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ABSTRACT

A key aspect of asset management is the determination of the performance level at which a standard intervention is to be applied. A profligate policy, where an intervention is applied when the asset is in a state of superior performance, would mean frequent and premature spending of agency funds even though the users derive benefits of perpetually superior asset performance. This would result in little incremental benefit and can be considered a waste of agency funds. On the other hand, a parsimonious policy, where an intervention is applied when the asset is in a state of inferior performance, leads to the avoidance of agency spending at the cost of severe user consequences of poor asset performance. In between these two extremes, there exists a certain optimal performance threshold for intervention application that is consistent with the maximum possible benefits and minimum possible costs. Given the paucity of analytical research on the explicit and rigorous resolution of this issue, agencies have resorted to non-analytical methods such as averaging of historical pre-treatment performance levels or questionnaire survey of experts. With this background, this dissertation introduces a systematic and logical methodology for establishing the optimal asset performance thresholds for any intervention. This methodology is rooted in simple but robust and widely-known concepts that identify the optimal control decision parameters to yield minimum overall cost at maximum possible benefit or the highest cost-effectiveness. To demonstrate the proposed methodology, thresholds for selected pavement maintenance and rehabilitation treatments are established. Highway agencies can use this methodology to establish appropriate treatment triggers or performance thresholds to identify appropriate timings for each of their standard treatments. The methodology can also be applied to establish performance thresholds for various standard interventions in the management of other highway asset types.