**Pooled Fund Study: Autonomous Maintenance Technologies – Phase 2**

**Study Description**

Road maintenance activities are crucial for ensuring safe and efficient delivery of goods and people. Well-maintained roads not only extend their lifespan but also significantly reduce the risk of accidents and improve fuel efficiency. In recent years, with the development of sensing, vehicle automation, wireless communication, and robotic technologies, some road maintenance activities can be partially facilitated or fully replaced by machines, which bring significant benefits in improving road maintenance workers’ safety and productivity.

The existing pooled fund project titled “Autonomous Maintenance Technology (AMT)” started in 2018 and the main focus so far has been the Autonomous Truck Mounted Attenuator (ATMA) technology. Current research in ATMA has led to broader interest in other AMTs including both full automation technologies such as ATMA, autonomous cracking sealing, and autonomous mowing, and partial automation technologies such as snowplow driver-assist systems and remote-operated culvert inspection robots. This motivates us to expand the scope of the current pooled fund project and develop a cooperative agreement to conduct further research on other available ATMs and their supported road maintenance activities. The Indiana DOT (INDOT) will serve as the lead state for the execution of the continuing pooled fund project. INDOT, through the Joint Transportation Research Program (JTRP) at Purdue University, will handle all administrative duties associated with the project. Purdue University will also serve as the lead research institution for the project.

**Objectives**

The overall objective of this study is to support and promote collaborative research efforts in the field of AMTs for road maintenance activities. Specific objectives include 1) Identifying needed research priorities from participating state DOTs; 2) Providing a platform for technology, experience, and lessons learned exchange among participants; 3) Funding research related to AMT development, testing, evaluation, and deployment in various DOT maintenance activities; 4) Fostering collaboration among state agencies, industry, and academia; and 5) Providing technical leadership in AMT to advance the state-of-the-art road maintenance practices. It is expected that this consortium will become a national leader in AMT-related research and applications.

**Scope of Work**

The project will fund research and development efforts to achieve the program goals, with proposed initial research focusing on

* AMT Deployment Requirements: identify the purpose, features, functionalities, and underlying technologies of each selected AMT and investigate how the AMT is intended to be used in what road maintenance activities, and corresponding external conditions (e.g., road, traffic, weather, etc.).
* Human-AMT teaming: explore how the AMT interacts with DOT workers to what extent in road maintenance activities.
* Machine-machine teaming: explore how multiple AMTs can be operated together in terms of interoperability, safety, reliability, scalability, and cybersecurity.
* Workforce consideration: conduct systematic analysis on the impact of AMTs on workforce development and shifts (e.g., job replacement, required skills)
* Cost-benefit analysis: analyze potential benefits and costs and build business cases for each technology.

Besides research activities, this scope of work also includes

* Identify AMTs that are of high interest to participating member states
* Identify and solicit new research ideas and directions.
* Develop research problem statements for possible pooled fund projects to address research needs identified by member states.
* Maintain and keep developing the pooled fund website and listserv
* Develop a forum for member states to exchange information, post questions and answers on AMT-related problems
* Organize internal meetings (online every month, and in-person once a year) within the member states to discuss research updates, administrative issues, budget, technology transfer, and future research directions.
* Organize research webinars to disseminate project outcomes. Each funded project is required to deliver a research webinar after completion. The research webinar will be open to the public.
* Organize special workshops/sessions regarding AMTs at transportation conferences and venues such as the TRB annual meeting and ITS America.
* Prepare reports to member states and FHWA.

**Comments**

We are proposing $25,000 per year for four years for each participating agency (a total of $100,000). This will allow one participant to attend the annual meetings. For each additional participant, an additional $4,000 is expected. Our goal for funding will be initially $250,000 annually (or $1,000,000 in total) from all members.

In each monthly internal meeting, the current budget status will be shared with all member states.

Research problem statements will be solicited on an annual basis. In one of the monthly meetings, the submitted research problems will be discussed and the member states will vote for the proposals to be funded in the next year.

This pooled fund is always accepting new member states. Please inquire with the lead agency contact Michael Lane (MLane1@indot.IN.gov) to join this effort.

**Subjects**

Highway Operation and Maintenance, Safety, Traffic Control, Work Zone, Human Performance