Summary of Past Optimization Methods

HDMT April 2019
1980’s & 90’s Truck Staffing Analysis

Office of Maintenance

TRUCK & STAFFING ANALYSIS

Location Factor = \( \frac{L_{Mau} + L_{Mar} + L_{Mb} + L_{Mc} + L_{Md} + L_{MPi} + \text{Ramps} + RA + WS}{20 + 25 + 30 + 40 + 50 + 60 + 12 + 4 + 4} \) 

Snow Removal Trucks = Location Factor x 1.11 for average dead heading x ( ) for down equipment

Operator/Mechanic = Location Factor x Staffing Factor ( )

L_{Mau} = Lane Miles Service Level A, Urban Area Interstate
L_{Mar} = Lane Miles Service Level A, Rural Area Interstate
L_{Mb} = Lane Miles Service Level B
L_{Mc} = Lane Miles Service Level C
L_{Md} = Lane Miles Service Level D
L_{MPi} = Lane Miles of Park & Institutional Roads
Ramps = Number of Interchange Ramps
RA = Number of Rest Areas
WS = Number of Weigh Stations
Contr. P&I = Lane Miles of Park & Institutional Roads Under Contract Maintenance
City Contr. = Lane Miles of Primary Extension Under Contract Maintenance
2005-2010? District Plow Route Committee

- Group of district reps reviewed and “timed” proposed snow runs
- Times based on mileage, deadhead, ramps, stops, turns, etc.
- Proposed by district and reviewed by committee
Researchers worked with DMMs to develop a turn-around classification combining AADT and service level assignment as a basis for resource optimization.
2015 – AADT and FTE Modeling

- FTE funding gap was driving reduction of field staff vacancies
- Used GPS pings to study current effort levels on different AADT roads and night vs. day patterns
- Used plow speed to estimate how many FTEs needed to traverse garages’ miles at a frequency defined by AADT classification
- First appearance of the infamous “bubble maps”
2016 and Ongoing -- ISU Garage Optimizations

• Muscatine consolidation and new Dubuque location
  • Started with new routes at Muscatine (for consolidating Wapello) and expanded to new garage/route possibilities for Dubuque
  • Simulated all possible route and garage locations
  • Select those that used the fewest trucks and deadhead miles while still adhering to turn-around frequency requirements and assumed truck capacities

• D3 is the subject of ongoing work to also simulate routes as well as potential garage boundary revisions and multi-garage routes
2017 – FTE Modeling Take 2

• Like 2016, AADT-based. But with updated:
  • Vacancy reduction targets
  • Included look into temporary driver needs/utilization

• Provided comparisons to area total staff need vs FTEs
  • If every district targeted a 53% FTE-to-Temp ratio, where would positions shuffle?

The Model: Assumptions

Average plow speed = 23.6 MPH
Truck uptime = 90%
Crew availability based on 12 hour shift
Route cycle time expectations:

<table>
<thead>
<tr>
<th>Traffic Volume (cars/lane/day)</th>
<th>Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8000</td>
<td>1.1</td>
</tr>
<tr>
<td>5000-8000</td>
<td>1.2</td>
</tr>
<tr>
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<td>1.5</td>
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<tr>
<td>800-1500</td>
<td>2.5</td>
</tr>
<tr>
<td>&lt;800</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Results – FTE and Temp Staff Needs

If we plow to those turn-around goals for a 24 hour storm:
• We would need 1570 plow drivers statewide
• With 838 FTEs, that means we’d need the temp equivalent of 732 drivers
• That means that our FTEs make up 53% of our total staff need.