

# REAL TIME GPS TRACKING AND THE BENEFITS FROM POST ANALYSIS OF DETAILED TRIP DATA

## ABSTRACT

*Alberta-Pacific Forest Industries Inc. operates a pulp mill in Alberta, Canada. The implementation of innovative technologies within the log haul transportation system has resulted in cost savings to the company. These savings occur mainly in the areas of increased overall efficiency and decreased road maintenance costs, and has resulted in one of the safest log haul programs found anywhere. Some of this technology has only recently been used on a commercial basis and was developed through national defence programs. With the basis of the system now developed the Company is now looking at innovative ways to improve upon the already successful program.*

## INTRODUCTION

This presentation outlines the GPS component of the Log Haul Management System that Alberta-Pacific Forest Industries has put in place to monitor, control and optimise its log haul fleet. I will be covering the following main items:

- Alberta Pacific's log haul program and wood fibre requirements.
- GPS applications at Alberta Pacific.
- Real Time GPS tracking.
- Tracking Log trucks.
- Point data for trip files.
- Generating exception reports from data
- Data collection and analysis from road maintenance equipment.
- The Future - Some Ideas and Direction Alberta-Pacific is Considering

## ALBERTA PACIFIC'S LOG HAUL PROGRAM AND WOOD FIBRE REQUIREMENTS

Alberta Pacific is one of the largest single line Kraft pulp mill in the world, located in north eastern Alberta, the mill consumes 2.4 million cubic meters of wood fibre per year, which translates roughly in to 50,000 + loads of wood delivered to the mill.

Alberta-Pacific has been given the approval to grow and harvest timber on a perpetual sustained yield basis on the Forest Management Area (FMA) which is approximately 55,000 square kilometres.

Managing a log haul fleet of 90 trucks over such a massive area using conventional methods was clearly going to be inefficient and cumbersome. A computerised dispatch system called "Truckbase" was developed to maximise efficiency of this fleet, and

tracking trucks in real time using available GPS technology is the main component of the Truckbase program.

## GPS APPLICATIONS AT ALBERTA PACIFIC

Alberta Pacific is currently using GPS technology for tracking log trucks and their movement throughout the FMA, gathering point data on a trucks on board computer for analysis. Tracking and gathering data from road maintenance equipment is also being implemented at this time. The mills two large portal cranes that are used for the unloading of the trucks also use GPS technology for an on board anti collision system. Cutblock and road layout is also being implemented as real time differential correction becomes more available.

## REAL TIME GPS TRACKING

All trucks in Alberta Pacific's permanent log haul fleet are equipped with Trimble GPS receivers and on board computers. Log loaders are also equipped with these components in order to coordinate the movement of log trucks to their assigned loader(s).

Some road maintenance equipment is also currently equipped with on board "black boxes", these use PC-card technology to gather point data that is later downloaded for analysis. Expanding this to have operator input as well as real time tracking will be in place soon.

GPS technology on harvesting equipment will soon be a reality as well, allowing operators to have visual aids to stay within cut block boundaries, and "live" tracking of processing equipment to monitor inventories.

## TRACKING LOG TRUCKS

Each truck's position will be "polled" every 10 minutes, and updated on a computer monitor at Central Control. This data string is sent through a wide area radio network, which is capable of sending / receiving both voice and data. Each type of equipment will have a unique shaped icon, and a log trucks icon is colored depending on that trucks status at the time, i.e. loaded or empty.

A "who am I" query will show the dispatcher who any particular truck is when its icon is clicked on, as well as who is driving it at the time. A "where am I" query will show the dispatcher where a particular truck is at a given time, showing the lat. - long on screen and changing the colour of the trucks icon. Both of these

queries can show the trucks current speed and bearing as well.

All of this visual information is displayed on two of four 19" monitors, one of them displaying a main map of the FMA, and another showing a "zoom" window to show more detail of a selected area. Different layers can be turned on or off as desired, such as lakes, cut block boundaries, rivers etc..

### **POINT DATA FOR TRIP FILES**

The trucks on board computer will be recording lat. - long coordinates, speed, time, and bearing at short intervals, writing this data to an internal file that will be downloaded via the trucks radio when it reaches the mill. This data can then be used for post analysis and generating exception reports, such as speed and idle time reports. Through the use of "virtual" signposts, the truck will know what type of zone it is in at the time, each zone having its own attributes for speed limit, tire pressure etc.

Wildlife sightings will also be recorded with the drivers input and a database of these will be built over time for possible use of a planning tool. Monitoring and setting of cycle times will also be done from the trip files.

Additional data such as tire pressure, engine health, and truck bunk weights will also be recorded on these files in the next phase of development.

### **SPEED AND IDLE TIME EXCEPTION REPORT'S**

The speed exception report is a very useful tool for monitoring the truck fleet, it allows user input to set speed limits, then will show how long a truck was speeding for, the highest speed attained, and time & location of the offence.

The idle time report allows a user to input what constitutes idle time, be it 5 minutes, 10 minutes etc. and also shows where and when a vehicle was idle. Both of these reports can also be displayed and printed on a map screen or in tabular form.

### **ROAD MAINTENANCE EQUIPMENT DATA COLLECTION**

Currently "black box" computers are being used to track road maintenance equipment movement and activities. The data is recorded on PCMCIA cards and downloaded to a PC at weekly or bi weekly intervals, depending how much activity there was at the time. This data is now primarily to generate idle time reports, but direct invoicing from this data will soon be available. Virtual signposts will enable road maintenance costs to be tracked precisely by road section as well. The ability for operator input will enable tracking and / or billing by activity, i.e. grading,

assisting vehicles, travelling etc. It will also enable performance tracking by operator.

Also to be implemented in the near future is monitoring attachment usage, such as blade pressure, snowplows, winches etc.

### **FUTURE DEVELOPMENTS AT ALBERTA PACIFIC**

Monitoring ready to haul bush inventory directly from log processors using GPS coordinates and data from computerised measuring devices.

Using real time GPS display for log harvesting equipment to ensure cutting remains in boundaries.

Implementing GPS to track a load after it is unloaded to its position in the log deck to analyse attributes of the log deck inventory.

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The following information is in a question and answer format, as Neil Wylie has tried to anticipate questions conference delegates may have.

#### **Question**

Are you able to tell us how much the system has cost you to date?

#### **Answer**

\$250,000 is approximately the amount that has been spent on the Truckbase system, the radio system is about \$8 million, 5 of which comprises the voice system.

#### **Question**

What has the time frame been from starting the system to when you expect all the equipment to be operating on it?

#### **Answer**

The system was originally conceived in 1991, with the writing of the code starting in 1992. If you mean the start time since we gave the go ahead to the radio system, it should be about 2 to 3 months. This is from the time we ported the real time code, to the production system, to the time that we have all the equipment in place and working. Depending on how many unforeseen issues come up when we are "live", it could be a lot quicker.

#### **Question**

When do you expect all the trucks, loaders and other equipment to be running on the system?

#### **Answer**

If everything goes good with the Motorola system, (and at this point it looks like it will), all of the trucks and loaders will be on by the end of our summer, this is the start of September. This is weather dependant, and we

are currently having a lot of rain which has slowed the haul to a near standstill. The road maintenance equipment will be phased in the remainder of this year. There is still some software development to be done for this application, although we have the rudimentary software in place, now we are now looking for more detailed data logging. The harvesting equipment will hopefully be my next project, with initial test equipment going in place this fall.

**Question**

Is the reason for the extended time frame you have experienced because it has never been done before?

**Answer**

Yes, because this is leading edge, and the fact that it had never been done before are the main reasons for this. The main delay by far was that the radio system could not handle the volume of data, mainly the downloading of the truck log files, at a fast enough rate to avoid bottlenecks at 400 loads per 24 hour period. That issue has been resolved, but our needs had stressed the radio system to a point it had not reached before, with problems surfacing that were previously not seen in other systems.

**Question**

Are the GPS systems on the market now (Rockwell Transport Electronics are one supplier) suitable for what you are doing, and if you were starting today could you use an "off the shelf" system, or would you still have to develop your own?

**Answer**

I have not looked at these systems in depth. Our needs, are very specific to our operation and much more than just the live tracking of vehicles. I think that we still would have had to develop the larger part ourselves, if not all of it.

**Question**

What is the length and width of the FMA, and what do you expect your longest haul distance to be?

**Answer**

The FMA boundaries are approximately 300km's x 350km's, with the mill being about 30km's outside the FMA boundary, It is about 60,000 kilometres square in total. We are expecting our most distant haul cycles to take 14 hours.

**Question**

What would you do different if you were starting again today?

**Answer**

We would not rely so much on one radio system to meet all of our needs without having a better backup plan in place. Things did not look good when it looked like the one system may not have been able to meet our needs, and we had not kept up our research on alternate methods. Originally we were going to use spread spectrum wide band radio's to do the data dump from the loaders to the trucks and the trucks to the Truckbase computer when they got to the scale, this technology still has a lot of merit and I would defiantly consider it if I were starting over again.

**Summary**

In summary, this defiantly has not been a system that we could just turn on a switch!, it has been a very interesting and challenging 4 years for me, with many more of those in the future I am sure. I have found out first hand why they often call the leading edge the "bleeding edge"! I view this portion of the Truckbase system more as a beginning, now that the basic infrastructure is in place and working, we will have the capability to have the most current and accurate information system available, as well as a wealth of historic data available for analysis and planning.

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**Truckbase Administrator**

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