



Researcher

Dr. Pasi Lautala
Research Assistant Professor
Director
Rail Transportation Program
Michigan Tech
Transportation Institute

ptlautal@mtu.edu
906.487.3547

Sponsor

National Center for Freight &
Infrastructure Research &
Education (CFIRE)

Project Title

GPS-CFIRE Research Study

Project Manager

University of Wisconsin-
Superior
Dr. Richard Stewart

Co-investigator

Hamed Pouryousef
Janne Vartiainen
Libby Ogard (Prime Focus LLC)

Project Summary

Technology Transfer Outreach Publication

Improving Log Transportation with Data Based Monitoring and Analysis in Northern Wisconsin and Upper Peninsula of Michigan

Minimizing transportation costs is essential in the forest products industry, but understanding of system inefficiencies requires sufficient data. While most individual forest products companies collect data on origins and destinations of truck trips, little is known about the actual movements in between. One alternative to collect data on truck movements is with Global Positioning Systems (GPS) data receivers. The objective of this research is to use inexpensive GPS tracking devices to analyze truck movements and using data to identify potential improvements to the performance of log transportation system in northern Wisconsin and the Upper Peninsula of Michigan. The research included three major steps within its one year time frame: (1) selecting GPS technology and performing a pilot test, (2) first round of data collection and analysis for any improvement opportunity to be implemented in next round, (3) second round of data collection, analysis and conclusions. Three industrial companies participated with the research team to set up GPS devices inside their designated trucks.

Research Approach and Outcomes

Since the applied inexpensive GPS system didn't have real-time tracking capabilities, one month of movement data was collected by the devices. Geospatial data was complemented by log sheets for truck drivers. With combination of GPS data and log sheets, the research team was able to define truck movements and stops for various purposes. Both log and chip trucks were analyzed including features such as operational patterns, stops times and reasons, truck mileage and performance records, identifying unloading locations (such as mills, log yards, rail yards) and fuel consumption analysis through truck idling. The outcomes were consistent in both rounds and demonstrated significant similarities between log truck and chip truck operations. Trucks spent remarkable portion of their time stopped for activities (40-50% during a daily operation). Unloading time of chip trucks was significantly shorter than log trucks, due to modern innovations such as truck tippers. In average, chip trucks moved about 40 miles per day more than log trucks (295 versus 256), although the average operational hours of chip trucks were approximately one hour shorter than log trucks (10.8h vs. 11.8h). Also, the analysis showed that each dollar increase in fuel price adds almost \$700 in idling costs annually.



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University Facts

Total Enrollment	6,550
Graduate Enrollment	916
Number of Faculty	417
Placement Rate	95%

Michigan Tech is located in Houghton, MI on the south shore of Lake Superior. This rural area is known for natural beauty, pleasant summers, abundant snowfall, and numerous all-season outdoor activities. In addition, the University maintains its own downhill and cross-country ski facilities and golf course. There are numerous cultural activities and opportunities on campus and in the community. Michigan Tech has also been rated as one of the safest college campuses in the United States, and the local community provides excellent resources conducive to an outstanding quality of life.

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Methodology

- Obtain GPS devices and distribute to the industry partners with instructions to use GPS and log sheets
- Setting up GPS devices in addition to designing log sheets and spreadsheet interpretation tools
- Downloading geospatial database of GPS units to spreadsheets and Google Earth for each individual truck
- Data Analysis and interpretation of every truck movements and stops, based on GPS data, GIS maps and log sheets
- Repeating data collection and data interpretation steps, considering modification and recommendations
- Identify potential improvements of log and chip truck operations for industry partners

Anticipated Research Findings

- Evaluating operation patterns of trucks including daily hours of activities, stop reason categories, categorizing loaded and unloaded movements, classifying used roads by trucks,
- Truck idling analysis and determining sensitivity of fuel consumption
- Loading and unloading analysis and suggesting which mills and unloading locations have faster unloading and admin procedures

Benefits

- Better perception on truck's real operation challenges, requirements and opportunities to be improved by applying GPS devices.
- Providing a collaborative framework between industry partners to share their experience and challenges through this project.
- Validating anecdotal evidences of truck operation records for both log and chip trucks.
- Comparing log and chip truck performances based on different operational features.
- Consistent analysis approach to compare different trucks performance from different forestry companies.

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