



WINTER PERFORMANCE MEASURES

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Topics

- **Background**
- **Development Process**
- **Methodology**
- **Storm Severity and Winter Performance Formulas**
- **Partnership with Vaisala**
- **Winter Mobility Index**
- **Future plans**

Background

- ITD spends \$30 Million on Winter Maintenance for labor, materials and equipment
- 500 vehicles statewide
- Salt, salt brine, magnesium chloride, anti-skid
- 100 RWIS locations with 95 measuring Grip
- Differences in geography, terrain and weather patterns among the 6 districts created various basic maintenance practices
- ITD needed a uniform approach for measuring winter maintenance performance

Idaho has Diverse Geography



The Birth of Idaho's Winter Performance Measure

- Ed Bala, D5 District Administrator, developed the storm severity and performance index in 2008
- Dennis Jensen, District 4 foreman, was using the RWIS data to evaluate various treatment success
- 2009-10 Ed and Dennis shared ideas and worked out a system to evaluate winter maintenance
- In 2011 ITD Director Brian Ness instructed the districts to develop a statewide performance measure for winter maintenance.
- Upgrades to existing RWIS sites began utilizing end of year and redirected funds

Methodology for Idaho's Winter Performance Measure Index

- How everything works
 - RWIS network with non-invasive pavement sensors (“grip”)
 - Storm severity index (multiple available)
 - Performance Measurements for Highway Winter Maintenance operations (QUI 2008)
 - Developing of a Roadway Weather Severity Index (Strong et al. 2005)
 - Local Storm Scale (Cerruti and Decker, 2001)
 - SHRP (Boselly et al.)
 - States; Idaho, Wisconsin, Indiana, Iowa, Ontario, Utah, California
 - Time element for grip recovery

Idaho's Storm Severity Index

- Storm Severity Index rates three storm parameters
- FORMULA:
 - **Storm Severity Index = Wind Speed Max (mph) + Water Equivalent Layer Max (mm) + 300/Surface Temperature Minimum (degrees F)**
- Lower values indicate light storm events
- Range 10- 80 normal events with severe cold and high winds as high as 500

Winter Performance Measure (WPM) Index

- Winter Performance Measure Index rates the treatment effectiveness to the storm (recovery time to safe grip)
- FORMULA:
 - **Winter Performance Measure Index** = Ice Up Time (hours) / Storm Severity Index
- Ice up time is the duration of the event when the grip is below 0.60 for more than ½ hour

Partnership with Vaisala

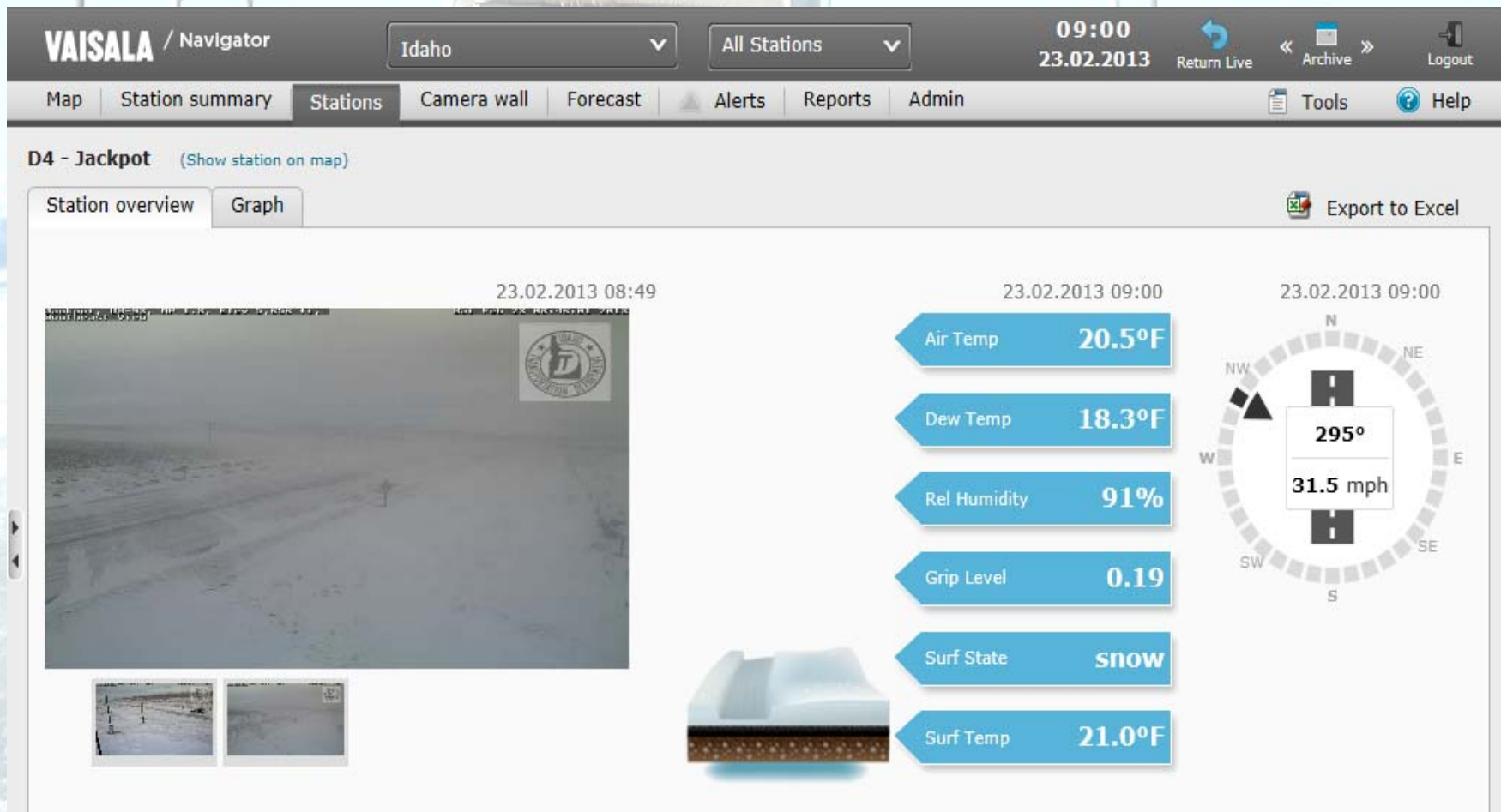
- ITD Collaborated with Vaisala during the development of the project to automate the WPM calculations

Storm Performance Index Legend

0	Successfully treated
0.00 - 0.30	Significantly accelerated grip recovery
0.31 - 0.49	Some success at grip recovery
0.50 - 0.69	Very little success at deicing
0.70 -	Limited maintenance or no deicer success
	Observation data / parameter missing or temp is below threshold

Station	Date	Time Range	Event	Duration (hours)	Max Wind Speed (mph)	Max Ice Layer (mm)	Max Snow Layer (mm)	Max Water Layer (mm)	Min Surface Temp (°F)	Severity Index	Performance Index	Mobility Index	Comments
D1 - 4th of July Pass													
	22.02.2013	12:45 - 22:00	TREATED	9.25	6.26	0.12	0.11	1.12	29.30	17.62	0	96%	
	22.02.2013	22:00 - 22:30	GRIP<.6	0.50	5.82	0.00	0.00	1.17	31.10	16.63	0.03		
	22.02.2013	22:30 - 07:15	TREATED	8.75	10.96	0.03	0.01	1.02	27.50	22.89	0		
	23.02.2013	07:15 - 08:00	FROST trea	0.75	5.37	0.00	0.00	0.03	27.14	16.45	0		
	23.02.2013	08:00 - 08:45	TREATED	0.75	3.13	0.05	0.14	0.05	27.32	14.25	0		
	23.02.2013	08:45 - 09:15	GRIP<.6	0.50	4.03	0.05	0.20	0.00	26.78	15.43	0.03		
	23.02.2013	09:15 - 11:30	TREATED	2.25	6.71	0.03	0.10	0.32	26.06	18.54	0	100%	
	23.02.2013	18:00 - 21:00	FROST trea	3.00	4.03	0.00	0.00	0.01	26.96	15.16	0		
	25.02.2013	07:00 - 10:15	TREATED	3.25	4.92	0.16	0.21	0.28	26.24	16.63	0	80%	
	25.02.2013	10:15 - 11:30	GRIP<.6	1.25	1.79	0.08	0.27	0.03	28.22	12.69	0.10		
	25.02.2013	11:30 - 13:15	TREATED	1.75	9.84	0.04	0.06	0.59	28.22	21.06	0		

Partnership with Vaisala



Mobility Index

- Winter Mobility Index rates the percentage of time of wet pavement with below freezing conditions
- FORMULA:
 - Mobility Index = % Time Grip above 0.60 when surface layer is below freezing (32 degrees F)

Results 2010-2013

Winter Storm Mobility by District -- Total

% of Time Mobility Not Significantly Impeded During Winter Storms



How We Achieved the Results 2010-2012


- Management emphasis on performance measures
- Positive influences in performance were recognized
- Statewide training was implemented
- Critiquing of graphs allowed crews to evaluate products and timing
- Adaptation of new Basic Maintenance Procedures
- Feedback and coaching created more communication and a learning environment

Mastering Applications



What is Next?

- Add RWIS sites at strategic locations
- Monitor performance of maintenance crews
- Analyze WPM results; make adjustments if indicated
- Provide on-going training and coaching



Thanks for your Attention

- QUESTIONS?

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