

A Cross-Border Logistics Problem with Fleet Assignment and Routing in Hong Kong

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Abstract

Since the implementation of the open-door policy in China, economic activities between the Hong Kong Special Administrative Region (HKSAR) and China have dramatically increased. A major phenomenon of this development was the moving by HKSAR-based manufacturers of their product lines to China to take advantage of the lower production costs in terms of wages and rent. That the HKSAR and China are separated by a border, means that the finished products that are transported by lorry into the HKSAR must cross the border and incur a cross-boundary fee. As a result, manufacturers have devised a number of ways to transport the finished products into the HKSAR; a company may use not only its own lorries to transport the products directly from China to the HKSAR, but may hire other lorries as well. A company might also deliver the products from its factory in China to a temporary storage area near the border, and transport the products to the HKSAR at a later date. With regard to practical application, manufacturers also use different managerial logistics policies.

This study looks at a transportation problem faced by a single the HKSAR manufacturer. This is a typical logistics problem that manufacturers in the HKSAR and mainland China have to deal with. The specific problem in the company in this study is as follows: The company's headquarters are in the HKSAR and its warehouse is located at a container terminal in the HKSAR. The company's factory is

located in Dongguan on the mainland. Dongguan and the HKSAR are separated by a cross-border boundary at Shenzhen, so all trips between the two places must pass through a cross-border checkpoint. Every day finished products are transported from China to the HKSAR to fulfil daily sales orders and future demand. The company has three private lorries available for this transport route which originates at the depot in the HKSAR. The lorries are registered in the HKSAR and can operate on both sides of the border. If necessary, the company will hire more lorries to handle excess demand etc. There are two types of hire lorries. One is hired in the HKSAR. These lorries have a larger capacity and can also operate on both sides of the border. The other type is registered in the mainland and can only operate in the mainland. With the information presently available there are currently three routing alternatives:

- 1) To use the company's own lorries to transport the products directly from Dongguan to the HKSAR;
- 2) To hire HKSAR lorries to transport the products directly from Dongguan to the HKSAR;
- 3) To hire China lorries to transport the products from Dongguan to Shenzhen first, and switching to the company's own lorries between Shenzhen and the HKSAR in order to enable more round-trips to be made so that more products can be delivered in a single day under a travel time constraint.

Moreover, two warehouses located one each in Dongguan and the HKSAR store any excess products. Using the warehouses incurs inventory costs. Each trip across the border also involves a complicated inspection procedure, including an examination of the products, validation of travel documents, etc. Therefore, besides their basic salary, an allowance is also provided to drivers that make more than one round-trip border crossing.

In this study, a logistics problem in a HKSAR-based manufacturing company the HKSAR is investigated, and an optimization model is developed in solution. The robustness and effectiveness of the model are demonstrated by numerical results. It is expected that, if a company's policy and situation change, the model can still be applied implement the daily distribution plan in an effective way.