# Review on Maintenance of Roads based on Pavement Condition Index

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**Abstract –**As per civil engineering is concerned, Road network play important role in the transportation sector it is very important for every transportation engineer to maintain roads from various distresses. The reason is, the development of any country is measured on the basis of the road network it occupies and the quality of the same. Every type of road has its life span. It is expected to retain for the entire life span at all loading conditions. But due to improper material, low quality supervision roads are seen to be in good condition. This paper focuses on the various road maintenance techniques adopted by using PCI method.

**Keywords-** PCI.

## 1. INTRODUCTION

India has the one of the largest road network in world in which the part of rural road network is large. Population growth rate of country is high so the percentage of road users increases. So for the safe travelling there is need of well-maintained road network. The cost of reconstruction of road is mostly high as compared to maintenance work so maintenance is mostly preferred in developing countries.

The aim project is to develop pavement management system is based on following parameters Inventory assessment, Pavement Inspection, Condition Assessment, Condition Prediction, and Condition Analysis recommends priority of recommendation.

## 2. IMPORTANCE OF MAINTENANCE:

For any developing country there is need well maintained roads for better transportation. The growth rate of any country depends on transportation system of this country. So, the better transportation there is well maintained road are needed. Maintenance is important for any road because roads suffers from climatic conditions, traffic volumes, geographical conditions. If the maintenance is not done then the pavement life becomes decrease and it's directly effect on the cost. The cost of reconstruction of a road is high as compared to maintenance cost. So, maintenance is required to provide smooth traffic flow and saves the cost of reconstruction.

## 3. TYPES OF DISTERSS:

There are nineteen distresses present in the flexible pavement. All distresses present in flexible pavement are as follows:

| 1 | Alligator cracking |
| 2 | Bleeding |
| 3 | Block cracking |
| 4 | Bumps and sag |
| 5 | Corrugation |
| 6 | Depression |
| 7 | Edge cracking |
| 8 | Joint reflection cracking |
| 9 | Lane/shoulder drop off |
| 10 | Long and transverse cracking |
| 11 | Patching and utility cut |
| 12 | Polished aggregate |
| 13 | Potholes |
| 14 | Railroad crossing |
| 15 | Rutting |
| 16 | Shoving |
| 17 | Slippage cracking |
| 18 | Swell |
| 19 | Weathering |

## 4. PAVEMENT CONDITION INDEX (PCI)

Pavement condition index is calculated by determined by the ratio of total distress area to total patch area. Also distress quantity, severity, types of distress helps to determine the pavement condition index.

$$Pavement\ Condition\ Index\ =\ (Total\ Distress\ Area \div Total\ Patch\ Area) \times 100$$

## 5. OBJECTIVES

1. To compute distress severity in road network by pavement condition index (PCI).

2. To prioritize roads for maintenance based on the indicator.
3. To integrate the above task by developing a maintenance management system.

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## 6.    METHODOLOGY

In this research work, various road maintenance techniques by using PCI method are studied. First of all, data regarding the distress in the flexible pavement is collected to enhance the road maintenance work. Further PCI index gives percentage of distress as well as the present road condition. Same data is used to predict life of roads after maintenance work. This paper studies all the similar methods of road maintenance.

**Shah Y. U., Jain S.S., Tiwari D. and Jain M.K. (2013), "Development of Overall Pavement Condition Index for Urban Road Network".**

The author describes the evaluation of pavement performance done using pavement condition indicators which is basic component of pavement management system. The pavement maintenance management strategy was established by constructing overall pavement condition index, present serviceability index and roughness index. The overall combined index has developed for the Noida urban road network.  Various distresses which cause the damage to pavement surface were discussed which results in becoming remaining service life of the existing pavement unpredictable. The aim of this paper is to evaluate the condition of the pavement and damages to calculate the remaining service life of the pavement. The pavement condition calculated according to ASTM procedure and deflection data, air temperature, surface temperature, ground water level measured with the help of Falling Weight Deflectometer. The study resulted in establishing the correlation between PCI values and remaining service life.

**Setyawan Ary, Nainggolan Jolis, Budiarto Arif (2015), " Predicting the remaining service life of road using pavement condition index".**

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**Huidrom Lokeshwor, Das Lalitkumar and Sud S.K. (2013), "Method for automated assessment of pot holes, cracks, and patches from road surface video clips"**

The objective of this study is to develop a method which has the capacity to detect and measure pot holes, cracks and patches accurately from real life video for bituminous pavement. Pot holes, cracks, and patches are some types of road surface distresses whose assessment essential in India. In this research distress data collection done automatically by using various imaging systems and analysis of the collected raw video clips for distress assessment done manually which is expensive and time-consuming. In this paper method for automated detection and assessment of pot holes, cracks and patches from video clips proposed by auto detection of potholes, cracks, and patches and subsequent measurement.

**Juang C.H. and Amirkhanian S.N. (1992), "Unified Pavement Distress Index For Managing Flexible Pavements".**

In this paper, the author describes the evaluation of distresses for flexible pavement. According to his research there is six main distress mostly obtained in flexible pavement also described the measurement of severity of distress and decide rating scale for each distress type. The author also did pavement distress analysis using fuzzy sets. Pavement management system is based on the unified pavement distress index.

**Mahmoud Afaf, Ahmed Hassan Y. and Othman Ayman M. (2013), "Deterioration of Egyptian desert roads in al-minea district"**

In this paper author done work on development on a deterioration model for roads in Egyptian desert's road. For the preparation of the model collect the data regarding progressive deterioration stages of the road surface. He took 10 road segments for the study each segment had length 500 meters. For all 10 segments current pavement condition index calculated and plotted against the time for each road, and he developed a deterioration prediction model for Egyptian desert roads.

**Nassar Khaled M., Gunnarsson Hordur G., Hegab Mohamed Y.  (2005), "Using Weibull analysis for evaluation of cost and schedule performance"**

In the construction industry large amount of money lost because of poor scheduling and cost control. In this project, the author described a statistical approach named Weibull analysis to evaluate schedule performance of design or construction project. Weibull analysis is a common method for failure analysis and for reliability engineering. In this research, the Weibull analysis is used to comparing the reliability of the multiple projects. Various steps of analysis are discussed along with two projects are analyzed and compared, and author also concludes about the benefit of Weibull analysis for better control or monitors their project.

**Mohammed Shafi Akhai M., Shakeel Ahmed A., and Pai S. K. (2016), "Life cycle cost analysis of road pavements in rural areas"**

In this paper author described future need of road network in India. According to the author, we are behind the actual plan of constructing the road network. In this paper, he described total cost of construction required for flexible and rigid pavement for per meter square. Also, the cost of maintenance for flexible and rigid pavement is calculated by using PMGSY report for the year 2016.According to him the cost of construction of rigid pavement is 20%-25% greater than flexible pavement.

**Sahin Hakan, Narciso Paul, and Hariharan N. (2014), "Developing a Five-Year Maintenance and Rehabilitation (M&R) Plan for hot mix asphalt (HMA) and Concrete Pavement Networks".**

The author describes steps involved in developing a multi-year pavement maintenance and rehabilitation (M&R) plan which includes condition assessment, network inventory, identification of pavement sections requiring M&R, need analysis, and impact analysis. In this research Texas A & M university campus road network taken as case study consist of 13.95 miles of roadway. The pavement condition index is calculated with the help of ASTM (D-6433-07). The identified the road sections which required M & R. were prioritized based on cost parameter. Impact analysis used to determine the impact of the reduced budget.

## 5. CONCLUSION

India's population is continuously increasing so the need of well-maintained road network is also increased. So we have to plan according to future need not only taking today's problems of deterioration in consideration. If we plan for every maintenance work it will help to reduce cost and time required for the maintenance work. Road maintenance management system helps to take management decisions, financial decisions, and help by providing a scientific approach towards the maintenance of existing road network. By using maintenance management system we can predict future deterioration for the road network and prepare preventive maintenance plan for this. PCI method promotes the distress conditions of existing road bays.

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