Alaska DOT & PF: Working to Foster a Culture of Innovation

Alaska DOT&PF is in its fourth year as a State Transportation Innovation Council (STIC) Incentive Program participant. Since 2014, four grants have been awarded to Alaska DOT&PF: Two to Northern Region, and two to Statewide Design and Engineering Services, although all the projects have had a statewide focus.

What is the STIC?
The Federal Highway Administration STIC Incentive program provides resources to help foster a culture of innovation and make innovations standard practice. Through the program, funding up to $100,000 per state is available each Federal fiscal year. The STIC serves as a forum for initiating and overseeing the rapid deployment of innovative strategies into routine practice to accelerate transportation project delivery and enhance project quality and effectiveness.

Alaska has participated in four STIC grants. The 2016 and 2017 projects are complete, while the 2018 and 2019 projects are still active:

- **2016 NEPA**: Developed online training modules and associated materials to implement quality environmental documentation and NEPA Assignment as standard practices for Alaska.
- **2017 Ground Penetrating Radar**: Developed and implemented a performance specification for acceptance of asphalt paving compaction based on continuous-full-coverage density data collected by ground penetrating radar.
- **2018 Utility/GIS**: Developing a manual and framework for implementation of an Alaska Utility Information Management System.
- **2019 Virtual Reality/Virtual Public Involvement**: Working on the creation and implementation of a comprehensive, statewide, multidivision augmented and virtual reality

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program. The goal is to provide workflows and training to include the use of AR/VR technology in various aspects of the planning, design, and construction process.

**Eligible STIC Grant Recipients:**
The State Transportation Agency (STA) or state DOT is the primary recipient of the STIC Incentive awards. Other public sector STIC stakeholders such as metropolitan planning organizations, local governments, or tribal governments are eligible to receive STIC Incentive funding as subrecipients to an STA. The following are the kind of questions the STIC members consider in order to award a grant:

1. Does your project improve a safety concern or stimulate economic growth?
2. Does your project support cost savings or efficiency project delivery?
3. Does your project have a high likelihood to improve the way we do business or foster a culture of innovation?
4. Is your impact narrow or widespread?
5. Does the proposal include matching funds beyond the 20% requirement?

More information about Alaska's STIC can be found at:

http://www.dot.state.ak.us/stwddes/research/stic.shtml

Watch the series of STIC videos to see how each stakeholder benefits from being a STIC member.

![Industry](https://youtu.be/1HvHN5jq9I0)

![STIC Overview](https://youtu.be/TYUUnphp-TQ)

![Local Public Agencies](https://youtu.be/gyCK4E_YASE)

![Academia](https://youtu.be/7JWFH594kWE)

![DOTs](https://youtu.be/roN1jUPpxyk)
Virtual Reality Innovations for Planning, Design and Construction

By Paul Eckman

Augmented and virtual reality technology is becoming an integral part of transportation and infrastructure around the world. It has the ability to illustrate complex systems in a way that is easier to understand. Alaska DOT & PF wants to be able to harness this technology to be more efficient at what we do.

Alaska DOT&PF’s Northern Region was recently awarded an FHWA State Transportation Innovation Council (STIC) grant for the creation and implementation of a comprehensive, statewide, multidivision augmented and virtual reality program. The project's goal is to create a program that will provide workflows and training to implement the use of AR/VR technology in the various aspects of our work. Below is a small list of some of the applications Alaska DOT& PF wants to pursue:

- 3D plans, specifications, and estimates (PS&E) reviews
- Public Outreach
- Training for a broad range of staff
- Building mapping (e.g., mapping mechanical rooms to allow maintenance staff to effectively troubleshoot issues remotely)

Our staff will be targeting projects in each region to apply the technology to various aspects of design and construction. These projects are targeted in Northern Region: University Avenue, Steese/Johansen Expressway, and 3rd Street. Central and South Coast Region projects are yet to be identified.

These projects represent various design and construction challenges. We will be able to track if the AR/VR technology was useful in delivering these projects. Representatives from each of the regions are on the team and are getting close to having the funding available.

- Christine Langley, project manager
- Caitlin Frye, communications
- Paul Eckman, lead investigator
- Matt Flickinger, Central Region
- Michael Sjoroos, South Coast Region
- Alan Skinner, Northern Region
- Kailing Chang, Northern Region
- Billy Connor, STIC sponsor, Alaska University Transportation Center

As we progress, we will find more ways to test the technology and its usefulness. This is an exciting step towards upgrading our current tool set to include the best available.

Augmented reality allows a person to see virtual reality imposed on top of actual reality, looking through the camera on a phone or tablet. DOT&PF staff could use this technology during site visits to see underground utilities in the field without a shovel hitting the ground. The public would be able to see how a construction project would look after it is built while standing on-site.

Virtual reality allows a person to see and interact with a 3D virtual model, usually using special goggles or other sensors. DOT&PF staff could use this technology to more effectively review projects remotely, see how designs look in 3D, or better understand a remote facility and the tools and equipment needed for repairs before traveling to the site. The public would be able to better understand project designs and provide more productive feedback.
Microsurfacing Experimental Feature

By Drew Pavey, Research & T2 Pavement Management Engineer

The Minnesota Drive Pavement Preservation Project includes microsurfacing on select ramp locations. Microsurfacing uses specialized equipment to mix aggregate, emulsion, and additives at specified rates before it is placed on the road. The additives make the mixtures quick set, so traffic is able to drive on the surface within an hour of application. The vehicle used contains bins for the aggregate and additives, an emulsion tank and pump, and meters that control the rate at which these components are combined and mixed in a pug mill before placement on the road from a spreader box. See the picture below.

Microsurfacing was selected as a treatment and experimental feature due to its potential as an alternative to the standard mill and fill projects used in Southcentral Alaska. Typically, mill and fill projects are used when ruts reach depths of ½” to ¾”, and they remove and replace 2” of existing pavement. Microsurfacing treatments do not require removal of existing material, and two or three passes with the equipment is enough to fill existing ruts, provide a level application surface, and apply a new thin wearing course, which is significantly less expensive than traditional mill and fill projects.

This research project will monitor the construction application of the microsurfacing as well as its performance over a three-year period after the application. Its performance will be judged on the development of rutting, shoving/deformation, delamination, and other surface distresses. If the microsurfacing does not display these distresses, it will be considered successful and will likely be used at other locations. A picture of a newly applied microsurfacing overlay is shown below.

For more information go to:
https://cpmamerica.com/micro-surfacing/
https://macropaver.com/
http://www.alsherouk.com

By Drew Pavey, Research & T2 Pavement Management Engineer

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Economic Analysis of Pavement Impacts from Studded Tire Use in Alaska

Project Background
Alaska DOT&PF received a request from state legislators in 2016, asking for data regarding economic impacts to Alaska roadways from studded tires. Studded tires are a significant cause of pavement rutting in Alaska. Depth of ruts is measured to determine the “health” of pavement. Ruts greater than 0.4 inch are considered a safety issue in other states and are considered “Poor” using federal metrics. Rutting is a major issue in the high-traffic-volume areas of South-central and Southeast Alaska.

Over the years, DOT&PF conducted a number of studies to assess and quantify the effects of studded-tire use and to find methods to reduce the rate of pavement rutting. These methods and studies include:

- Using hard aggregate and improved mix designs (e.g., Stone Mastic Asphalt and Superpave mixes) helps minimize the rate of rutting. For example, instead of reaching a pavement rut depth of a half-inch in five years when using local “soft” aggregate in a mix, the use of “hard” aggregate and special mixes may yield a rut depth of a half-inch in eight years, extending pavement life.
- Extracting and transporting hard aggregate from remote sources is cost effective (e.g., from Cantwell to Anchorage by rail). See: http://dot.alaska.gov/sttddes/desmaterials/assets/pdf/hard_asphalt_aggregate_study/6_final_cantwell_development_study.pdf
- Importing hard aggregate is cost-effective (e.g., from Washington State and British Columbia to Southeast Alaska by barge). See: http://www.dot.state.ak.us/sttddes/desmaterials/mattraining/assets/costeffectiveness_hma_0603.pdf
- Since the mid-2000s, a number of factors have changed:
  - Improved non-studded tire options and increased use of flexible studless tires (e.g., Blizzak tires).
  - Increased use of lightweight studs on tires
  - Increased studded tire use on bare pavement caused by warming winters.
  - Improved pavement design using hard aggregate and stiffer, polymerized asphalt binders. The hard aggregate use policy can be found at: http://www.dot.state.ak.us/sttddes/dcspubs/assets/pdf/directives/2013/081413_hard_aggregate_policy.pdf

In summary, the use of hard aggregate and improved mix designs were able to improve but not eliminate studded tire wear.

Research Approach
Staff worked with the Civil Engineering Department and Institute of Social and Economic Research at the University of Alaska Anchorage and used funding from the Federal Highway Administration to conduct research investigating the legislative request, which included:

- Completed literature review.
- Reviewed five years of studded tire tax data.
- Conducted cost review for 20 highway projects in Southcentral and Southeast Alaska.
- Reviewed winter tire options in Alaska.
- Conducted parking lot and household surveys.
- Analyzed life-cycle cost and road damage from studded tire use over past 20 years.

This project excluded quantifying cost benefits from safety-related trade-offs of studded tire use versus rut depth, due to limited project funding.

Key Findings
- Road damage from studded tire use in Alaska costs $203.2 million in 2019 U.S. dollars over 20 years, or $13.7 million per year.
- The effect of studded tires reduces the asphalt surface life from 15 years to six to eight years, depending on traffic, location, and type of asphalt mix used.
- Studded tires on passenger vehicles cause 237% more rutting than plastic deformation from the same number of heavy trucks, as shown on the figure on page 6.

(continued on next page)
• Parking lot and household surveys show studded tire use ranges between 35% (Anchorage) and 48% (statewide) for personal vehicles.
• The survey results show a large gap in public awareness of options for nonstudded winter tires.
• The resurfacing cost associated with road damage from studded tires is 42 times more than the state’s annualized studded tire tax revenue of $318,000.

Research Tells Us We Have Options
The precise environmental conditions under which studded tires provide a traction benefit over studless winter tires are rare. On smooth ice near the freezing point, when studs are new, they perform well. As the temperature drops, or as the studs wear, their effectiveness diminishes. Studless or nonstudded winter tires offer an excellent alternative. They are good on ice, great on snow, maintain similar performance characteristics as they wear, and are only slightly more expensive. All-season tires can provide good traction on snow and ice. However, on ice near the freezing mark they perform poorly when compared to studded tires or studless winter tires.

The chart above shows stopping distances at 25 mph. They are the average of a front-wheel-drive car, a rear-wheel-drive pickup, and a rear-wheel-drive car. Traction performance can be characterized in many ways, including braking, acceleration, cornering, controllability, and grade climbing. Although all factors are important, the single best indicator of tire performance is braking distance and deceleration.

The test was conducted in Fairbanks at near-freezing temperatures. All three tire types performed well on packed snow surfaces. On ice, studded tires performed only slightly better than Blizzaks. On bare pavement, studded tires performed the worst.

What Can the State Do to Help Reduce Damage to Our Roads?
Options include:
• Ban use of studded tires.
• Ban heavy metal studs. Switching to lightweight studs will reduce total pavement damage by 50% and increase total pavement life by 7 to 10%.
• Shorten the studded tire season by two weeks on either end, consistent with recently observed winter weather trends.
• Educate motorists about the safety benefits of nonstudded winter tires such as Blizzaks.

The final research reports can be found here:
http://www.dot.state.ak.us/stwdes/research/assets/pdf/4000-175.pdf
and
https://www.wsdot.wa.gov/research/reports/fullreports/551.1.pdf
NHI Online Training

Just create an account with your Alaska DOT&PF email account. Remember, we encourage everyone to talk with your supervisor before enrolling in T2 or non-T2 sponsored courses.

https://www.nhi.fhwa.dot.gov/course-search?tab=0&sf=1
On-line Training Available on the T2 Website

- CUF Federal-aid Highway Program Video Training
- Wetlands
- Stormwater
- Hazard Communication
- Airports MSGP Training
- Introduction to Title VI Training
- Inspection Report Form 25D-100 Instructions
- Natural Occurring Asbestos: Asbestos Awareness Training
- Natural Occurring Asbestos: Competent Person Training
- Natural Occurring Asbestos: Project Designer Training
- Natural Occurring Asbestos: Project Designer Training
- RBA: Operate Alaska’s Marine Transportation Services
- RBA: Modernize Alaska’s Transportation Infrastructure
- RBA: Operate Alaska’s Transportation Infrastructure
- NEPA Procedures Manual Training, Module 1: Environmental Procedures Overview
- NEPA Procedures Manual Training, Module 2: Class of Action Determination
- NEPA Procedures Manual Training, Module 3: Categorical Exclusions
- NEPA Procedures Manual Training, Module 5: Environmental Impact Statement
- NEPA Procedures Manual Training, Module 6: Re-Evaluation
- NEPA Procedures Manual Training, Module 7: Public and Agency Involvement
- NEPA Procedures Manual Training, Module 8: Section 4(f) and 6(f)
- NEPA Procedures Manual Training, Module 9: Endangered Species Act and Marine Mammal Protection Act
- NEPA Procedures Manual Training, Module 10: Cultural Resources

How to enroll:

1. Go to our link: https://dot.alaska.ecatts.com/lmsTrainingCalendar
2. Log in to your account or create an account (sidebar, bottom right)
3. Find “on-line training” under the Training Links on the sidebar.
4. “Add on-line training” to your Scheduled Training and you’re ready to go.

For information about T2-sponsored training, contact:

Dave Waldo at 907-451-5323, david.waldo@alaska.gov
Simon Howell at 907-451-5482, simon.howell@alaska.gov
Upcoming Training

October 2019

FHWA-NHI-134077: Contract Administration Core Curriculum
Oct. 1–2 in Fairbanks

ICS 191: Emergency Operations Center/Incident Command Systems Interface
Oct. 4–4 in Juneau

ICS 300: Intermediate Incident Command System for Expanding Incidents
Oct. 7–9 in Juneau

ICS 400: Advanced Incident Command System for Command and General Staff: Complex Incidents
Oct. 10–11 in Juneau

135067: Practical Highway Hydrology
Oct. 1–3 in Anchorage

FHWA-NHI-380032A: Roadside Safety Design
Oct. 22–24 in Fairbanks

Traffic Control Supervisor
Oct. 2–3 in Haines

Traffic Control Technician
Oct. 1 in Haines

November 2019

EDC-5 STEP: Safe Transportation for Every Pedestrian
Nov. 5 in Fairbanks
Nov. 6 in Anchorage
Nov. 7 in Juneau

The current training calendar can be found at:
https://dot.alaska.ecatts.com/lmsTrainingCalendar

For periodic emails about research, sign up for our list-serve:
http://list.state.ak.us/mailman/listinfo/dot-research-notification

For periodic emails about training, sign up for our list-serve:
http://list.state.ak.us/mailman/listinfo/dot-training-notification

For any other information about T2-sponsored training, contact:
Dave Waldo at 907-451-5323, david.waldo@alaska.gov
or
Simon Howell at 907-451-5482, simon.howell@alaska.gov
or go to: www.dot.state.ak.us
AASHTO T3 Training Available Free for Alaska DOT&PF Employees

Just create an account with your Alaska DOT&PF email account. Remember, we encourage everyone to talk with your supervisor before enrolling in T2 or non-T2 sponsored courses.

https://tc3.transportation.org/training-resources/courses/

Hundreds of courses in several topic areas:

- Construction
- Maintenance
- Materials
- Traffic and Safety
- Pavement Preservation
- Employee Development

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