LTRC Technical Summary Report 425

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Evaluating the Effects of Heavy Sugar Cane Truck Operations on Repair Cost of Low Volume Highways

Introduction

Current Louisiana state laws allow truck operators hauling certain agricultural commodities to purchase overweight permits and haul at gross vehicle weights (GVW) in excess of the legislated GVW limit of 80,000 lb. For instance, sugar cane truckers may purchase an overweight permit for $100/year and then carry sugar cane at a GVW of 100,000 lb., using the FHWA Type 9 vehicle. Such practice has generated a concern on the life span of local low volume roads on which those trucks travel. The Louisiana Department of Transportation and Development instituted this study to investigate the overloading effect of sugar cane trucks on highway infrastructure in the rural area in term of damage cost. In addition, there is a need to explore the remedy effect of using trucks with different vehicle configuration or types. In this study, investigators will determine the pavement costs associated with changing the load axle on a semi-trailer from a tandem to a triple axle for five different GVW scenarios using GVW for 80 kip, 100 kip, and 120 kip with Type 9 and 10 vehicles.

Objective

The main objectives of this research are to: (1) estimate the additional rehabilitation costs to roads damaged by heavy sugar cane trucks and (2) develop truck-axle configurations, which produce less pavement damage by permitted overweight trucks.

Data Collection and Analysis

The roads carrying sugarcane were identified with the help of the American Sugar Cane League and the representatives of the sugar mills. The pavement cross-section data of each control section that carried sugarcane was collected by interviewing personnel from each district. The control sections were divided into three groups of average daily traffic (ADT) as: (1) 88 control sections with ADT less than 2,000, (2) 91 control sections with ADT between 2,000 and 7,000, and (3) 92 control sections with ADT greater than 7,000. For each group, the structural number, a measure of pavement strength, was calculated as required to carry the traffic. The minimum sample size of control sections from each ADT group was determined based on the central limit theorem of statistics. The statewide net present worth of rehabilitation overlay costs for all GVW/Truck Types was determined using the statewide surface area of overlays by ADT groups determined in this study. The annual cost factor to convert present cost to an annual cost over 20 years used in the study was 5 percent interest/year.

Discussion of Results

The philosophy used in the 1997 Federal Cost Allocation Study was that each vehicle class should pay for the highway costs produced by the presence of those vehicles on the roads over which they travel. If this philosophy is applied to sugarcane trucks, all extra overlay costs on the 271 control sections induced by these vehicles should be borne by these vehicles. So, sugarcane haulers using the FHWA Type 9 truck should be paying $1.55 million/year instead of the current fees of $0.0748 million/year, only. Since they are not, the State of Louisiana is paying the difference, $1.475 million/year, as a subsidy to the sugarcane industry. Another way to look at these numbers is to determine how much each permit should cost if the sugarcane truckers pay for the overlay costs occasioned by the heavier loads. The cost of a permit, if equity governs, will be $1.55 million divided by 748 sugarcane permits issued per year or $2,072/year. If the semi-trailer is converted from a tandem axle in the FHWA Type 9 vehicle to a triple axle in the FHWA Type 10 vehicle, the cost of a permit could decrease from $2,072 per permit per year to –$1,243 per permit per year, meaning that the state could afford to offer each sugarcane transporter utilizing a FHWA Type 10 vehicle $1,243/year as a tax subsidy to reduce pavement overlay costs. However, if the FHWA Type 9 vehicle is allowed for hauling 100,000 lb. GVW

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on sugarcane, the corresponding permit fee should increase from $100/year to $2,072/year for trucks. The statewide annual costs per vehicle for all the GVW and truck type combinations are shown in figure 1.

One other significant factor should be noted; the bridge fatigue costs have been included in this evaluation. The estimates are based on the following assumptions: (1) In 2002, the sugarcane production was estimated at 15 million tons; (2) In 2003, there were 748 permits for sugarcane trucks; (3) The average weight of an empty truck is 37,300 lb.; (4) Each truck will cross one bridge per trip; and (5) The sugarcane season starts on August 1 and ends on December 31, i.e., 153 days.

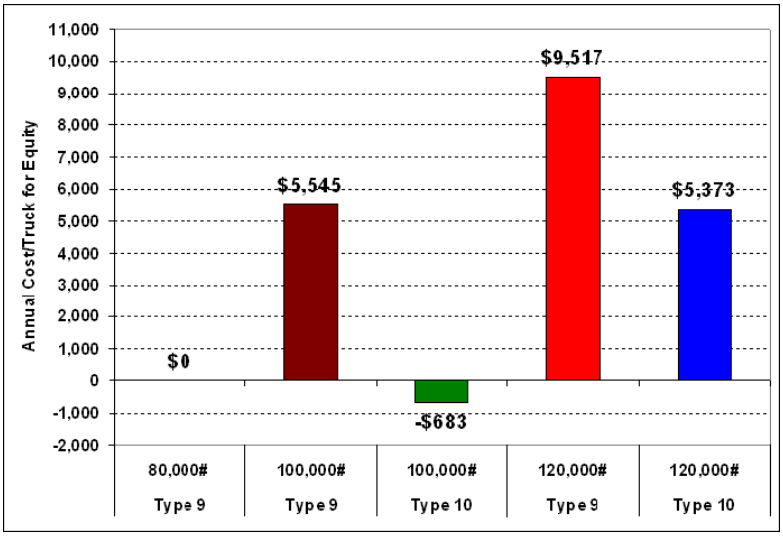

Figure 1
Statewide annual costs per vehicle for all GVW and truck type combinations

In this study, three options for trailer axle configurations were also investigated which represent alternatives to the current truck/trailer transport system that would reduce highway damage and/or reduce costs. These options are: (1) adding an extra axle to truck/trailer, (2) using lighter trucks and different trailer types, and (3) using the Mill delivery system or Bin transport system. All three options are feasible, but an appropriate decision must be made by the legislature keeping in view the pavement damage costs, one time investment costs, number of trucks to be modified, etc. Switching to any one of these options would prove very beneficial, in the long term, to the sugarcane industry.

Conclusions and Recommendations

The GVW for FHWA Type 9 sugar cane trucks should be reduced from 100,000 lb. to 80,000 lb., or the permit fee should be increased from $100/truck/year to $5,545/truck/year. However, if the legislature requires that the semi-trailer of the FHWA Type 9 truck be converted from a tandem to a triple axle, the permit fee could be reduced to $0/truck/year and each truck could be given a $683/year tax incentive to pay for the conversion. Such requirement will reduce the pavement damage to the level below the one produced by the FHWA Type 9 vehicle hauling freight at the legislated level of 80,000 lb. GVW.

The GVW for FHWA Type 9 sugar cane trucks should not be increased from 100,000 lb. to 120,000 lb. because of the risk of bridge damage, and even bridge failure is too significant to ignore. Even if sugarcane trucks were required to convert from FHWA Type 9 to Type 10 vehicles, the additional costs and potential damage to bridges from overstressing would likely produce serious safety concerns for the bridges. These extra pavement and bridge costs far outweigh the potential savings in transportation costs for the trucks hauling sugarcane.

It is recommended that future studies should evaluate alternative transport systems, develop an investment business plan for sugarcane harvest that will reduce highway damage and/or reduce costs, and allocate more highway funding for handling the extra damage caused by the increase of truck load limits.