IOWA’S WINTER DATA AND PRODUCTS

ERIC ABRAMS
IOWA DEPARTMENT OF TRANSPORTATION
ERIC.ABRAMS@IOWADOT.US
HTTPS://DATA.IOWADOT.GOV/PAGES/WINTER
WHERE IS IOWA?
WINTER DATA

HTTPS://DATA.IOWADOT.GOV/PAGES/WINTER
ITS

Fixed Cameras

Digital Message Signs

Traffic Speeds
WEATHER

- Roadway Weather Information System (RWIS)
- Aviation Weather Observation System (AWOS)
- NWS watches and warnings
- Radar from NWS and Iowa State Mesonet
- Predictive snowfall
TRUCKS

Sensor types include:
- Speed
- Material
- Rates
- Location

Images/Dashcam
TRAVELER INFORMATION

- 511 events
- TV Station Integration
- Road Conditions
INVESTMENT IN MOBILITY

Segments over time
Material
Labor
Depreciation
Overtime
PRODUCTS
Flagship product

Original purpose was two fold

- Educate the public about operations
- Inform media about how many plows are out to reduce calls.

Shows ITS, Plows, Road Conditions, Radar, Cost Information and Easter Eggs
2015 to 2016
WINTER COST CALCULATOR

Education Product

Purpose

• Educate the public about operations
• Inform policy makers about how DOT does business.
• Most important was to prove aggregation process is working

Shows costs like labor, depreciation, material usage

wintercostcalculator.iowadot.gov
Truck 1 travels on segment A and sends back 4 pings to Iowa DOT. We know the length of the segment (in this example 1 mile) and distance between pings. We also know the distance from the start of the segment to the first ping and end of the segment and last ping. We can calculate time on the segment because we know when the truck entered and exited the segment. For this example let's say 15 minutes for each pass.

Since we have Time on segment, total material applied and type, the diagram above shows the same segment twice. This is because over time trucks will travel the same segment, but ping in different locations.

Each ping gives us data like material being used, rate material being applied, speed, bearing, etc.

In winter cost calculator we run a query to conflate all the segments that have been touched by a truck over a rolling 48 hour period. In this example Segment A had 2 trucks travel over it.

- Total Cost is the sum of the costs.
- Material cost is the total material used. Total solid material+total brine+total prewet. Brine and prewet are 2.2 pounds of salt per gallon at 19 cents per gallon and solid material is $68.55 per ton
- Labor cost multiplies the time on segment (30 minutes) times an average labor rate of $45.53 per hour
- Equipment takes the total time on segment (30 minutes) times a factor of $38.08 per hour
- Salt applied, take the salt total for the segment (granular and brine) and multiply by a $68.55 per ton
- Labor hours takes the total time on segment
Winter Cost Calculator

Route: IA 7 E
Buena Vista County

LAST PASS: 12/22/2016, 7:12 AM
# OF PASSES: 18
# OF PASSES WITH MATERIAL: 4

SEGMENT LENGTH: 4.8 Miles

TOTAL COST FOR ROAD SEGMENT: $3,080
LBS OF SALT: 74,266 | COST: $3,036
LABOR COST: $24
EQUIPMENT COST: $20

NOTE: ALL VALUES ESTIMATED BASED ON
BEST-AVAILABLE DATA

Salt Applied (Lbs)
16,964,064

Material Cost ($)
7,264

Labor Cost ($)
0

Total Cost ($) 317,464
Material Cost ($) 146,244
Labor Cost ($) 32,217
Equipment Cost ($) 18,003

wintercostcalculator.iowadot.gov
Calculate values

Lbs of Salt Used in Prewet - 48 Hours

Total Lbs of Salt - 48 Hours

CREATES TOTAL ROUNDS OF SALT USED FOR EACH GALLON OF PREWET (2.2 LBS OF SALT PER EACH GALLON):

(QUANTITY_PREWET/2.2)

PYTHON CALLER ROUNDS ATTRIBUTE TO 0 DECIMAL PLACES

CALCULATES TOTAL ROUNDS OF SALT PUT DOWN ON SEGMENT WHICH INCLUDES ALL SOLID MATERIAL AND THE 2.2 LBS OF SALT/GALLON OF BOTH LIQUID AND PREWET

(QUANTITY_SOLID + LIQUID_SALT_QUANTITY + PREWET_SALT_QUANTITY)

PYTHON CALLER ROUNDS ATTRIBUTE TO 0 DECIMAL PLACES
R&D Project

Purpose

• Test winter road conditions if they are getting better worse or staying the same
• Tie to imagery
• Give field staff the ability to scroll through pics with ease

Shows picture, location, road condition and indicator
<table>
<thead>
<tr>
<th>Route</th>
<th>Update Date/Time</th>
<th>Road Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA 10 E</td>
<td>Updated: 4/14/2018 6:32:55 PM</td>
<td>Completely Covered - completely covered with mixed snow ice or slush</td>
</tr>
<tr>
<td>IA 12 N</td>
<td>Updated: 3/6/2018 5:58:57 PM</td>
<td>Travel Not Advised - white out</td>
</tr>
</tbody>
</table>

Updated: 3/7/2018 8:40:24 AM
Current Road Conditions
Completely Covered - completely covered with mixed snow ice or slush
**Purpose**

- Educate DOT staff and others about data available for winter operations
- Inform policy makers about how DOT does business.
- Most important was to prove ArcGIS Operation Dashboard

**Shows costs like labor, depreciation, material usage**

http://data.iowadot.gov/pages/winter
Help school administrators

Purpose

• Educate DOT staff and others about data available for winter operations
• Inform policy makers about how DOT does business.
• Most important was to prove ArcGIS Operation Dashboard

Shows costs like labor, depreciation, material usage

https://data.iowadot.gov/pages/winter
https://myschooltrackaplow.iowadot.gov
IOWA DOT PLOW CAMERA – BY SCHOOL DISTRICT

This application displays photos by selected route and reference post. It combines all of our real-time winter operations data into an easy to view format.

Plow camera images are taken over the last hour. The process for those photos runs every 10 minutes, but is subject to change during high impact events. In general, a photo is snapped every 5-10 minutes while a vehicle is moving.

HOW TO USE THE MAP

Data represented is based on the area of the map shown. Pan around the map to show data for different areas, or zoom out to show data for the entire state.

1. SELECTORS
   Select a school district to view photos for that school district, or choose a county forecast.

2. MAP SELECTION TOOL
   Use this tool to select an area on the map by using the point, rectangle, lasso, circle, or line tools. The photo list will display the plow cam images from the plow in the selected area.

3. PHOTO LIST
   The photo list displays the plow camera images from all the plows currently in the area you have zoomed to on the map. The list is sorted by route name and mile post.

   Note: The photos displayed are the most recent photo per mile post within the last hour. The process runs every 10 minutes, but is subject to change during high impact events.

4. SNOWPLOW COUNT
   This is the number of snowplows in the area you have panned to on the map.

5. ADDITIONAL INFO TABS
   The different tabs include the number of active plows, a pie chart of road conditions, and a road/bridge temperature forecast.

6. TEMPERATURES
   This feature displays real-time temperatures, similar to traditional weather maps.

   Note: there’s options to toggle on/off using the layer button (✓) found in the upper right corner.

7. MAP TOOLS
   - BOOKMARKS - Use this to save specific areas and quickly move to a metro area.
   - LEGEND - Use this to determine what road conditions the colored road segments represent.
   - LAYERS - Use this to enable or disable different layers on the map.
   - BASEMAPS - Use this to change the type of basemap.
OPEN DATA

Provide information to DOT systems

Partners can pull data
- NWS
- Emergency Management
- Here

DMS to Costs to Plows to Road Conditions
CHECK YOUR ROUTE BEFORE YOU GO USING THE TRAVELER INFO MAP ON MODOT.ORG

TIM image posted 11/26/18 at 6:20 AM
Did you know you can see road conditions from our neighboring states on trackaplow.iowadot.gov? This is a snapshot of conditions on Feb. 7 at 11:52 a.m. If you think we have it bad, look at Minnesota and North Dakota!

Road conditions remain partially to completely covered with compacted ice and snow in SE Minnesota. Roads are much better across north Iowa. Slow improvements will be made throughout the day. #MNWX #IAWX #ABC6WX #ABC6Roads

bit.ly/2ruf7rW
Slippery Road Conditions

Road Conditions as of 7:45 p.m.
Take it slow tonight!
Allow road crews time and space to clean things up!
According to the @iowadot Winter Cost Calculator, more than 2 million pounds of salt has been applied to the metro roads in the past 48 hours...and DOT workers have spent more than 1,000 hours working. #iawx iowadot.maps.arcgis.com/apps/webappview ...

4:53 PM - 6 Feb 2018

Great for tracking plows and reporting real-time info on the number that are out and percentages of roadways that are dealing with snow cover! I use it for every winter weather event we have :)
HOW IT IS POSSIBLE
<table>
<thead>
<tr>
<th>SUCCESSFUL PEOPLE</th>
<th>UNSUCCESSFUL PEOPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Give others credit</td>
<td>Secretly hope</td>
</tr>
<tr>
<td>Exude joy</td>
<td>others to fail</td>
</tr>
<tr>
<td>Share</td>
<td></td>
</tr>
<tr>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>Have a sense</td>
<td></td>
</tr>
<tr>
<td>COMPLENT</td>
<td></td>
</tr>
<tr>
<td>Embrace Change</td>
<td></td>
</tr>
<tr>
<td>Forgive others</td>
<td></td>
</tr>
<tr>
<td>Keep a &quot;to-do&quot;</td>
<td></td>
</tr>
<tr>
<td>Keep a journal</td>
<td></td>
</tr>
<tr>
<td>Keep a &quot;to-be&quot;</td>
<td></td>
</tr>
<tr>
<td>Read everyday</td>
<td></td>
</tr>
<tr>
<td>Accept</td>
<td></td>
</tr>
<tr>
<td>Operate from</td>
<td></td>
</tr>
<tr>
<td>TRANSFORMATIONAL</td>
<td></td>
</tr>
<tr>
<td>WANT OTHERS TO</td>
<td></td>
</tr>
<tr>
<td>SUCCEED</td>
<td></td>
</tr>
<tr>
<td>HORDE INFORMATION</td>
<td></td>
</tr>
<tr>
<td>EXUDE ANGER</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OPEN SYSTEMS

• Open APIs
  • Skyfire

• Databases
  • Ability to read authoritative

• Feeds
  • REST Services
  • XML, etc

• Open Data philosophy
PROPER TOOLS IN THE BELT

- FME
  - Server
  - Desktop
- AGOL
  - Operations Dashboard
  - Web App Builder
  - M1/M2
- Oracle/SQL Server
- Proper data processes
PROPER MANAGEMENT STRUCTURE

- Right people in the right place
- Ability to try new things
- Stay current
QUESTIONS

• Eric Abrams - Eric.abrams@iowadot.us
• Twitter @ericabramsdot
• Linked in Eric Abrams