

TRANSPORT SYSTEMS TODAY AND TOMORROW

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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 defense 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 a Log Haul Management System that Alberta-Pacific Forest Industries has put in place to monitor, control and optimize its log haul fleet. I will be covering the following main items:

- Background of Alberta-Pacific

- Pulpmill - Process and Production
- Forest Management Area and Practices
- Log Harvesting Process
- Log Haul Management System - TRUCKBASE
- The Future - Some Ideas and Direction Alberta-Pacific is Considering

BACKGROUND OF ALBERTA-PACIFIC

Alberta-Pacific Forest Industries Inc. was incorporated as the operator on behalf of the Alberta-Pacific Joint Venture, whose participants are Crestbrook Forest Industries Ltd. (40%), MC Forest Investment Inc. (35%) and Kanzaki Paper Canada Inc. (25%).

The Alberta government selected Alberta-Pacific from among several competitive bids because of its commitment to responsibly steward the Forest Management Area, an environmentally sound production process, strong aboriginal liaison and employment programs. The principles of integrated resource management, sustained yield, public involvement and private woodlot sourcing are the basis for building

a competitive, sustainable business enterprise.

More than two years of exhaustive governmental review and public input - the most intensive ever undertaken in Canada for a forestry project - preceded the final approval. Construction began in early 1991, and the mill commenced startup activities in late summer, 1993.

PULPMILL - PROCESS AND PRODUCTION

The pulp mill is capable of producing a minimum of 1,500 ADt (Air dry tonnes) per day of bleached hardwood pulp or 1,250 ADt per day of bleached softwood pulp. The planned annual output is 390,000 ADt of bleached hardwood pulp and 110,000 ADt of bleached softwood pulp.

Significant new technologies have been implemented as a means of helping to protect the environment. This includes extended delignification which helps to reduce the amount of chemicals used, elemental chlorine has been substituted with chlorine dioxide and the utilization of both primary and secondary effluent treatment processes. The end result is one of the cleanest mills in the world producing pulp of high quality.

The mill commenced operations in September, 1993 and has reached (and on some days exceeded) design capacity within the first six months. The start-up to date has gone exceedingly well and pulpmill emissions have been significantly less than federal and provincial established levels.

FOREST MANAGEMENT AREA & PRACTICES

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 kilometers. Almost half of the FMA - 49 percent - is wetland or other lands unsuitable for timber production. A further 10 percent is allocated to other forest companies. Another 16 percent is allocated for "reserves", which includes land for lake and river buffers, ecological reserves and old growth stands. The area the company manages to meet its fiber requirements is just less than 25 per cent of the total FMA.

Alberta-Pacific will harvest annually 2.4 million cubic meters from the FMA. The timber will come from approximately 450 small cut blocks dispersed throughout the FMA which will end up being only 0.25 percent of the area harvested annually. The cut blocks will range in size from 25 to 60 hectares. These blocks are designed for efficient harvesting, but they will also provide wildlife corridors and protect environmentally sensitive areas. Buffer zones of trees are left standing along stream and water bodies, and wherever aesthetics within an area should be maintained. The size, design and location of cut blocks will be determined with regular public input, as part of the FMA plan submitted to the Alberta Forest Service.

ECOSYSTEM MANAGEMENT

Alberta-Pacific Forest Industries Inc. is developing an ecosystem management approach to forest/wildlife management in the boreal mixed-wood forest found within the FMA. Forest ecosystem management integrates timber harvest activities within

the bounds of natural disturbance to ensure that biodiversity and ecological processes are maintained.

The boreal mixed-wood ecological system have been shaped by natural forest fires for thousands of years. Studies of fire history and ecology suggest that the boreal forest had relatively high fire frequency, with fires recurring every 35-40 years. As a result natural forests were generally young and contained little old growth. The reduction of fire disturbances through effective fire protection has resulted in a larger proportion of older forest.

Integrated resource management follows ecosystem management and attempts to develop a set of social economic and biological conditions that are ecologically sustainable and fall within the range of natural variability. This does not mean that Alberta-Pacific will be developing harvesting plans based exclusively on fire, or attempting to completely mimic natural conditions.

Instead fire will be used as the model for ecosystem management while still recognizing that the principles may be limited by biological, social and economic considerations.

LOG HARVESTING PROCESS

Road access is being developed quickly within the first few years to avoid depleting prime long-term summer wood supplies. The harvesting and hauling operations are highly mechanized for efficiency and safety. Falling is done primarily with feller buncher machines, skidding by grapple and line skidders to roadside decks or landings, limbing and topping by delimiting machines, sorting into coniferous and

deciduous by skidding to separate piles, sorting with the delimiting machines, or a combination of both. Logging contracts are stump to roadside, with loading and hauling being separate contracts. All of Alberta-Pacific's woodlands operations are contracted to independent owner-operators, providing local employment for approximately 660 people.

LOG HAUL MANAGEMENT SYSTEM - TRUCKBASE

Since 1991 Alberta-Pacific has been working with Silvacom Ltd., an Edmonton, Alberta forest consulting company to develop a revolutionary truck dispatch, geopositioning monitoring, optimization and management system for the forest product industry. This system, registered as TRUCKBASE, features:

1. Computer aided truck dispatching and traffic control;
2. Radio data links between trucks, loaders and the mill;
3. Truck monitoring, which includes geographic positioning, truck health, payload weights, bill of lading data, emergency and other data;
4. Central tire inflation; and
5. Management information systems for log haul co-ordination.

TRUCKBASE will monitor and control the entire log traffic of Alberta-Pacific. It includes four software modules: Geopositioning and Computer Aided Dispatch; Haul Management Module; Optimization Module and an On-Board Data Collector Module.

GEOPOSITIONING AND COMPUTER AIDED DISPATCH (GPS/CAD)

GPS/CAD will monitor and control trucks, loaders and road maintenance traffic at all times. Global positioning through satellite technology will allow the dispatcher to know where its trucks and loaders are at all times. An on-board GPS receiver tied into the on-board computer system will transmit by radio geographic co-ordinates periodically, at an interval yet to be finalized, but probably 15 or 30 minutes.

This information will be displayed at the mill control centre on a computer map of the FMA using a large, high resolution monitor.

HAUL MANAGEMENT MODULE

The entire data collection system will be tied together with a sophisticated management information system called the Haul Management Module. This will interface with the mill's accounting and log yard inventory system. It will also be accessed by the individual log haul contractors, as well as by the Alberta Forest Service and Alberta Transportation.

OPTIMIZATION MODULE

Advanced operation research techniques will be used to optimize truck dispatching and traffic control, as well as reduce any bottlenecks throughout the FMA. A computer module will provide the best routing solutions to the dispatcher. For instance, the optimization model will balance the arrival of trucks at any loader or weigh scale so that wait time is reduced

to a minimum. Four trucks per hour scheduled to any loader, and no more than 25 loads per hour returning to the mill, will provide maximum efficiency for both Alberta-Pacific and its contractors. This means reduced dispatch staffing, reduced errors in payment (particularly for back hauling records), interest benefits in "just-in-time" delivery and increased loader efficiency. It will also calculate the best available options should a piece of equipment such as a loader break down.

ON-BOARD DATA COLLECTOR MODULE

Alberta-Pacific has received approval from Alberta Forest Service to use the on-board computer to replace the written TM9 form, or bill of lading. The TM9 information will be entered at the truck's computer terminal. Verification of the data would occur before the truck left the loading area, so that any errors can be corrected immediately. The computer will also collect the weight from the truck's on-board scales and the location of the truck from the satellite GPS and transmit the data via radio system to the central dispatch computer.

Conifer sawlogs will be shipped to other mills. In these cases the computer technology will allow contractors and truckers to be paid based on truck scale weights to avoid delays caused by inter-mill invoicing. Similar to most mills in Alberta, speed and vehicle weights will be monitored and recorded by the computer. Reports produced by the on-board computer software would only be generated where speed limits or gross vehicle weights were exceeded. These exception reports reduce paperwork and staff time dramatically.

TRAINING PROGRAMS

A new log haul training program offered by Keyano College at Fort McMurray is providing training for new drivers. All log truck drivers will require log haul certification and Keyano College will provide this service for Alberta-Pacific. Experienced drivers will probably require no more than a couple of hours to meet certification requirements. A business awareness course for new contractors, to help them through the bookkeeping and other needs of an efficient business, is part of the training program.

HAULING CONFIGURATION

Eighty-eight per cent of the timber hauled will be deciduous, with aspen being the primary species. All logs will be hauled in short-log form bucked to approximately nine metres in length.

Alberta-Pacific will be contracting eight-axle Super "B" train short log truck configurations. Truckers are expected to achieve net pay loads of 40 to 42 tonnes on highway hauls. Although Alberta-Pacific will be building a significant number of private roads, all trucks must use public roads to get to the mill, therefore, all trucks must be highway legal.

Consistent with Alberta-Pacific's pulp mill philosophy of efficient energy consumption and lowest exhaust emissions, all trucks will have computerized engines. This will provide precise metering of fuel and oxygen to reduce fuel consumption and emissions.

ON-BOARD COMPUTER

Each truck will be equipped with an on-board computer, a "black box" arrangement mounted out of the way in a rugged case. A display terminal with a touch screen interface will be mounted in the cab. The computer will collect data from the Central Tire Inflation system, on-board scales, the global positioning system, truck health system and radio. It will send and receive data by radio to "home base", either the mill or scale house. The truck on-board computer will have the capacity to store data until it is either polled by home base or until it transmits to home on a pre-programmed schedule. Some data such as truck health and incident or event data, due to the volume of data collected, can be off-loaded when the truck arrives at the mill site.

TRUCK OWNER REPORTING AND MONITORING SYSTEM

Alberta-Pacific recommends that each truck contractor install a home computer with a modem that can access the central dispatch computer and through a password, download all information pertaining to his truck. A revenue cost program similar to the REVHAUL program developed by Forest Engineering Research Institute of Canada would be installed on the contractor's home computer. The data from the central dispatch computer would feed directly into this program. This information, as well as costs entered by the contractor, will be used to calculate driver's wages, income tax, W.C.B., G.S.T., actual hourly rate of the truck, truck costs and profit.

Data from the truck's computerized engine will also be passed onto the owner's computer. Preventative maintenance or "exception" reports would be generated that would indicate problems developing in the truck. For instance, there may be one cylinder overheating - the computer will give you that message. As well, driver performance can be monitored so the owner can take corrective action for poor driving habits such as improper shifting, or to identify efficient driving procedures and recommend them to other drivers.

CENTRAL TIRE INFLATION

Another innovation that we are requiring for installation on all trucks is a thirty-year old technology called Central Tire Inflation - CTI - developed by the U.S. military for use by rubber tired vehicles in off road or poor road conditions. By varying tire pressures, truck drivers can match vehicle performance to road and load conditions. By varying tire pressures, truck drivers can match vehicle performance to road and load conditions ... without getting out of their vehicles and even while the truck is in motion. Some timber sales in the northwest United States have a restrictive clause that trucks must be equipped with central tire inflation to haul logs.

CTI systems use the air brake compressor and pressure tank. All tires - steering, drive and trailer - are equipped with rotary air valves and plumbing to deliver air to the tires. Some use external air hoses, while newer systems allow for air delivery through the inside of axle housings. The truck driver selects air pressures based on road, load and speed conditions. An on-board computer does not allow the driver to change tire pressure at unsafe or incorrect pressure-speed conditions. Lower pressure

results in greater tire deflection and a much larger tire to ground footprint.

What this means is that trucks can travel through soft or rutted forest roads where they could otherwise not haul, because of the ability to lower tire pressure, thus extending the hauling season. It means that road maintenance can be greatly reduced, mainly through the elimination of "wash boarding" and reduction of raveling on gravel surfaces. Less costly subgrade and surface materials can be used for haul roads, a big benefit with respect to northern Alberta. It also dramatically increases tire life, another benefit for the owner-operator.

CTI also means that truck drivers have fewer back problems from jarring. Obviously when washboard is not created and the ride is smoother, cycle times - the time required for a truck to leave the mill and return with a load - are dramatically reduced.

FUTURE DEVELOPMENT AND DIRECTION

Specifically Alberta-Pacific sees development in the next five to ten year window in the following areas:

TRAINING

Excellent driver habits will be identified and analyzed through the TRUCKBASE System and on-board computer in order to identify the beneficial characteristics and these will be passed to other drivers to achieve better fleet performance. Fuel consumption, reduced downtime and safety performance are only a few of the areas where this information could provide driver feedback and improved driver performance.

time. This system will certainly also be beneficial for training equipment operators.

DRIVER FATIGUE

Driver fatigue has been the greatest cause of accidents for Alberta-Pacific and we believe that this is true for most of the transportation industry. On-board monitoring devices must be developed to provide some indication of driver performance. As an example, the Air Force has developed equipment to monitor pilots to indicate when their performance is less than some established level. Perhaps this technology can be transferred to the commercial transportation industry. Our TRUCKBASE System allows for automatic trapping or collection of this type of data, however, the equipment required to assess the driver and the analysis programs are not yet available. This type of research may require the co-operation of several organizations and industry sponsors.

MAINTENANCE EQUIPMENT MONITORING

Presently graders and other road maintenance equipment are hired to continually keep roads in good condition without allot of performance information or feedback. We are currently developing the on-board computer to record the actions or events that are occurring on these pieces of equipment. For example, we would record the time the grader started and stopped, the speed and direction when working, the pressure on the blade, the number of passes on a section of road, etc. We would combine this information with log truck haul information to determine for any section of road what is the required level of road maintenance for optimal truck cycle

ROAD STANDARDS OR PERFORMANCE

The continuous monitoring of hauling and maintenance performance will allow the evaluation of road construction and engineering standards. There should be considerable savings accrue as a result of identifying roads that were over or under constructed for their intended use. In areas such as northern Alberta, where road construction material is at a premium, if available at all, this information would be extremely valuable.

These are only a few of the programs or projects that I believe will occur in the near future. The equipment and technology is now becoming available to provide the data and monitoring of vehicles and roads, and with the significant cost of the transportation component of products, these advances will someday be accepted as common practice.

SUMMARY

The benefits to a forest products mill of TRUCKBASE and the associated technologies are immense. Direct cost savings to the mill will include reduced road construction and maintenance, reduced direct wood delivery costs, reduced clerical and management costs. Indirect savings will include improved information for management decision making, lower costs for the truck owner-operators, which will translate into lower delivered wood costs.

