

UTAH DEPARTMENT OF TRANSPORTATION

Materials & Pavements Fact Sheet

02/18/2021

UDOT's Pavement Asset Management Cycle - A Simple Approach to Network Optimization.

A robust pavement management system is data driven and helps the Department make the smartest choices for both short and long-term impact. Explained here in a simplified framework is how the Department is optimizing taxpayer dollars while maximizing pavement life.



Source:



ASSESS PAVEMENT CONDITION

- **WHERE ARE WE AT TODAY**

Each year we survey the entire network, which includes the Interstate in both directions-in the outside travel lane, and all other roads in the positive direction-in the outside travel lane. This outsourced contract is currently being performed by [Mandli](#). This meets what is considered the best practice in the industry.

The data collected and analyzed allows the Department to facilitate better forecasting and measure network progress as well as distribute funding between the various systems (Low Volume vs High Volume) or between various areas of the state.

OPTIMIZE YOUR TREATMENT PLAN

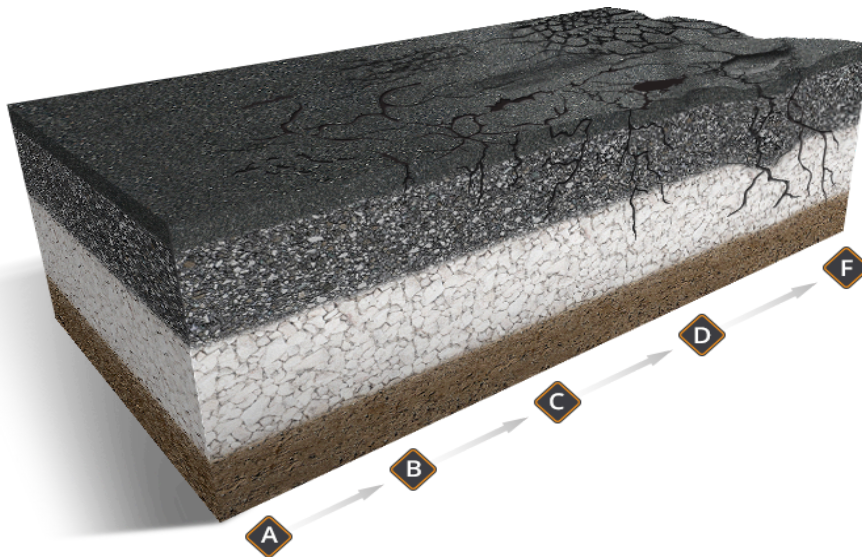
- **HOW CAN I MAXIMIZE THE DOLLARS RECEIVED?**

- Understanding Equivalent Annualized Cost (EAC) - Making apples-to-apples cost comparisons.
- Understanding Remaining Service Life (RSL) - Is the network gaining or losing life with a given treatment plan?
- Understanding Cost-Benefit Value (CBV) - With limited resources, which projects make the cut.

A Pavement Management System (PMS) is the best way to integrate these concepts with a predictive ability to understand the impact of choices today, on the network tomorrow, and to justify funding needs to decision-makers.

For this effort the Department uses the [Deighton Total Infrastructure Management System](#) (dTIMS). In simple terms, dTIMS takes the available funding levels and maximizes the system condition as a whole for both Low and High Volume Roads. This analysis is based on deterioration curves of various pavement conditions, as well as traffic. The Department uses from the model, a surface condition indicator, the International Roughness Index, IRI (the roughness of the road), to predict and show if current funding is sufficient to meet the desired long term pavement performance.

Consider the image below, which shows a pavement's deterioration from "A", new or good condition, through "F" to failing or poor condition.



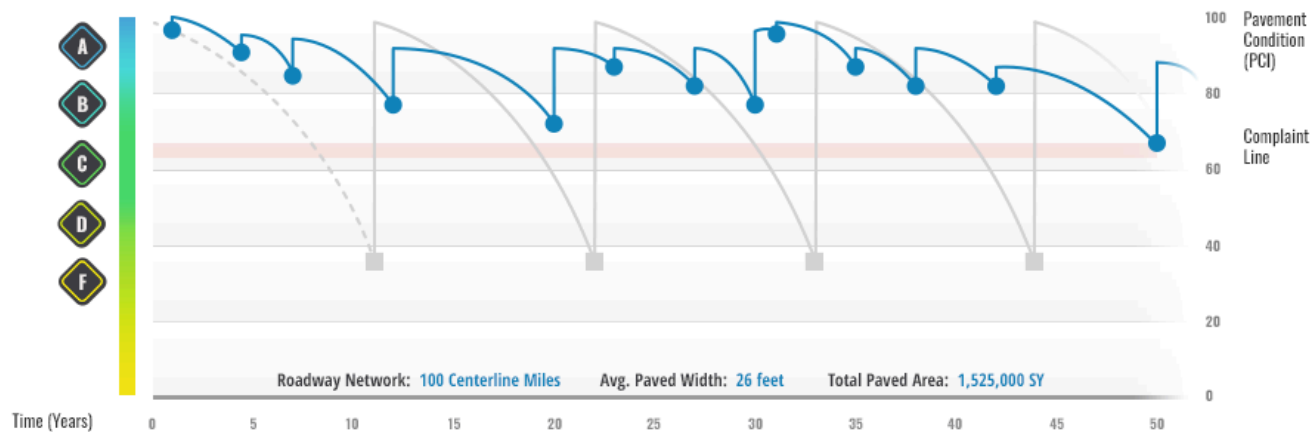
Source:



Pavement Preservation & Recycling Alliance

To maximize the life of the pavement, the dTIMS Model selects the most economical treatment for the given condition and available funding. When funding is sufficient to do the right treatment at the right time, the cost benefit ratio is maximized. The following image is an example of doing this over time. Doing the right treatment in an optimized method, keeps the

condition of the pavement above the “complaint line” as demanded by the public, but not only that, it also shows from an economic standpoint, the cost throughout its life is more than 2.5 times more efficient.



Treatment Selection

Conventional Approach	Optimized Strategy
Year 11 Mill & Fill with HMA overlay	Year 1 & 31 Rejuvenating Fog Seal
Year 22 Mill & Fill with HMA overlay	Year 4, 23, 35, & 42 Crack Seal
Year 33 Mill & Fill with HMA overlay	Year 7 & 38 Slurry Seal
Year 44 Mill & Fill with HMA overlay	Year 12, 27 & 50 Micro Surfacing
	Year 20 Cape Seal
	Year 30 1.5" AC Overlay
Total Cost: \$205.6 Million	Total Cost: \$79.6 Million

A-EXCELLENT, B-GOOD, C-FAIR, D-POOR, F-VERY POOR

Source:



● URBAN VS RURAL EQUITY

Most pavement management systems throughout the country weigh the value of the benefit of a treatment to the roadway network by the amount of traffic that is affected by that improvement in order to maximize the overall benefit to the system. However, if that were the only consideration, much of the rural network wouldn't rate high enough to be treated on a regular basis. Therefore, UDOT has divided the network into High and Low Volume systems in order to ensure that both systems are adequately taken care of. Another consideration is that it is much more cost effective to maintain current condition and much more expensive to increase it. The primary goal of the pavement management system is to “take care of what we have”, but the ultimate state of the network is driven as much by public perception and fiscal policy as by data. UDOT is

continually evaluating what each of the systems should look like and how much funding is needed to maintain conditions at relatively equitable levels.

MEASURE PROGRESS

- **TREATMENT PLAN ACHIEVING DESIRED RESULTS**
- **MODIFICATIONS FOR GREATER IMPROVEMENT**

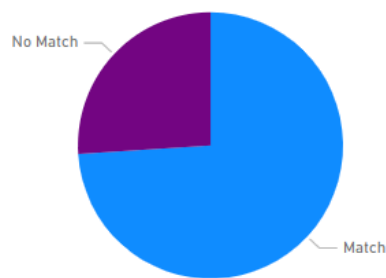
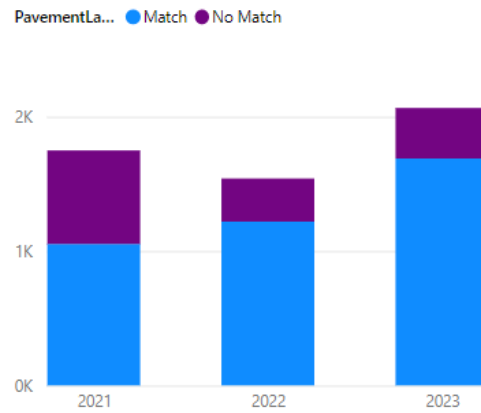
To complete the Pavement Asset Cycle it's important to evaluate the outcome of your actions, compared with anticipated results. In measuring our progress, it can be summed up in answering the four following questions.

- How did the approach improve the condition of the Department's network over the long-term?
- How often does the model's treatment selection match what was actually done?
- How did treatments perform against expectations?
- What should be tried next year for greater gains?

The first question, "How did the approach improve the condition of the network over the long-term?" For many years, the Department has been measuring the network condition over time. The pavement itself is the Department's largest asset at a replacement value of over \$28 billion dollars. Pavement Management is part of one of the Department's primary strategic measures, ([Preserve Infrastructure](#)) and is currently reported on the Strategic Direction Website. The goal for this asset is to maintain a condition that is acceptable to the public at the most economical cost. The network condition is tracked using IRI as an indicator. It can be seen on the Department's Preserve Infrastructure Strategic Measure a steady state condition for High Volume Roads has been maintained, as well as an increase in the Low Volume Road condition. The Low Volume Road increase is due to the recent gas tax increase which directed a portion of the funding to the Low Volume Roads.

To address the last three questions the Department began the process of tracking additional information to more accurately determine if the decision trees and deterioration curves built into the model are correct. The Department has three years of data regarding this effort. Given that a pavement's anticipated life is much longer than this means it will be an ongoing effort.

Another aspect of model accuracy is, if the dTIMs recommended treatment type is ultimately what is being selected. Final decisions are made after site evaluations and engineering review. From the data collected to date, the decision trees predict correct treatments approximately 75% of the time. The model accuracy trend is improving as shown in the following chart.



Assessing the pavement condition, optimizing the treatment plan and then measuring progress will be an ongoing effort. Anticipated improvements as the Department continues to collect and analyze the data will be: increased model sensitivity given funding levels, decision tree improvements and modeled treatment selection accuracy.