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| Sponsor | Nominations must be submitted by an AASHTO member DOT willing to help promote the technology | 1. Sponsoring DOT (State): Minnesota
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| 1. Name and Title: Curt Turgeon, State Pavement Engineer
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| Organization: Minnesota DOT |
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| 3. Is the sponsoring State DOT willing to promote this technology to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative? Yes or No: Yes |
| **Technology Description (10 points)** | The term “technology” may include processes, products, techniques, procedures, and practices. | 4. Name of Technology:Uniform asphalt mat placement, compaction and analysis using paver mounted thermal profiling, intelligent compaction and ground penetrating radar.  |
| 1. Please describe the technology.

Paver Mounted Thermal Profiling (PMTP) monitors the thermal uniformity of the asphalt materials immediately behind the paver. The uniformity of placement, or lack of segregation, is linked to the uniformity of the temperatures across and along the mat surface. This is a SHRP2 product and is documented in AASHTO Provisional Standard PP80-16.Intelligent Compaction (IC) for asphalt utilizes GPS tracking, temperature sensors and vibration monitoring to ensure uniform coverage and pass count for each roller. MnDOT has used this technology to verify the number of rollers verses paver speed is adequate and track coverage at longitudinal joints. This technology is documented in AASTO PP81-16.Ground Penetrating Radar (GPR) provides continuous full coverage of the pavement surface and measures the asphalt mixtures’s dielectric constant. Changes in the amount of air in the pavement relate directly to the amount and uniformity of the compactive effort. This concept is not new, but was refined to apply specifically to asphalt paving applications by TTI under SHRP 2. A provisional AASHTO standard is in development. These three technologies deployed together will have an immediate impact to the uniformity and overall density of asphalt pavements leading to longer pavement life and fewer performance issues such as early deterioration of longitudinal joints.  |
| 1. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the technology. (If electronic, please provide a separate file.) Please list your attachments here.

Intelligentcompaction.com<https://tti.tamu.edu/featured-project/rolling-density-meter/><http://www.trb.org/Publications/Blurbs/167280.aspx> |
| **State of Development** **(30 points)** | Technologies must be successfully deployed in at least one State DOT. The AII selection process will favor technologies that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use. | 1. Briefly describe the history of its development.

PMTP is a SHRP2 product (RO6C). The $500k project was completed by TTI in 2013. MnDOT was one of the test cases. We began deployment prior to the project completion and will require this technology on all significant paving projects in 2018 including an incentive/disincentive specification.IC was first deployed on the complete roller train on a pilot project by MnDOT in 2011. Prior work had focused on soils. Numerous instances of inefficient and inadequate roller passes have been documented since. All significant paving projects in 2018 will require this data collection and analysis by the contractor. GPR using the SHRP2 RDM is still under development. MnDOT first used the device in 2015 with extremely promising results and developed a method to statistically analyze collected RDM data. More data is being collected during the 2017 construction season.  |
| 1. For how long and in approximately how many applications has your State DOT used this technology?

PMTP 8 years 50 projects +IC 7 years 50 projects +RDM 1.5 years 3-5 projects to date.  |
| 1. What additional development is necessary to enable routine deployment of the technology?

PMTP and IC are mostly off the shelf items. The standardized software is getting support from TPF-5 (334) with 11 member states. Software development is never as fast as everyone would like. Compatibility with numerous hardware vendors is still an issue. RDM is demonstrating ruggedness and accuracy within context. Use in the quality control and quality assurance as well as acceptance has not been established. The system performs as expected, but there is a lack of clarity on how it fits into the low bid system.  |
| 1. Have other organizations used this technology? Yes or No:       If so, please list organization names and contacts.
 |
| Organization | Name | Phone | E-mail |
| Maine DOT | Richard Bradbury |       | richard.bradbury@maine.gov |
| Alaska DOT | Richard Giesel |       | richard.giessel@alaska.go |
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| **Potential Payoff****(30 points)** | Payoff is defined as the combination of broad applicability and significant benefit or advantage over other currently available technologies. | 1. How does the technology meet customer or stakeholder needs in your State DOT or other organizations that have used it?

Without these technologies, asphalt paving is a black box. There is no feedback to the construction personnel to improve or maintain placement and compaction quality. All processes require real-time operator feedback to maintain consistency and quality. Spot tests, after the fact, are not an adequate assessment of the placement, compaction, uniformity or long term durability of an asphalt pavement.  |
| 12. What type and scale of benefits has your DOT realized from using this technology? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing technologies.In general, core density values have increased approximately 0.5-1.0% of MTD. Density on joints has improved. Project with poor core results have been analyzed and processes have been improved to decrease or eliminate the low density areas. Smoothness appears to have become more consistent industry wide. A typical 2-lift asphalt overlay yields an IRI of less than 35 inches per mile with some contractors consistently paving at 25 inches/mile.  |
| 1. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?

Any organization that is in the business of purchasing, owning or constructing asphalt pavements will benefit from the use of these field quality control measures.  |
| **Market Readiness (30 points)** | The AII selection process will favor technologies that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential. | 1. What actions would another organization need to take to adopt this technology?

Create an oversite committee with agency, paving industry and technology vendor representation. Determine where these technologies fit within current specifications. Develop pilot projects so all parties become versed in the abilities and current limitations. There have been cases of expectations exceeding current equipment and software abilities.  |
| 1. What is the estimated cost, effort, and length of time required to deploy the technology in another organization?

Outfitting a single paving train costs from $200-$350k and can be done in a matter of days. The implementation industry-wide in any state will depend upon the desires of the oversite committee and its individual members. Full implementation could occur in 3-5 years.  |
| 1. What resources—such as technical specifications, training materials, and user guides—are already available to assist deployment?

AASHTO PP 80, AASHTO PP 81, draft AASHTO PP for the Rolling Density Meter, draft AASHTO PP for standardized data format for Veta. Construction specifications available from MnDOT. Online Veta course is in development. Classroom Veta class has been provided to nearly 200 students in Minnesota, primarily Contractor personnel.  |
| 1. What organizations currently supply and provide technical support for the technology?

Each vendor provides their own support. Depending upon the State, the vendors may or may not have adequate personnel currently on staff to support quick implementation. GSSI has limited onsite tech support.  |
| 1. Please describe any legal, environmental, social, intellectual property, or other barriers that might affect ease of implementation.

None.  |
| ***Submit Completed form to*** | [***http://web.transportation.org/tig\_solicitation/Submit.aspx***](http://transportation1.org/tig_solicitation/Submit.aspx) |