The Evaluation of Winter Maintenance Performance Metrics used in Improving Winter Maintenance Operations

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Special Thanks:

Dean Alatsis, Tom Corey, Hiram Crabtree, Jamie Hendershot, Laythe Istefan, Jill Martindale, Rod Nuveman, and all other participates in the Route Optimization project.
Winter Maintenance

Fleet Size
- Deploy 1,600 snow plow trucks

Facilities
- Operate out of 229 garages, yards, and outpost

Extensive Road Network
- Maintain approximately 43,337 lane miles

2016 Winter
- Purchased 957,000 tons of salt
- Snow & Ice Crews travelled 12,000,000 plus miles
Common Snow Fighting Weather
The Ohio Department of Transportation

It Never Looks Like This

3/14/2017 6:59:33 PM - Headed S on I-76 at 21mph [Summit County SLM: 1.37]
The goal of this project is to develop a tool, that will provide a cost effective high level of service to the travelling public.
Route Optimization

**Route Efficiency**
- Determine most efficient routes for ODOT fleet

**Fleet Sizing**
- Optimal fleet size for each facility

**Equipment Evaluation**
- Performance matrix of specialty equipment

**Justification**
- Analytically quantify winter maintenance knowledge
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Case Study: Districts 1, 2, and 10

Sample Size
• 352 trucks,

Coverage Area
• 16,600 lane miles

Facilities
• 45 garages, outposts and yards

Number of Events
• Between 35 and 55 storms per year

Total Snowfall
• 100 inches per year
The Ohio Department of Transportation

Number of Operational Trucks vs. Percent LOS Maintained

Percent LOS is Satisfied

Number of Operational Trucks

- Truck Removal Optimization
- Current District 10 Operational Trucks
- Fleet Optimized Operational Trucks
- Initial Optimized Operational Trucks

Maximum
### District 10 Route Optimization Analysis

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Optimized</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Trucks</td>
<td>116</td>
<td>109</td>
<td>-7</td>
</tr>
<tr>
<td>Fleet Size</td>
<td>128</td>
<td>120</td>
<td>-8</td>
</tr>
<tr>
<td>Total Travel Time (Minutes)</td>
<td>12,650</td>
<td>11,813</td>
<td>-837</td>
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<tr>
<td>Percent LOS Maintained</td>
<td>60</td>
<td>61</td>
<td>1</td>
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<tr>
<td>District Efficiency Range</td>
<td>Low</td>
<td>81</td>
<td>83</td>
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<tr>
<td></td>
<td>High</td>
<td>86</td>
<td>87</td>
</tr>
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</table>

The Ohio Department of Transportation

UARF
Route Optimization: Case Study Summary

**Travel Time Impact**
- Net time reduction – 17 hours per cycle

**Equipment Impact**
- Reduction of 6-10 trucks per district without impacting the LOS

**Facility Location**
- New facility sites based on minimizing deadhead

**Economic Impact**
- Maintain the same level of service with 24 fewer trucks
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Route Optimization: Full-Scale Deployment

**Users**
- 100 plus active users
- 1 user has full control of the system
- Full mobile platform

**Trucks**
- Current system maintains 1,600 active snow plow trucks

**Route Optimization**
- Base level optimization for 43,000 miles
- 4,796 ramp segments
The Ohio Department of Transportation

Salinity Vulnerability

<table>
<thead>
<tr>
<th>Year</th>
<th>Tons</th>
<th>Cost</th>
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<tbody>
<tr>
<td>FY17</td>
<td>594,600</td>
<td>26,287,542</td>
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<td>FY16</td>
<td>957,664</td>
<td>65,272,196</td>
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<td>FY15</td>
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<td>FY14</td>
<td>425,092</td>
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<tr>
<td>FY13</td>
<td>229,406</td>
<td>9,727,232</td>
</tr>
</tbody>
</table>

Monroe County Garage

Cumulative Curve: 10%
- Avg Usage: 10%
- 25%: 25%
- 50%: 50%
- Proposed Tonnage: 100%
- Adding Additional: 100%
- Replacing Existing: 100%

UARF
Equipment Selection
The Ohio Department of Transportation

Thank You For Your Time

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