 2* also shows their interest/involvement with Road Pavement Management as the Questionnaires were given to them to get their feedback in the required topic as

1. They also view the importance of Road Pavement Management in High value.
2. As the role of Road Pavement Management we see that basic materials research, Pavement structure work, Rehabilitation option selection, Parameter research, Traffic loading and commercial evaluations.
3. In the future of Road Pavement Management we see growing, Stimulation and advanced computer analysis and other analysis should be used.

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4. In the benefits section we come to see Improved structural & materials design methods, Evaluation of novel materials and structures, Development of performance-related specifications, Material databases, improved performance modelling, and Better understanding of variability.

5. The main opportunities to disseminate Road Pavement Management research information can be focused transportation conferences, focused pavement engineering conferences, focused transportation journals, and focused pavement engineering journals, conferences such as WCPAM (World Conference on Pavement and Asset Management).

6. Load characteristics that they relate to Road Pavement Management are applied wheel load, Tyre inflation pressure, Tyre contact stress, Tyre type, Load configuration, Vehicle-pavement interaction, Speed, Rest periods, Overloading, Pavement roughness.

7. Environmental data that they relate with Road Pavement Management are ambient air pressure, Pavement temperature, Rainfall, Relative humidity, Aging, Water table, Drainage, Depth to bedrock.

8. During Road Pavement Management certain environmental parameters are controlled, they are; Pavement temperature (ranges), Water application (method), Subgrade moisture, Drainage.

9. In construction and rehabilitation sections, the aspects of pavement engineering that they evaluate that may enhance construction and rehabilitation of pavements are Unconventional materials, Gradients, Joints, Buried pipes & culverts, Bridge deck joints, Road markings, Durability, Compaction, Reinforcement, Risk management, Preventive maintenance, Quality assurance/control, Surface texture, tolerance and drainage.

10. Approaches are not used by their system to predict road pavement performance/maintenance.

11. The type of treatment/maintenance recommendations that are generated in their pavement management system are of both type.

12. Factors that are considered in their road pavement management system for selecting a feasible pavement treatment/maintenance are Pavement condition, age & type, Traffic volumes/loads, Highway system (such as inter-state, NH, non-NH), Pavement layer characteristics (base or sub-base), Climatic condition.

13. They also includes cost estimates in the road pavement management system that also includes the cost of non-pavement related activities such as striping or guard-rail repairs.

Secondly, the *Organisation 2* although does not predict any kinds of road pavement management/maintenance, however, they undertake various load characteristics that they relate with road pavement management. They do emphasise on some of the environmental parameters that are duly controlled during road pavement management like temperature, water application, aging, drainage etc.

V. CONCLUSION & FUTURE SCOPE

The factors like basic materials research, as well as in rehabilitation option, traffic loading etc. which generally plays a vital role in the 1st surveyed organisation whereas according to 2nd organisation various load characteristics is related with road pavement management. Likewise, applied wheel load, tyre inflation pressure, tyre type, suspension system etc. are the factors considered in evaluation. They also undertakes some of the environmental parameters that are duly controlled during road pavement management, they are; pavement temperature, water application, aging, drainage etc.

In the future scope section, a detailed survey can be taken on more sites can be conducted for the better performance of Road Pavement Management. Various points may include like soil type, climates etc. can be measured and other several points can also be taken in consideration. Pavement roughness evaluation can also be done which can consist like rutting, bump, skid resistance, longitudinal stress, water permeability, Further; visual inspections that take place can be done more precisely. They consists inspection of potholes, cracks, local aggregate loss, edge break, scratches, bleeding, etc.

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