

Road Failure Analysis for state highways in Sangli District by Weibull Distribution

Pujari Amey Raoso¹, Prof. S.V.Pataskar²

¹ P.G. Student Civil – Construction Management, D.Y. Patil College of Engineering, Akurdi, Maharashtra, India

² H.O.D.- Civil Engineering Dept., D.Y. Patil College of Engineering, Akurdi, Maharashtra, India

ABSTRACT:

Large amounts of money are lost each year in the construction industry because of poor schedule and cost control. Construction managers regularly monitor projects to ensure that the project performance is under control. The objective of this study is to present an activity-based model to conduct a probabilistic assessment and estimation of schedule performance in repetitive construction projects. This paper presents a statistical approach, namely Weibull analysis, to evaluate the schedule performance of construction or design projects. This paper focuses on the automotive component failure rate detection using Weibull analysis and Other survival analysis techniques. The analysis results agree well with real-world test data, and provide reasonable prediction of future failure trends. In this paper, a time-dependent deterioration forecasting model is presented.

Keywords - Distress analysis, Deterioration, Assessment

1. Introduction:

Construction activity durations are typically subject to uncertainty. As a result, the schedule performance of construction projects often deviates from the baseline plan. Once a construction project is started, an appropriate forecasting tool is required to use actual project performance data and identify schedule deviations that may lead to serious delays in the project delivery. Because of the unique nature of each construction project, duration of project activities often cannot be accurately predicted. In repetitive construction projects, schedule deviations can lead to significant schedule performance deficiencies. Continuous inspection and monitoring of the system are, however, often technically or financially difficult. Therefore, a need to develop an analytical deterioration forecasting model that can estimate the deterioration speed of either an individual component or the entire infrastructure system has been widely recognized.

2. Methodology:

The main objective of this research paper is to apply the weibull distribution to the roads in the sangli district. Weibull analysis is helpful to do failure analysis the procedure to apply weibull analysis is as follow:

- 1) First calculate the median rank for the available data by following formula

$$MR (\%) = \frac{(i-0.3)}{(N+0.4)} \times 100$$

- 2) Then the calculated MR value is put in the weibull distribution formula

$$PCI = 100 e^{-\left(\frac{t}{\tau}\right)^{\beta}}$$

PCI = Pavement Condition Index

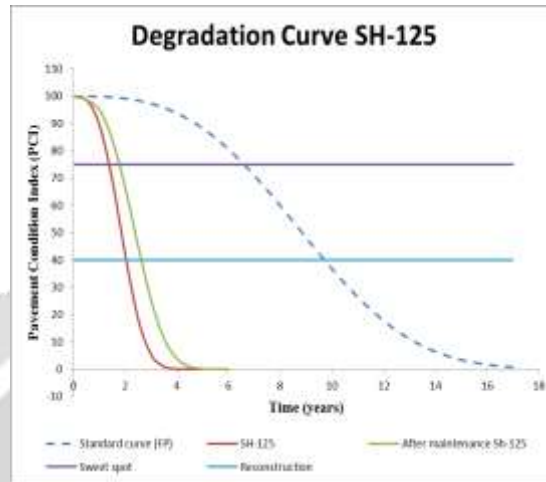
t = Time in years

β = Shape parameter (taken as 3)

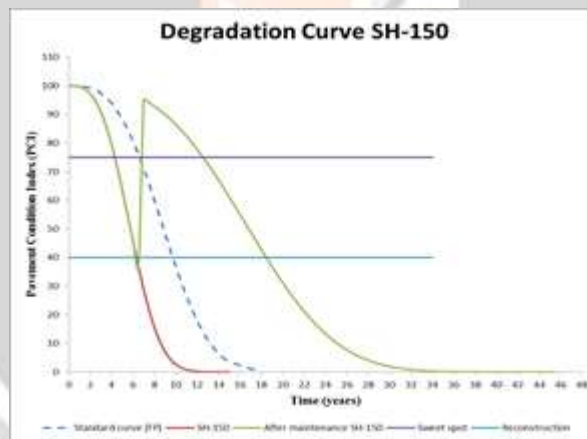
η = Scale parameter

- 3) Then calculate the value of “ η ” by weibull distribution graph.
- 4) Then by using Microsoft excel plot the graph between age of the pavement and the current pavement condition index. The sample calculation is as follow:

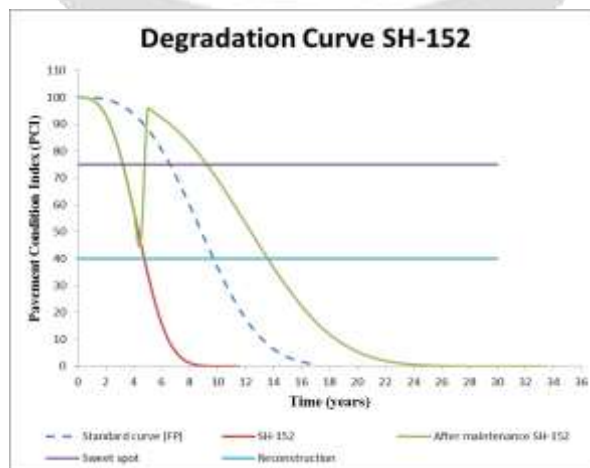
1) SH-125



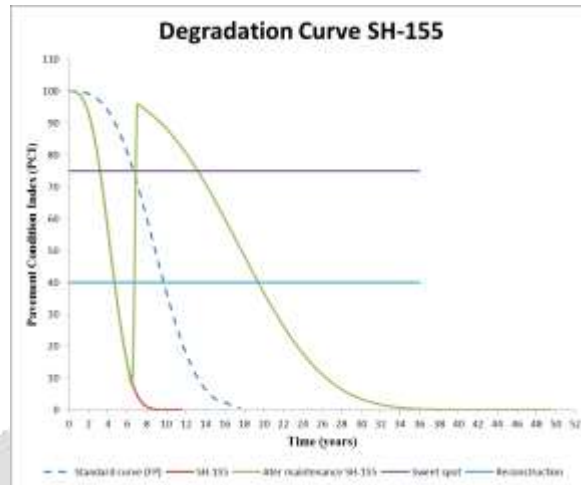
2) SH-150



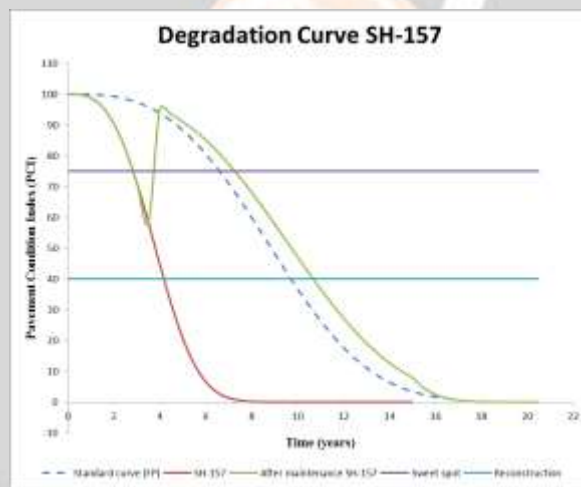
3) SH-152



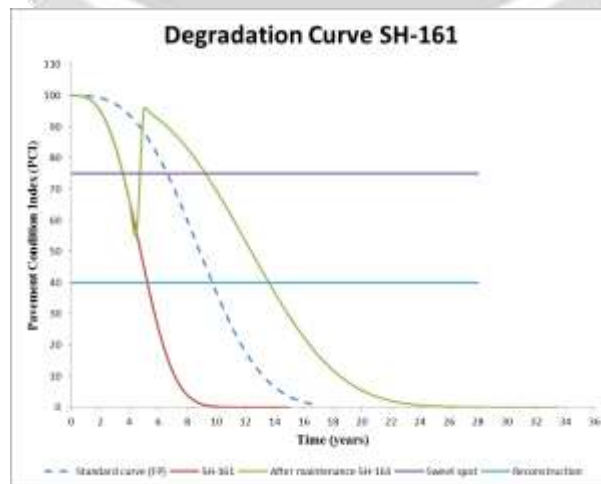
4) SH-155



5) SH-157



6) SH-161



3. RESULTS:

Failure of road from high to low:

- 1) SH-155
- 2) SH-150
- 3) SH-152
- 4) SH-161
- 5) SH-157
- 6) SH-125

4. CONCLUSION:

From above research work following points are concluded:

From the weibull plot between age and PCI failure analysis is done. From above research it is conclude that SH-155 is highly deteriorated and SH-125 is slightly deteriorated

5. REFERENCES:

- [1] C.H Juang, and S. N. Amirkhan (May 1991), "Unified Pavement Distress Index For Managing Flexible Pavements". (ASCE)
- [2] Habib Shahnazari, and Mohammad A Tutunchian, and Mehdi Mashayekhi, and Amir A. Amini (Dec 2012), "Application of Soft Computing for Prediction of Pavement Condition Index".
- [3] Ary Setyawan, and Jolis Nainggolan, and Arif Budiarto (Nov 2015), "Predicting the remaining service life of road using pavement condition index". (Science Direct)
- [4] Hakan Sahin, and Paul Narciso, and Narain Hariharan (Jan 2014), "Developing a Five-Year Maintenance and Rehabilitation (M&R) Plan for HMA and Concrete Pavements Networks". (Science Direct)
- [5] Yogesh U.Shaha, and S.S. Jainb, and Devesh Tiwaric, and M.K.Jain (Nov 2013), "Development of Overall Pavement Condition Index for Urban Road Network ". (Science Direct)
- [6] Abdullah I. Al-Mansour and Kumares C. Sinha and Thomas Kuczek 3(July 1994)" Effect of Routine Maintenance On Flexible Pavement Condition" (ASCE)
- [7] Jose M. Vassallo and Rafael Izquierdo (Nov 2002)" Modeling Road Maintenance Management and Financing"(ASCE)
- [8] Xueqin Chen and Qiao Dong and Hehua Zhu and Baoshan Huang (Nov 2015)" Development of distress condition index of asphalt pavements using LTPP data through structural equation modelling"(ELSEVIER)
- [9] Abhay Tawalare and K. Vasudeva Raju (Jan 2016)" Pavement Performance Index for Indian rural roads"(ELSEVIER)
- [10] American Society of Standard Material "Standard Practice for Roads and Parking Lots Pavement Condition Index"(D 6433-07)