Data Driven Granular Roadway Management for Local Agencies

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Granular roadway surfaces deteriorate with time owing to external factors such as traffic volume and weather impacts, or internal factors such as improper design, construction methods, or material quality issues. Proper budgeting and effective roadway treatment strategies are prerequisites for maintaining the granular roadway network at a satisfactory level. However, most local agencies constantly struggle with limited funding and typically determine maintenance and rehabilitation decisions based on subjective opinions and experience due to a lack of proper guidance and maintenance strategies. One of the most important issues that local agencies face in terms of granular roadway management is to determine annual maintenance needs (quantity of rock to be purchased) to make better budgeting decisions. The research goal here is to provide the county engineers with a model to estimate agency level annual rock requirements for granular road management purposes. To accomplish this goal, survival analysis was chosen because it can effectively handle censoring of data which is typically required for analysis of real-life situations. In this study, data from two Iowa counties was analyzed to predict the percentage of the roadway network expected to fall below a minimum acceptable criteria after a certain time, and the minimum amount of rock needed for resurfacing purposes. The estimated minimum rock requirement was compared with historical rock application data. The results showed significantly different behavior between the survival curves for Allamakee and Clay counties. Comparison with historical data also revealed, on average, that the Clay county annual rock application rate was approximately twice the minimum rock requirement estimated by the survival model. The results from this study will help local agencies to determine agency-level rock requirements at a given point in time, and will be useful for assessing different maintenance strategies and budget conditions.

Keywords: granular roads; maintenance; survival analysis