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HOW TO IMPROVE TRANSPORTATION EFFICIENCY AND COST: A WSRI[1] STUDY

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Abstract: *Researchers at Auburn University completed a study project funded by the Wood Supply Research Institute on trucking in the Southeast during the spring of 2004. The objective of the study was to explore ways to improve the productivity, efficiency, safety and cost of the transportation portion of the wood supply system. The study was organized into three sections: Equipment, Logistics, and Safety. Data was collected at several locations across the South to determine the condition of the current fleet, assess the attitude of truck drivers on safety training, and to observe operations that were on the leading edge of technology.*
We determined average empty truck weights, in-woods scale usage and evaluated loading methodology. We also examined truck driver experience levels for safety implications. For equipment, recommendations are to spec out trucks more carefully to keep weight and horsepower at a more efficient level; under safety there are recommendations for training needs; and the area with the most potential is in logistics where independent trucking operations using a dispatcher showed significant efficiency gains.

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1. Introduction

Transportation of forest products from the woods to the mills accounts for a major portion of the total wood cost. It also has the greatest exposure to the public as the most visible part of the logging industry. For these reasons, industry managers instigated a study to examine the productivity, efficiency and safety of the trucking portion of the supply chain. Three specific areas were evaluated: equipment, logistics and safety.

Equipment – Through the Fleetsmart program in Canada, FERIC has implemented optimal logging truck configurations to reduce tare weight and improve fuel efficiency. Trucks with optimal configurations achieved a 9% increase in payload and a savings of $0.70 per ton for an average haul when compared to a typical tractor-trailer. Results of a 2003 limited survey in east central Alabama found that tare weights of the lightest tractor-trailers in use were 6-9% lighter than the median unit. Options implemented by FERIC such as aluminum components in the truck and cab were already implemented on 50% to 80% of the tractor-trailers in east central Alabama. Other components such as GPS and navigation systems, on-board computers, on-board scales, single frames, aluminum wheels, super single tires, smaller horsepower engines, and light weight trailers have been implemented at a lower rate. Limits to acceptance of some technology are presumably due to questions about durability in harsh logging conditions, return on investment, products hauled, and truck driver and owner preconceptions.

Logistics – Efficiency of log transport in the South could be increased greatly through application of modern logistics technology. The current practice of dedicating tractor units to a particular logger maximizes the total number of miles driven to deliver a given quantity of wood and often leads to underutilization of trucking resources. Under some circumstances, having too few trucks assigned can lead to underutilized harvesting equipment if it sits idle waiting on wood already processed to be loaded and delivered. Random arrival times at mills can lead to extended waits at the woodyard. Coordination of pooled trucking resources, if managed properly, would eliminate most of these types of inefficiencies, but the forest products industry, and the logging community in particular, has been reluctant to adopt this strategy.

Safety – Any method implemented to increase efficiency of the log truck fleet is likely to lead to improvements in safety. Decreasing the number of miles driven by log trucks are likely to result in the following: 1) a reduced risk of involvement in incidents or accidents, 2) a reduced number of poor drivers through decreased employment, 3) an improvement in training of the remaining drivers and better compliance with Federal Motor Carrier Safety Regulations since centralizing trucking should lead to economies of scale in training and record keeping, and 4) a greater investment in modern trucks and trucking technology. Two surveys completed in Alabama in 2000 and 2003 indicated that the median tractor was 8 years old and 20 and 30 year old tractors are not uncommon.

2. Methods

Data was collected from five "regions" across the South (Figure 1): North Carolina, South Carolina, Alabama/Georgia, Mississippi/Alabama and Texas/Louisiana. At each region, several facilities were visited and information on the trucks was gathered and the drivers were asked to complete a survey. Truck and trailer age, horsepower rating, products being hauled, whether in-woods scales were being used and load configuration were some of the measurements collected.

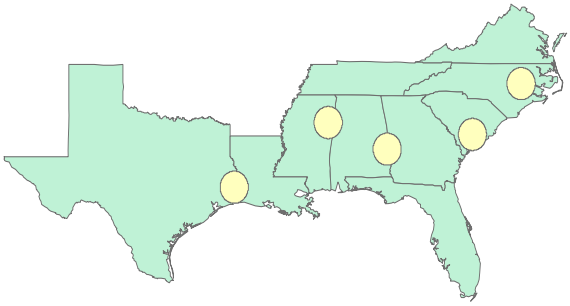

Figure 1. The five "regions" where data was collected. For each region, several facilities were visited

The driver survey consisted of several questions about length of service, driving habits, training received and insurance status. All of the questions on the survey centered around determining a "risk" rating for drivers.

3. Results and Discussion

Approximately 600 trucks were measured and 400 drivers completed surveys throughout the five regions in the spring of 2004. The following represents the information we learned from the data:

Equipment – There was a wide range of trucks and trailers measured, from as early as 1975 to some brand new rigs just put to work. The average age of trucks and trailers was 10 years old. While many log trucks are purchased for the purpose of hauling forest products, there is still a strong population of over-the-road trucks being incorporated into the system. This was evident by the almost 40% of trucks that still had a sleeper attached.

The average empty weight of all trucks was 29,500 pounds (Figure 2), with the low coming in just below 24,000 and the heaviest truck at 33,800. Characteristics of the 25% lightest trucks include empty weight less than 28,300 pounds, typically a late model truck purpose built for logging, many lightweight components such as aluminum wheels and headache rack, smaller fuel tanks (<200 gallons) and no sleeper. The heaviest trucks were characterized with an empty weight greater than 31,000 pounds, large fuel tanks (>200 gallons) and many times still had a sleeper attached. Most of these trucks were used over-the-road rigs with a long wheel base.

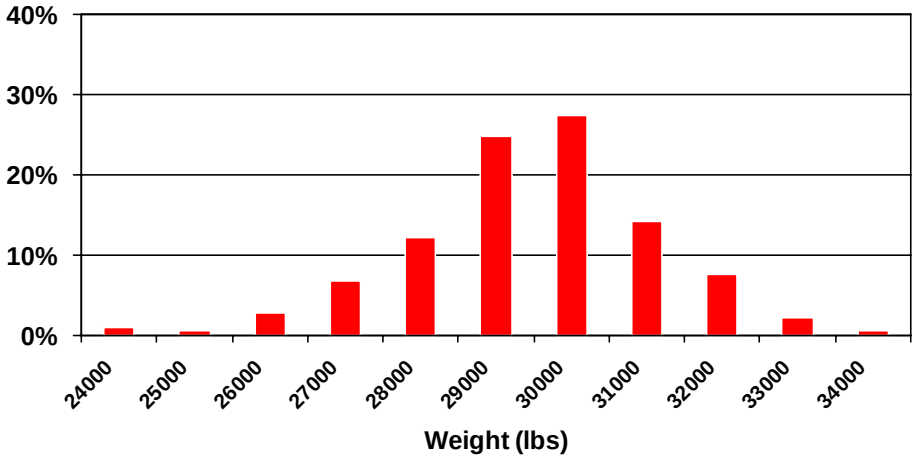

Figure 2. Range of truck weights across all the regions

Changes can be made to improve fuel efficiency. Select the correct engine size, transmission and rear axle ratio for the conditions expected. The greater the power demanded the greater the fuel consumption, and gear reduction is more efficient at producing tractive effort than additional horsepower. Teach drivers fuel-efficient techniques, such as operating at the most efficient rpm, rather than the higher range. Since fuel usage is at the maximum during acceleration, pick routes that have fewer stop signs and traffic lights.

Recently, much more emphasis has been put on truck and trailer design and how it can affect empty weights. A new trucking concern in Mississippi has put new trucks and trailers on the road specifically ordered for hauling forest products (Abbott, 2005). These trucks use lightweight components throughout, single fuel tanks and new lightweight trailers. The empty weight for these rigs is 25.720 lbs, fully fueled and driver in the cab.

Another technology used to improve efficiency of trucking is in-woods or on-board scales. Forest products will vary in weight for each loaded truck. Ensuring that the legal limit allowed in the region is on every truck will minimize overweight fines and maximize truck efficiency. The study tallied trucks with and without some type of weighing system and the results are shown in Figure 3. Several locations did not tally any in-woods scale usage and they are not included in the data. But for the locations included, the trucks without scales are evenly distributed across all weights. The trucks with some type of in-wood scaling are shown to be clustered around the legal limit for their region. Several states have legal limits above 80,000 pounds, so the heavy trucks in Figure 3 were not representing over-loaded trucks. Three of the regions showed good in-woods scale usage (NC, Miss/AL and TX/LA); two regions (SC and AL/GA) had very little. Adoption of in-woods scales seemed to be more influenced by the large forest products companies in the region than how the logger could benefit, though ultimately they did improve efficiency.

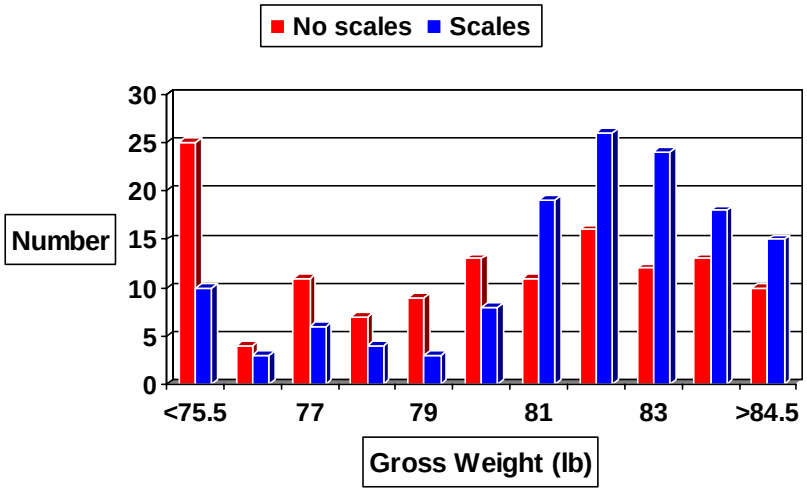

Figure 3. Comparing trucks with and without scales at several locations indicates how more trucks are fully loaded when some type of in-woods scales are present

Other findings for equipment found that use of pole trailers could potentially increase net load weights by a ton, but many loggers were hesitant to include them in their system because of operational concerns. Also, allowing trucks to load wood in both directions (butt to tops) also increased net load weight by almost a ton, but pulpmills had operational difficulties that prevented this from occurring at all but a few locations.

Logistics – Trucking logistics have been examined using a computer program that evaluated several approaches to transporting wood from the harvesting site to the mills (McDonald et al., 2001). Using an informed dispatch scenario, 20 to 30 percent more wood was delivered than the traditional system of logger's having dedicated trucks. These benefits were achieved by reducing wait times and increasing loaded miles for the trucks involved.

As part of this project, we discussed several scenarios with loggers on how a pooled transport system could be implemented. The alternatives discussed included:

1. Consuming mills could require all wood to be delivered by an 'approved' transport contractor. The approved hauler (or haulers) would implement a high-tech logistics system to minimize unloaded miles driven subject to the constraint that all loads from every logger that should be delivered, in fact, are. The financial benefits of this system would be accrued by the consuming mill, provided the transport contractor could lower per-ton mileage costs. Indirect benefits might also be gained by coordinating arrivals at the mill gate, reducing congestion at the woodyard and perhaps

eliminating the need for additional unloading capacity. There would also be a single point of negotiation for haul rates, perhaps lowering logging contract administration costs. Those loggers with efficient trucking operations might see a loss in total income if they were forced to quit hauling, but would also be relieved of the responsibility of administering the transport of their wood. If properly implemented, the system would remove the financial burden on loggers of operating at greater distances from the mill, perhaps reducing fluctuations in their income.

2. Loggers could join together in a transport cooperative, pooling their trucking capacity under a dispatch agent that is responsible to the loggers themselves. Haul rates could be negotiated such that all costs of the dispatching service were covered, with a lease rate paid to the logger for use of their truck resources. Benefits of this system would be greater for the loggers. It is unlikely that, at least initially, haul rates would be lowered. The main benefits then would be a reduction in the administrative oversight required on the logger's part, leaving more time to supervise and improve their in-woods operations.

3. A trusted third party, perhaps a wood dealer, could offer the transport service to all loggers under contract, allowing them to liquidate their trucking capacity and the provider handles all wood delivery duties. Those using the service would have the same incentive as in the cooperative model above, namely that administrative overhead could be reduced and they could, perhaps, eliminate the effect of distance to the mill on their profitability.

While the loggers were less than enthusiastic of any of these scenarios, it appears the dealer driven system might be the most realistic. An example of such a system was found in North Carolina and, at least from the wood dealer's standpoint, the approach was working quite well. This was despite the fact that dispatch was handled strictly *ad hoc*, with no use of optimization technology at all.

Since the completion of the study, the first scenario has been implemented in parts of Mississippi and Louisiana by Weyerhaeuser (Abbott, 2005). While the system has been bringing some benefits to the participants, it is still too early to determine the long term success of the program. What is being demonstrated by both these examples is that any type of logistical coordination of trucking will increase efficiency, but it has to meet the demands of all parties involved.

Safety - Safety, in about every venture, can be affected by managing exposure to risk. In hauling, exposure to risk is related to the number of drivers contracted or employed, the miles driven by those drivers, the quality of the equipment, and the quality of the drivers. Most of this WSRI report addresses methods to reduce exposure and the miles driven by increasing payload and percent loaded miles. If logging were able to achieve a 5% increase in payload and a 5% increase in loaded miles that could eliminate 3 fatal crashes, 71 injury crashes, and 154 towaway crashes per year (Federal Motor Carrier and Safety Administration, 2003). The results could even be better if the fleet is modernized and the better drivers and carriers are retained as a result of the improvements.

Training can be improved. Seminar training does work to ensure that drivers know the rules and the consequences for not following them. However, seminar training doesn't make better drivers. The conclusion from training of drivers is that talking about driving in a classroom is not helpful. Driving is such a complex task that the drivers that need training won't get the point until they've had more experience. Training via seminar won't add age or experience to drivers. If you plan on making better drivers through training, you'd better be a driver and plan to spend that training time in the cab with the driver.

Safety equipment will help, but the industry in such a condition that it's tough to propose and justify investment in new machines or add-ons. However the sad fact is that the age of the fleet probably does result in some crashes every year due to equipment failure. It's probably also true that performance of newer machine braking and suspension systems could eliminate more crashes. For life saving purposes automatic crash notifications systems are worthwhile, simplistically they are like black boxes in airlines with a mayday system to alert responders in case of a crash. For carriers serious about improving safety or documenting the safety and action of their drivers during crashes, on-board computers and the Eaton Vorad systems are sophisticated and cost effective choices.

4. Conclusions

With trucking being a major portion of the cost of delivered forest products, any improvement in the efficiency of trucking will reduce delivered costs. There are many areas where changes can be considered. On the equipment side, loggers should reduce the empty weight of trucks by replacing older, heavier trucks with purpose built lightweight vehicles that allow additional wood to be hauled. Using pole trailers will also increase the net weight of loads. If receiving locations can allow for wood to be loaded in both directions, higher net weights will be achieved. The logistics area has the most opportunity for improvements. Any system that can increase loaded mileage, reduce wait times or improve utilization of trucks will improve efficiency. How it can be implemented in a mill procurement zone to satisfy all the parties involved will be the challenge. In the safety arena, finding and retaining good drivers, especially those with experience, is necessary. Proper training should be a requirement for all drivers. Adding new technology that improves a driver's awareness should also be considered.

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