### A “F.A.S.T” and Cost Effective Solution

**Fixed Automated Spray Technology Prioritization**

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### Outline

- Anti-icing systems in Minnesota
- I-35W / TH 62 (Crosstown Project)
- Prioritization process
- Results/Recommendations

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### Minnesota’s Experience

- 10 Anti-icing systems deployed
- 3 Vendors  
  - Boschung, Energy Absorption, Traffic Tech.
- First installation I-35W – 1999
- Bridge and Roadway installations

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### Metro District Anti-Icing Systems

- 35W over Mississippi in Minneapolis
- 35E over Mississippi in St. Paul/Mendota

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### Metro District Anti-Icing Systems

**FACT SHEET FOR 35W and 35E Anti-icing Systems**

<table>
<thead>
<tr>
<th></th>
<th>35W System</th>
<th>35E System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Mississippi River Crossing, Minneapolis</td>
<td>Mississippi River Crossing, St. Paul</td>
</tr>
<tr>
<td>Bridge Length Treated</td>
<td>1950 feet, 8 lanes</td>
<td>1150 feet, 6 lanes</td>
</tr>
<tr>
<td>Roadway Length Treated</td>
<td>0</td>
<td>1250 feet, 2 lanes, NB only</td>
</tr>
<tr>
<td>Unique Site Characteristics</td>
<td>Major River Crossing, Industrial Plants in Proximity of Bridge</td>
<td>Major River Crossing</td>
</tr>
<tr>
<td>Installer</td>
<td>Boschung</td>
<td>Bruce and Merilee Electric</td>
</tr>
<tr>
<td>Original Contract Cost</td>
<td>$578,000 (first system of its kind installed in US), extra work brought total $677,000</td>
<td>$1.2M (original bid $1.9M MnDOT provided traffic control and bridge spoons)</td>
</tr>
</tbody>
</table>
Metro District Anti-Icing Systems

<table>
<thead>
<tr>
<th>FACT SHEET FOR 35W and 35E Anti-Icing Systems (cont.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Components</td>
</tr>
<tr>
<td>- RWIS and Other Sensors</td>
</tr>
<tr>
<td>- Measures atmospheric and pavement conditions</td>
</tr>
<tr>
<td>- Pump House</td>
</tr>
<tr>
<td>- Houses tanks, pumps, instrumentation and controls</td>
</tr>
<tr>
<td>- Valve Units</td>
</tr>
<tr>
<td>- Deliver Anti-Icing agent to Spray Disks</td>
</tr>
<tr>
<td>- Spray Disks</td>
</tr>
<tr>
<td>- Deliver Anti-Icing agent to road surface</td>
</tr>
</tbody>
</table>

System Pressure
- 35W System: about 150 psi
- 35E System: about 150 psi

Spray Disks
- 35W System: 2 Spray Disks
- 35E System: 1 Spray Disk

Spray Disks
- Two Types
  - Bottom Connection
  - Side Connection

Adjust spray after installation
- Angle
- Pattern
- Direction

Valve Unit
- Used in Boschung Anti-Icing Systems
- Housed in a stainless steel cabinet or concrete box
- Typically serves 2 spray disks

Pump House
- Housed in a stainless steel cabinet or concrete box
- Typically serves 2 spray disks

Storage Tank Capacity
- 35W System: 5 tanks - 5100 gal total
- 35E System: 1 tank - 3100 gal total

System Pressure
- 35W System: about 150 psi
- 35E System: about 150 psi
Spray Disks

Planning and Design of Future Systems
- Anti-Icing projects currently planned:
  - 35W – TH 62 Crosstown Commons
  - St. Croix Crossing
  - TH 52 Lafayette Bridge
- Safety System

Metro District Preliminary Screening
- Crash Frequency
- Crash Rate
- Loss
- Nearest Truck Station
- Type of road
- Snow Storage
- Age of Bridge
- Traffic back ups
- Horizontal Grade
- Vertical Grade
- Volume
- What’s under bridge
- Microclimate
- Historical Weather data
- Shadowing

I-35W/62 Crosstown Project
- $288 million
  - Add capacity, increase safety, transit friendly
- 225,000 vehicle per day
- 6 mile segment
  - 26 new/rebuilt bridges
  - 1.5 million square feet of retaining wall

Visualization Video
Criteria

- Grade
- Horizontal Curves
- Bridge
- Snow Storage Capacity
- Shadowing Effects
- ADT per lane (ADT / # lanes)

Grade / Horizontal Curve

- 1 point per % grade or Degree of Curve
- 6 points maximum
- Round to nearest whole grade/degree

Snow Storage Capacity

- 0 points if 10’+ of storage space
- 2 points if 0-10’ of storage space

Shadowing Effects

- 0 points if no impact from shadows
- 1 point if shadowing prevalent on segment
  - Buildings
  - Other bridges/structures

ADT per lane

- ADT divided by number of available lanes
- 1-6 points possible

<table>
<thead>
<tr>
<th>ADT Range</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5000</td>
<td>1 point</td>
</tr>
<tr>
<td>5001-10000</td>
<td>2 points</td>
</tr>
<tr>
<td>10001-15000</td>
<td>3 points</td>
</tr>
<tr>
<td>15001-20000</td>
<td>4 points</td>
</tr>
<tr>
<td>20001-25000</td>
<td>5 points</td>
</tr>
<tr>
<td>&gt;25000</td>
<td>6 points</td>
</tr>
</tbody>
</table>

Bridge or Roadway Criteria

- If section is a bridge – 2 points
- If section is roadway – 0 points
- Tie breaker criteria
  - If total points are the same then Bridge section will be ranked higher than non bridge section
### Allocation of Points

- Grade: 6 points
- Curvature: 6 points
- Bridge/No Bridge: 2 points
- Snow Storage: 2 points
- Shadowing: 1 point
- Volume: 6 points

1 point minimum, 23 points maximum

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### Results

- 23 segments analyzed

**Points Summary**
- Maximum: 19
- Minimum: 6
- Mean: 12.6
- Median: 12
- Mode: 14 (4 segments)

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### Location of Top 10

Top 10 Location = $5.6 million
All locations = $22 million

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### Are we done yet?

- **Pump House**
  - Size matters
  - Top 10 locations = 16,000 ft of road
  - Each system can cover ≈ 5,300 ft of road
  - Multiple systems can be run from one pump house

- **Cost**
  - System costs money (~ $350/ft)
  - Can't fund every possible location

- Next step is to group the segments into systems

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### 5 Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Length</th>
<th>Cost</th>
<th>Priority Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12556</td>
<td>$4,394,600</td>
<td>1,2,6,9,12</td>
</tr>
<tr>
<td>2</td>
<td>8970</td>
<td>$3,139,500</td>
<td>4,8,14,15</td>
</tr>
<tr>
<td>3</td>
<td>8812</td>
<td>$3,084,200</td>
<td>7,19</td>
</tr>
<tr>
<td>4</td>
<td>19388</td>
<td>$6,785,800</td>
<td>10,11,13,19</td>
</tr>
<tr>
<td>5</td>
<td>1700</td>
<td>$595,000</td>
<td>3</td>
</tr>
</tbody>
</table>

TOTAL: $18 million
Still Not Done

- Budget constraints
- No system installed with project
- What do you want plumbed?

Plumbing

- 19000 ft of Conduit
- 65 Pull Boxes (Valve Units)
- 7 Pull Vaults
- 133 Locator Balls
Summary

- Evaluation Process is Flexible

- Can be expanded/condensed as needed

- Value to having an established procedure
  - Future projects will use methodology
  - Conduit installation should produce savings