Domiciling Truck Drivers More Strategically in a Transportation Network

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ABSTRACT

The authors propose a method to better domicile truck drivers in a relay-point highway transportation network to obtain better solutions for the truck driver domiciling and sourcing problem. The authors exploit characteristics of the truckload driver routing problem over a transportation network and introduce a new approach to domicile, source, and route truck drivers while more inclusively considering performance and cost measures related to the driver, transportation carrier, and customer. Driver domicile and relay-point locations are exploited to balance driver pay and recruiting costs and driving time. A mixed integer quadratic program will determine where driver domiciles are located to base drivers, source drivers, route drivers, etc. while considering key costs related to transporting truckload freight over long distances. A method to improve driver domicile locations is introduced to enhance driving jobs and driver sourcing, but not at the expense of the transportation carrier and customer. A numerical experiment will be conducted.

Keywords: Circuitous, Cost of Living, Domicile, Driver, Labor Availability, Relay Point

1. INTRODUCTION

Freight transportation has increased dramatically over the last 30 years as shipment demand has expanded causing driver and equipment capacity and infrastructure problems. U.S. freight transport tonnage is largely truck transportation- 69% of all freight distribution with a 5 year growth expectation of 27% (ATA, 2007). In truckload transportation currently represents about 5% of the U.S. Gross Domestic Product (ATA, 2007). In trucking, truckload transportation consists of about 50% of truck tonnage shipped (ATA, 2007). The trucking industry employs about 3.5 million truck drivers according to the U.S. Department of Labor (BLS, 1999). In truckload transportation, driver capacity, driver wages, and work conditions have become critical over the years. High truckload driver turnover and increases in driver wages to retain...
drivers cause high transportation rates, high driver recruitment costs, productivity issues, etc. It has been reported that truckload driver turnover is consistently above 100% (Min & Emam, 2003) and that driver recruiting costs can range from $10,000 to $30,000 per driver (DeWeese, 1999). According to Rodriguez et al. (2000), the truckload industry has a driver turnover rate of 100% each year, and Bush (2009) stated that driver turnover was between 80% and 100% each year. To combat driver turnover and retention problems, transportation companies have increased driver pay, which increase transportation costs and rates. Driver pay has steadily increased over the last two years (Indeed.com, 2012). Truckinfo.net (2011) reports that trucking companies average a 95.2 operating ratio leaving only 4.8 cents of profit for every dollar made, therefore, driver wages are critical.

As a result of driver turnover and retention issues, methods and strategies have been recently proposed and used on a small scale to enhance the truckload driving job by improving driver home time and reducing work hours. Strategies involve modeling key transportation costs that include the driver, transportation carrier, and customer, but most studies fail to consider a mechanism for better domiciling and sourcing truck drivers to minimize driver wages and to strategically consider labor availability to reduce driver recruiting costs. Domiciles are city/state locations where drivers live. Driver wages are a significant transportation cost consisting of about 35% of a transportation carrier’s total cost, and driver pay is market dependent. Since driver pay is market driven, drivers are paid based on their domicile location and the location’s wage rate. Domicile locations have different labor availability quantities based on population and employment rates, and locations have an associated cost of living index based on the wage climate. Therefore, effectively domiciling and recruiting truck drivers based on labor availability and market wages are important to keep transportation costs low while maintaining proper driver quantities to meet shipment demand. If shipment demand is not met, then an opportunity cost is incurred along with a possible loss in business. The motivation of this paper is to develop a better method for determining where truck drivers should be sourced from to keep driver pay at a minimum cost. The goal is to source truck drivers from areas with low labor wages and plentiful labor. In this paper, section 2 provides a literature background, section 3 states the problem, section 4 covers the data and mathematical model, section 5 includes a case study, and section 6 makes some closing remarks.

2. BACKGROUND OF STUDY

2.1. Overview

Several different transportation modes are used in the U.S. to transport goods from a ship point origin to a final receiving destination. The most frequent transportation modes are truck, rail, water, and air with different combinations serving as intermodal movements. According to the ATA, it is estimated that the distribution modes consist of 69% truck, 13% rail, 10% pipeline, 7% water, and 1% other (ATA, 2007). Typically, rail operations are used to move time insensitive freight cheaper over long distances while truck operations move freight cheaper over short distances. The two main segments of freight transportation in trucking are truckload and less-than-truckload (LTL). In both segments, different methods are used to dispatch drivers to keep drivers moving, to route drivers to their home domicile, and to route drivers to backhaul freight, and both are concerned with driver wages and driver domicile locations. The background study will explain the difference between LTL and truckload trucking, explain modern methods aimed to improve the driving job, and discuss some endeavors that have considered domiciling drivers more strategically. Unfortunately, literature related to domiciling drivers more cost effectively is somewhat limited.
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