BACKHAULING BENEFITS FOR A PINEAPPLE CANNING MANUFACTURER

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ABSTRACT

Transportation is an important issue, as firms try to minimize cost so as to stay competitive. When transportation cost is reduced, profit is increased. Through backhauling,, using otherwise empty returning vehicles, the total cost can be reduced. Backhauling, maximizing vehicle use in both directions, also provides visibility of delivery to the company through its internal control and management of the fleet. Efficiency of transportation management can be greatly improved

This research project enhances the knowledge and awareness of applying backhaul transportation and the techniques of how to utilize this strategy. A canned pineapple manufacturer in Thailand is the firm studied. The research also mainly examines the possibility of applying backhauling to paper packaging material, and the conclusion is that the company should do this, as a strategic tool to improve its supply management and transport system. This will minimize the total transportation cost and increase the visibility of the company's control of supplies.

INTRODUCTION

The importance of supply chain management is as a strategic tool to develop a sustainable competitive advantage by reducing investment and cost without negatively affecting customers. Any redundant and duplicate activities at each level of the supply chain can be reduced, while partners openly share information in order to facilitate the end customers' needs (Spekman, et al., 1998).

Efficient transport management can be a major source of competitive advantage because it can control cost and enhance service differentiation. It will help firms become cost and value leaders while it enhances a company's ability to gain and maintain its competitive advantage and at the same time maximize customer satisfaction (Goh & Pinaikul, 1998). In this case study, backhauling management, to integrate inbound material from suppliers with the return

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trip of core outbound travel, is examined, with a proposed extension to a wider range of materials.

Almost all freight shipments generally move in one direction, from point of production to point of consumption, without the need for returning to the origin. This leads to empty running of a truck on the way back to the origin point and creates a major logistical challenge to find backloads for returning vehicles. According to McKinnon and Ge (2006), the efficiency of any transport operation is critically dependent on the degree to which vehicle capacity can be utilized in both directions. In the absence of a backload the vehicle must return empty, usually at the carrier's expense which already adds to the transport price. This empty running not only represents a wasted resource in economic terms, but is increasingly regarded as an environmental liability in term of fuel consumption and pollution generation.

The company in this case study, CanPineCo (a pseudonym), is a manufacturer and exporter of canned pineapple. It has identified transportation as a major cost that can be reduced in order to remain competitive. In 2006 the company began implementing a pilot project for backhauling tinplate cans from suppliers back to the factory. Due to this, for the entire year of 2008, transportation expense was reduced from 12.16% percent of the total purchasing amount (if the transportation was the responsibility of the supplier as usual) to 3.62%.

Backhauling in CanPineCo also produces higher reliability in terms of material delivery because the company handles the inbound transport management itself. Only a sufficient quantity of tinplate cans is delivered when the production process needs it or warehouse space is available, which also leads to improvement in inventory management at the warehouse. Furthermore, the company can ensure the availability of the right supply at the right time to match production plans and increase customer satisfaction in reliable production lead time. However, the cooperation of suppliers is required in order to fully utilize this practice, e.g. suppliers must provide flexibility in the material loading schedules.

Because the pilot was successful, the company is considering the expansion of this strategy to another category of material. Paper cartons and trays are the materials for which CanPineCo pays huge transport costs, and yet sometimes experiences delay in rush shipments because suppliers wait for combined shipments in order to minimize the cost. Delayed arrival of paper packaging was about 8% of total inbound supply of this material in 2008. The company received complaints and had to pay the penalty fee for nine delayed outbound containers from customers in 2008, caused by the late arrival of the paper packages from suppliers. Therefore, there is high potential for this material category to utilize backhaul practice, by managing the empty running of inbound transport.

However, paper packaging is considered as a "make to order" product because of different customers' designs. Waiting time for production of this material can be longer, and higher

flexibility of trucks is needed because sometimes the paper packages are not yet available for pick up. Extending backhaul to this supply could also affect CanPineCo's production schedule because the work in process items cannot be processed at the packing station without the paper packaging. Therefore, the company will need a different set of methods to apply backhauling strategy to this packaging category to avoid disrupting the production schedule and lead time.

The company is located in a major area of pineapple plantations. All its products are exported, using standard 20 ft. sea freight containers. The two major seaports in Thailand are Bangkok Port and Laem Chabang. When a shipment departs from Bangkok Port, the container will be returned to Bangkok Port; while the Inland Container Depot (ICD) at Lad Krabang, Bangkok, is used as the inland return point for vessels departing from Laem Chabang. The company contracts with local truck suppliers in the same area as the factory site, which brings several benefits to the company such as higher flexibility in managing the fleet, more free-time allowance when a container needs to be on the truck longer than one night, availability for any emergency case, and lower cost arising from volume guarantees. The company's warehouse department has all the information about the transport demand link from supply delivery, and finished goods distribution is managed and scheduled internally by the department. There are two packaging suppliers located in the suburban area of Bangkok. These two suppliers usually consolidate shipments of a few customers located in the same routing of distribution, to deliver at the same time.

There are several factors to support this company's implementation of backhaul, such as its large size, the length of the haul, and the information visibility. However, various obstacles have to be recognized, such as: the priority that the company usually gives to outbound delivery; unreliability of collection and delivery, or longer lead time, which lead to delay; and the internal co-ordination needed between the main two functions of purchasing and logistics

SELECT LITERATURE REVIEW

The single direction of almost all freight movements creates a major logistical challenge: that of finding backhaul for returning vehicles to lower the transport costs and increase utilization of the vehicle capacity in both directions (McKinnon & Ge, 2006). Transportation in a manufacturing business is not only an incurred cost, but also an instrument to achieve higher competitive advantage in the market. Therefore a good performance of the transport carrier is required for the effectiveness of the logistics function of a company (Meixell & Norbis, 2008). In transportation there are two directions of movements. "Head haul" is a move that initiates the original movement of the carrier's equipment and the shipper's goods, while "backhaul" is the bringing back of the equipment and driver to the origin which is the result of the original move (Bardi et al., 2006).

A backhaul situation occurs when there is a movement of vehicles in one direction as regular route transport operation, and requires a return trip back to the origin with whatever loads can be found to fill backhaul capacity. The movement of that traffic is considered virtually costless since the truck will go back anyway (Fair & Williams, 1981). However, when a deviation is required for the backhaul activity, extra cost, extra wages, and more time relative to the consumer, need to be considered. In practice, empty backhauls can be reduced through improved transport management by consolidating shipments across vendors, optimizing mode selection, and matching inbound and outbound freight shipments (Meixell & Norbis, 2008).

In the export business, there are two deadlines for truckers to achieve: the requested delivery time of the empty container to the manufacturer and the terminal closing entry time. The objective in operation is to minimize the distances of transport and the total cost. Three classes of costs modeled are:

(1) Fixed costs: for vehicles and containers including the acquisition costs, taxes, etc.

(2) Variable costs: for operating and using the resources which usually are proportions of the distance travelled and the working hours of the drivers.

(3) Penalty costs: which may occur when deadlines are missed (Kelleher et al. 2003).

A backhaul strategy can minimize the fixed costs per trip along the way as the number of trips is increased through improved utilization. In the meantime, variable costs can be reduced because of less distance due to combining outbound and inbound freight together. It is obvious that good backhaul transport management can reduce the total cost of a company. However, awareness of deadlines is needed to in order to avoid any unnecessary penalty fee.

Mason et al. (2007) commented that any activity which includes too much cost in the process of adding value will create customer dissatisfaction and possibly lost sales. Freight transportation is clearly included as one such activity, and it is argued that a collaborative approach of inbound and outbound transport is often capable of providing better value to the more traditional purchasing and supply methods (Mason et al., 2007). Therefore, the efficient partnership of materials through the networks of transportation can be beneficial in minimizing the amount of total transport expenses for a company (Sarkis et al., 2004).

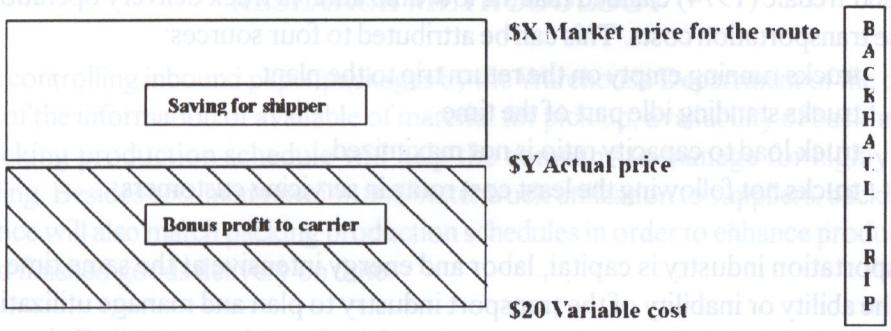
Roundtrip rate negotiation is needed because carriers try to avoid empty running on the backhaul especially if the carrier and/or driver are based at the origin of the trip's area. In several cases, a company may have a truck service provider who is located nearby to deliver the outbound freight and then pick up material on the way back to their headquarters (Stank & Goldsby, 2000).

The market for transport has also changed with the main haulage contractors now negotiating with one customer who is the buyer of the material. The conclusion is that the buying firm's position has strengthened in relation to its transport supplier (Potter et al. 2007). Stank and

Goldsby (2000) added that transportation service providers should be provided with incentives to seek the shipper's best interest. Hence, if a transportation provider is able to reduce a shipper's overall freight bill, the provider should receive a share of the savings as mutual benefit.

There is an explanation of transport pricing by Bardi et al. (2006). Assume a shipment from point A to point B with a total service cost of $90 and priced at $110. This movement is called head haul because it initiates the original movement. With the carrier's equipment at point B, it is necessary to bring the equipment and the driver back to point A as a backhaul trip which is the result of the original move (head haul). Assume that the variable cost which could be avoided if the carrier returns empty is $20, which is the cost of loading the shipment and the reduced fuel efficiency with loaded cargo instead of being empty. The pricing of the backhaul here can range from $20 upwards depending on the market price of that route. As illustrated in the diagram below, the bonus profit that the carrier can make on the backhaul trip is the price charged to the shipper deducting the variable cost of $20, while the saving for the shipper is the market price of transportation from point B to point A ($X) minus the actual price paid to the carrier ($Y) for backhaul (Bardi et al., 2006).

Pricing for head haul and backhaul



Source: Adapted from Bardi et al (2006)

One of the most important advantages of controlling inbound freight using backhaul is the increased supply chain visibility provided to the company. The company has greater insight into the behavior of its material inflows in response to changes in production demand. Backhaul practice for the inbound material also benefits reduction in inventory due to the increased reliability of supply deliveries. There is opportunity to synchronize the movement of products through the supply chain so that deliveries occur just prior to their use (Potter et al., 2007).

In addition to economies, there are also service level benefits. For instance, the buyer can enjoy higher delivery service levels, with more on-time delivery of incoming materials. The increased visibility of the supply chain enables the buying firm to identify problems and make

adjustment to improve the reliability of deliveries. If the cause of a problem appears to relate to a supplier or transport provider, the buying firm may decide to source from others instead, due to higher negotiation power of the buyer. The previous lack of visibility meant the suppliers and truckers could give excuses and other reasons for failure to arrive. Therefore, the power of the buyer is also a support factor to implement this practice and improve the production plan (Potter et al., 2007).

In addition, Yang et al. (2005) commented that using postponement strategy to delay the final agreement may lead to the availability of more information that enables better risk management as companies increasingly need to incorporate uncertainty into their business strategies. A successful postponement strategy requires integrating many elements of the organization, including transportation, to align with the production schedule. In fact, such a postponement strategy is known as an effective way to decrease empty running and to improve truck utilization. For example, it may enable operators to use higher backhauling opportunities when there is a longer period allowance (Yang et al., 2005). However the transport network management has to be managed with care, for the higher utilization of the transport network and to avoid any delays that can be even worse and lead to a significant impact on work schedules (Rodrigues et al., 2008).

O'Leary and Iredale (1974) claimed that the low utilization in truck delivery operations tends to increase transportation costs. This can be attributed to four sources:

- trucks running empty on the return trip to the plant
- trucks standing idle part of the time
- truck load to capacity ratio is not maximized
- trucks not following the least cost route in servicing customers.

The transportation industry is capital, labor and energy intensive at the same time. Consequently, the ability or inability of the transport industry to plan and manage utilization of its resources will definitely influence the economics of the firm (Hoop, 1984). To better utilize vehicles, there is an introduction of a single point of control for inbound transport network at a buying organization. This is to transfer previously external managed operations into internally controlled operations with enhanced fleet visibility (Mason et al., 2007).

However, sometimes additional miles, for deviations, are needed for a vehicle to travel to a backhaul origin point, which generates extra cost to the transport operator. Therefore, the highest capacity utilization exists when the original destination and backhaul movements occur between the same pair of terminals (Marino, 1971).

Hoop (1984) pointed out that collaboration can be achieved only with interaction of joint consideration, sharing information and communication between transport buyer and transport provider. The management of transport must be arranged within the context of the holistic

supply chain. Although vertical integration between customers and suppliers is desirable, it is not enough if transport costs are needed to be better optimized. Internal collaboration among departments inside an organization, particularly procurement, transportation, and distribution, needs to be concentrated (Mason et al., 2007).

Backhaul in transportation could be used as a mechanism to reduce haulage rate as a main reason. However, when suppliers become more familiar with the concept and realize the benefits for them, then higher cooperation is possible. For instance, the material supplier can now focus only on its core competencies for providing supply to customers, or the transport provider gets a higher volume of contracts for total shipments of both legs of transport (Potter et al., 2007).

Backhauling concepts include: Pricing strategy as Factory Gate Pricing (FGP) to separate the transportation cost from the purchase price; Lean to concentrate on reducing cost through eliminating waste of transportation; Collaboration and support from suppliers to enable the successful of backhauling implementation; and Generic Full Truck Load to consider combining small shipments of Less than Truck Load (LTL) into Full Truck Load (FTL).

RESEARCH METHODOLOGY

Through controlling inbound paper packages by the Warehouse Department of the company, visibility of the information of available of material for pick up, availability of backhaul truck, and a packing production schedule will help the company to manage for highly efficient backhauling. Besides cost minimization and better truck utilization to suppliers, backhauling in this practice will also match packing production schedules in order to enhance production and outbound finished goods delivery on time.

For analysis in this case study, the total shipment in pallets of inbound paper packages in 2008, and the same range of backhauling transport charge per trip with tinplate cans, are used in simulation in order to compute a proposed estimated cost saving in the expansion of the backhauling strategy. Various scenarios are used in the project simulation. to be analyzed for transport cost saving, truck utilization, and on-time delivery. Three research questions are specified:

- What would the transportation cost be if backhauling had been applied in 2008 for paper packaging, and when the fuel price changes?
- If the delayed delivery of paper packaging material can be minimized, how much overtime labor cost can the company save?
- What will the utilization rate be if the company applies backhauling practice at different levels with the inbound paper packages material?

The qualitative methods of data collection consist of observation and interviews. Observations are made of the operation process at the Warehouse Department, the packing production line of CanPineCo, and two sites of the paper package suppliers. Interviews are held at the Warehouse Department, Procurement Department, production packing line, and two of the paper packaging suppliers. The interviews are at both managerial (and supervisory) level and operational level. The key informants include current truck drivers of paper packaging, and truck drivers who will do backhaul for the company.

Pre-data analysis of the information in 2008 is used to analyze the three important criteria for transportation efficiency evaluation, which are Transport Cost Saving, Truck Utilization, and On Time Delivery. Microsoft Excel is used for simulation, through various possible backhaul scenarios to clarify how much transportation cost saving would be, how much the overtime cost would be reduced, and what the utilization rate would be if backhauling of paper packaging were applied throughout 2008. Both quantitative and qualitative data are collected, from company data records, observation at the operational level, and interviews with both operational and management levels of the company, material suppliers and transportation providers. The outcomes from the simulation are expected to benefit the study in this project and to bring in sufficient information for the company to make a decision whether to adopt the strategy into the company's supply management and transportation system.

FINDINGS AND DISCUSSION

In order to find how backhauling implementation of inbound paper packaging would benefit CanPineCo, four simulation scenarios were created using Microsoft Excel program to analyze them. The three possible outcomes of implementing backhauling (cost saving, truck utilization, and on time delivery) are analyzed and compared to that of the year of 2008. However, the best results are for Scenario#1, and therefore the simulation is only performed for that in this article.

Scenario #1: Truck suppliers of CanPineCo take the role of transport providers transporting paper packaging in Full Truck Load (FTL) delivery.

The results are now shown. Concerning the savings for transport costs, the company pays only the fuel cost to the transportation provider. For scenario #1, the outbound truck which will be used for the backhauling project with inbound paper packaging will be an 18-wheel truck with a 20 ft container on the back; therefore, a maximum of six pallets of paper packaging can be loaded per vehicle.

For 2009, CanPineCo forecasted the cost of paper packaging, based on the ordinary strategy that the suppliers are the ones who operate the transportation of this material. However, when

using the retrospective data of 2008, the **transportation cost** in scenario # 1 was reduced by 65.62%, compared to the transportation cost charged by the suppliers.

The total transportation cost for 2009 when implementing backhauling in scenario # 1 is estimated to produce a reduction of 74.68% compared to the transportation cost charged by the paper packaging suppliers.

Using retrospective data of 2008, **truck utilization** rate in scenario # 1 was increased from 73.15% to 88.05% of the total available trucks for backhaul, combining the backhaul utilization of paper packaging project with the previous tinplate cans project.

When applying scenario # 1, the total trips of backhauling for the entire year of 2009 would mean that the accumulated utilization rate would be 87.82%.

Turning now to **on-time delivery**, the total penalty and overtime (OT) expenses, under scenario # 1 of backhauling, decreased substantially in 2008, by a reduction of 78.98% when the company controls the delivery of paper packaging itself through backhauling. The number of employees required to work overtime was less, and less overtime was needed.

The estimated total cost saving in 2009 for OT and penalty expenses when applying backhauling in scenario # 1 also produces a huge 84.42% reduction compared to the cost if backhauling of paper packaging is not applied.

Overall cost saving benefits to the company if backhauling of paper packaging is applied under scenario # 1 in 2008 would be 68.17% lower. When calculating the forecasting for all the expenses and costs in 2009, there is an even larger proportion of transport cost saving of 74.68%, with penalty and OT expenses reducing by 84.42%. These savings are earned through the simulation because the same penalty expense is estimated even though a smaller numbers of shipments are made. However, the truck utilization rate is similar to the year 2008 for both with and without backhauling. In conclusion, the total cost saving the company could earn from the backhauling project under scenario # 1 in 2009 is 77.03%

CONCLUSION

In conclusion, the expansion of the backhauling project at CanPineCo to include the paper packaging category is considered to bring benefits and cost saving to the company. Even though the project will produce a longer lead time of the trip because of more waiting time at the supplier site and additional time spent on deviated driving, the total saving is still obviously an improvement. Scenario # 1 should be the first priority option for the company to choose when implementing backhauling with paper packaging material to gain the most benefit of

saving. However, scenarios # 2 and #4 could be alternatives to expedite the delivery of material either accepting LTL loads with only five pallets of paper packaging per truck or combining two half-orders of the material into one pallet. Even though the savings from these two scenarios are not as high as in scenario # 1, they can facilitate faster processing with rush orders through smaller lots of material delivery.

The results of data analysis and simulation in this case study are proof that efficiency in transportation can be improved through backhauling implementation. However, to be able to evaluate the generality of the results, there are some limitations.

This study was developed by using historical data of 2008 as a guideline to be used in simulating the scenarios, including the number of trips available for backhauling, total purchased material in pallets that require transportation, total pallets of delay delivered material from suppliers, and overtime and penalty expenses due to delayed arrival of paper packaging. Transportation costs calculated in this study are also based on the monthly average retail diesel price in 2008. One year's data may be an insufficient base for an evaluation.

There are other factors at paper packaging suppliers that create delayed delivery of the supply, such as problems in the supplier's production, incorrect printing and design, and wrong paper material used: these are outside the scope of this study.

This study of the backhauling project for paper packaging at CanPineCo brings several benefits to the company and increases knowledge of backhauling strategy in transportation. Therefore, a few recommendations are suggested for future research.

- Investment in new information technology such as Global Positioning System (GPS) for tracking will enable the company to have better control and visibility of the fleet throughout the system.
- The size of pallets used by the paper packaging suppliers is not standard to properly fit or maximize the capacity utilized for loading onto an 18-wheel truck with an export container. Negotiations for standardization of pallet would lead to capacity utilizing improvement in the backhauling project.

The most important step to start the project of backhauling implementation for the company is to negotiate with the suppliers. Mutual benefits of saving in total cost, reducing the work process, and increasing work efficiency should be shared to attract a higher level of collaboration. In adopting backhauling, there will be more work required by transportation management and schedule planning at the Warehouse Department.

The delivery of outbound finished goods is the core activity of transport operation at the

company. To apply backhauling to the delivery of inbound material by matching it with the outbound shipment schedule should only be done based on the condition that it does not have any negative impact on the delivery schedule of outbound shipments.

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