BYU | CIVIL & ENVIRONMENTAL ENGINEERING

IRA A. FULTON COLLEGE

CAPSTONE

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Pavement Management Research Project

Team members: Derek Linford, Trenton Parks, Robert Thompson

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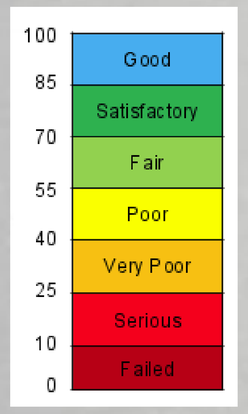
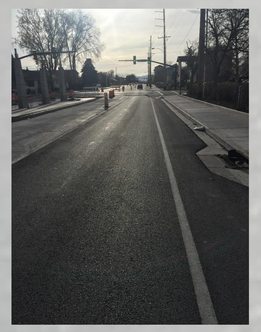
Project Description:

Each city in Utah County dedicates thousands of dollars every year to maintaining the miles of paved roads in their cities. Roadways are the single largest asset of most cities. Understanding where to allocate these funds is essential to providing serviceable roads to the residents and visitors that drive these roads. J-U-B Engineers, Inc. asked us to conduct a research of literature and local pavement practices. The purpose of this research was to gather data on pavement treatments and PCI ranges in which they are appropriate and effective as well as how long each treatment lasts. In addition to research of pavement treatments and preventative measures, they were interested in pavement deterioration rates. The deterioration rates can be measured by determining how the PCI decreases over a given time period.

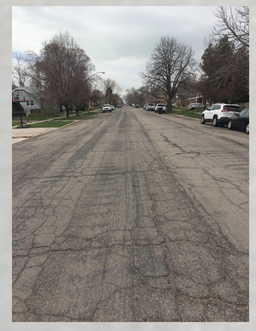


What is PCI?

PCI, or Pavement Condition Index, is a numerical index between 0 and 100. PCI is used to indicate the condition of a specific section of road pavement. PCI is determined by a manual inspection done on site by a professional pavement inspector. The inspection is done by examining features of the pavement such as cracks, potholes, and other distresses.



High PCI



Low PCI

Procedure:

In order to provide accurate information about PCI differences from pavement treatments, we created a survey that was given to multiple Street Superintendents in Utah County. This survey was intended to help us understand what treatments would best suit certain pavement distresses, and the costs of these treatments. From our own research and the data gathered from the Street Superintendents, we were able to analyze this data using a performance curve to show how different treatments effect the relationship between pavement condition (in PCI) and life of the road (in years).

Results:

Figure 1 shows how roads deteriorate over time. The graph shows how early treatments can have a significant impact if used at the appropriate time. If early preventative maintenance is provided to roads, this will extend the life of the road and prevent large and costly repairs. Rehabilitation treatments will have a greater effect on the service life of the road, but will cost more than routine preventative maintenance. As the age of the road increases, the deterioration rate also increases.

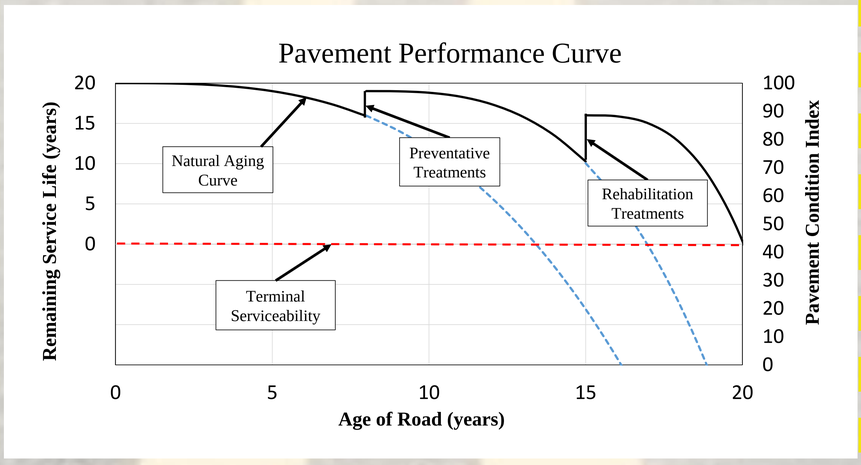


Figure 1: A graph of road deterioration rates

Table 1 is a list of each treatment that was studied. The list shows the average cost of each treatment, and an average of how long each treatment typically lasts.

Table 1: Cost and Lifetime of Treatments

Treatment Type	Average Cost ($/ft^2)	Lifetime of Treatments (years)
Chip Seal	0.14	5
Crack Seal	0.06	3
High Desity Mineral Bond	0.15	6
Major Patching	2.10	10
Microsurface	0.24	7
Mill and Overlay	1.84	12
Minor Patching	1.10	5
Overlay	1.50	10
Pulverize Asphalt and Repave	2.51	18
Replace Asphalt and Base	4.27	20
Slurry Seal	0.19	5
Spot Repairs	0.15	2

Table 2 is a list of the PCI ranges in which it is appropriate to apply treatment, and the approximate increase that it will have on the PCI of the road.

Table 2: PCI Ranges and Increase in PCI

Treatment Type	PCI range to apply treatment	Approximate increase in PCI
Chip Seal	100-94	6
Crack Seal	94-61	10
High Desity Mineral Bond	88-61	13
Major Patching	80-46	15
Microsurface	80-49	23
Mill and Overlay	80-45	35
Minor Patching	90-56	13
Overlay	80-50	28
Pulverize Asphalt and Repave	60-35	49
Replace Asphalt and Base	50-25	60
Slurry Seal	90-76	24
Spot Repairs	100-47	29