

Procurement Logistics of Japanese Auto Manufacturers in Inland China - Intermodal Transport Utilizing the Yangtze River - *

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Abstract

The procurement of automotive parts efficiently from remote suppliers under poor logistics infrastructure conditions has become a critical issue for car manufacturers located in inland China. This study explores how Japanese auto manufacturers located in Sichuan, China have established its automotive parts procurement network and improve its distribution system to cope with severe logistics infrastructure conditions in the area. An analysis on the viability of ship transport in the Yangtze River as a means for long-distance transportation was also performed.

Key Words : Procurement, Auto Manufacturer, Yangtze River, Intermodal

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I. Introduction

Auto manufacturers around the world are trying to strengthen their existence in the Chinese market which has expanded steadily compared to the sluggish market in advanced countries. Interests have been growing on the inland market where the domestic demand has rapidly expanded due to large developments in the West.

Although several state-owned automotive parts manufacturers exist in China, the production of high-tech parts which characterize today's car manufacturers is still limited. Therefore, foreign car manufacturers which had entered the inland market are obliged to procure large amounts of auto parts from China's coastal areas or from other countries. For Japanese car manufacturers, which have intrinsic policies to reduce inventories, procurement of parts more efficiently has become a vital issue in inland China where logistics infrastructures such as expressways and railways have not been well developed.

By taking up two Japanese car manufacturers (Sichuan FAW Toyota Motor Co., Ltd. (SFTM) and Chengdu Toyota Boshoku Automotive Parts Co., Ltd. (CTB)) located in Sichuan, Chengdu as case studies, this paper discusses how these firms have successfully established the parts procurement network and the type of distribution systems they have developed to cope with the difficult logistics infrastructure conditions in inland China. Furthermore, an analysis on the viability of the Yangtze River for long-distance transport is done using the results of field surveys conducted in August 2009.

II. Literature Review

The previous academic efforts concerned with 'procurement logistics of auto parts by inland waterway' could be found in two research fields; procurement

logistics and intermodal logistics.

In the first field, studies have been focused on why and how the auto manufactures construct their procurement logistics. Hashimoto et al.¹⁾ reviewed literatures that dealt with the relation between auto manufacturers and parts suppliers, and pointed out two characteristics of procurement logistics. First, networks of procurement logistics tend to become complex because auto manufacturers and parts suppliers take independent strategic positions. Second, it is getting an important issue to design and construct whole networks of procurement logistics synchronized with production and sales under many constraints.

As for the literatures on auto manufacturers in China, Marukawa and Date discussed networks of procurement logistics by local auto manufacturers.²⁾ They pointed out that auto manufacturers generally procure parts from vicinity suppliers in order to reduce transportation costs. However, they often procure from remote place in case of suppliers with high technology. Hashimoto et al. analyzed how Japanese manufacture in Southern China synchronized procurement from remote place with production.³⁾

However, there seems to be no literature focuses on auto manufactures in inland China to construct procurement logistics. Then, this paper analyzes how Japanese auto manufacturers in inland China construct procurement logistics adapting to local conditions.

In the second field, inland waterway is regarded as an important option in intermodal logistics in several policy papers (e.g. the European Commission's White Paper "European Transport Policy for 2010: time to decide"). Unfortunately, however, there are few academic papers to evaluate its advantages against other intermodal logistics options quantitatively.

Konings et al. conduct an interesting comparison between inland waterway

1) Hashimoto et al. (2009).

2) Marukawa and Date (2004).

3) Hashimoto et al. (2009).

logistics in Europe and the U.S.⁴⁾, although it is also based on a qualitative SWOT-analysis. The length of inland waterway along the Yangtze River is more than 2,500 km, having huge economic potential which has not been made clear yet.

III. Procurement logistics of Sichuan FAW Toyota Motor Co., Ltd.

1. Overview of SFTM

SFTM, established in November 1998, is the first factory under Toyota Motor Corporation (TMC) that produced the first built-up car in China. The current amount of capital is 67 million US dollars, and the total amount of investment has reached 99.09 million US dollars. The share of capital is broken down into: 50 percent from the China FAW Group Co. (formerly the First Automotive Works), 45 percent from TMC, and 5 percent from Toyota Tsusho Corporation. The duration of the joint enterprise is 30 years.

Apart from Chengdu, SFTM also has a factory in Changchun. The Chengdu factory began to assemble Coaster Minibuses in 2000 and Prado SUVs in 2003. The Changchun factory, on the other hand, assembles Land Cruiser SUVs and Prius hybrid cars. The succeeding Sections will mainly describe procurement logistics in the Chengdu factory.

2. Background of the production process

The Chengdu factory has a production capacity of 13,000 cars per year with an area of 177,000 square meters. The number of employees is about 17,000 (of which 30 percent are contractual employees) working under two shifts: 7:30 to 16:15 and 16:45 to 1:30. The present factory has already reached its production

4) Konungs et al. (2010).

capacity limit as the demand for automobiles increased. However, with the decision of the Sichuan City government to redevelop the area from industrial to residential use, SFTM had decided to transfer their operations in Spring 2010 to the Chengdu Economic and Technological Development Zone located in the suburbs. Press processing has already been moved to the new factory. The total amount of investment for the transfer is 3.6 billion yuan, with an expanded area and production capacity of about 450,000 square meters and 30,000 cars per year, respectively.

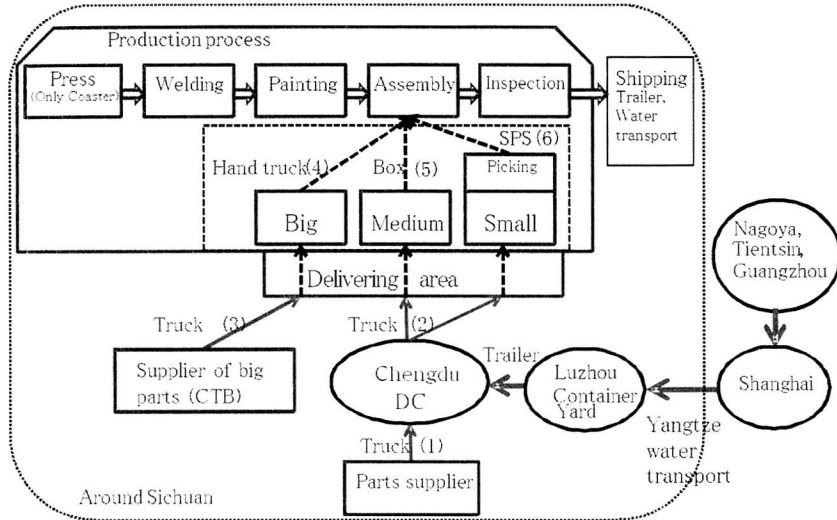
Welding, painting and assembling for both the Prado and Coaster are done in the factory (Figure 1). The pressing process for the Coaster is also done in the factory, which contributes to increasing the local content ratio. Both the Prado and the Coaster have separate body and chassis structures similar to trucks, and thus the number of parts is less than the usual passenger cars with monocoque structure design. Assemblies are all done by hand, and automation equipment such as robots have not yet been introduced. However, automobile manufacturing process standards are strictly performed to maintain high quality using the Checklist Method. Takt time, which is the maximum time per unit allowed to produce a car in order to meet demand, is 19 minutes for the Prado and 40 minutes for the Coaster.

In the assembly line, conveyance systems such as belt conveyors and moving platforms have not been utilized yet. Factory workers move the cars being assembled to the next assembly process manually using hand trucks.

Suppliers of small parts deliver their merchandise to the Chengdu Distribution Center (DC) located in the suburb (Figure 1 (1)). The necessary parts, synchronized with the progress of production (2), are then sent from Chengdu DC to the factory. Bigger parts such as car seats are delivered to the factory directly by the suppliers (3). As for parts ordering, SFTM informs parts suppliers of the medium-term production plan beforehand, and orders only the necessary amount

of parts using paper kanban just before the assembly.

<Figure 1> Parts procurement synchronized with the production process



Source : SFTM

The delivered parts are then unpacked and put in order at the assembly line. Big parts are carried to the assembly line by hand trucks (4), medium-sized parts are put in boxes (5), and small-sized parts in Set Parts Supply (SPS). Parts in the SPS are picked up manually according to a printed list (6).

3. Procurement logistics

1) General conditions of procurement

The total number of cars (Prado and Coaster) produced in Chengdu is merely 13,000 units, and thus only a few Japanese parts suppliers relocated together with SFTM. The local automotive parts industry has not yet been so developed that it is difficult to procure important parts. Therefore, procurement from Japan is indispensable. The local content ratio is about 75 percent for the Coaster, and about 25 percent for the Prado. The local content ratio for the Coaster is higher than that for the Prado because most of the processes for the Coaster are done

in SFTM. The number of procured parts locally is about 1,200 items for the Coaster, and about 1,400 for the Prado. There are a total of 91 parts suppliers in China, of which 17 are located in Sichuan. As for geographic distribution, most of the procured parts come from Tientsin and Shanghai, where the automotive parts suppliers have converged, with a total number of suppliers of 22 and 12, respectively. Other parts suppliers are located in Jiangsu province with 7 companies, Shandong and Zhejiang both with 3 companies, and Hebei with 2 companies.

2) Local procurement

Because the site of the present factory is too small, SFTM established the Chengdu DC with an area of 10,000 square meters, located in the suburbs about 2 kilometers away from the factory. Nearby suppliers of small to medium-sized parts are requested to deliver to the Chengdu DC. Parts coming from remote areas in China and Japan are likewise delivered to the Chengdu DC. The Chengdu Toyota Boshoku Automotive Parts Co., Ltd. (CTB), adjoining SFTM, delivers seats directly to the factory using just-in-time (JIT) transport. Other suppliers also deliver their parts to the Chengdu DC. As standardization of transport equipment such as palletes and folding containers in China is not yet in the advanced stage, the efficiency of loading and unloading or material handling is lower compared to Japan. SFTM is exploring to introduce milk-run logistics in its new factory as the amount of parts to be procured is expected to increase. From the suppliers surrounding Tientsin, parts are picked up using milk-run and are consolidated at Tientsin DC (Figure 2 (1)). These parts are then loaded into containers and transported to Shanghai DC by coastal shipping twice a week (2). Similarly, parts are picked up by milk-run from suppliers surrounding Shanghai, and are consolidated at Shanghai DC (3). These parts are then transported twice a week through the Yangtze River (4).

SFTM used to transport by rail from Tientsin to Chengdu, a distance of about

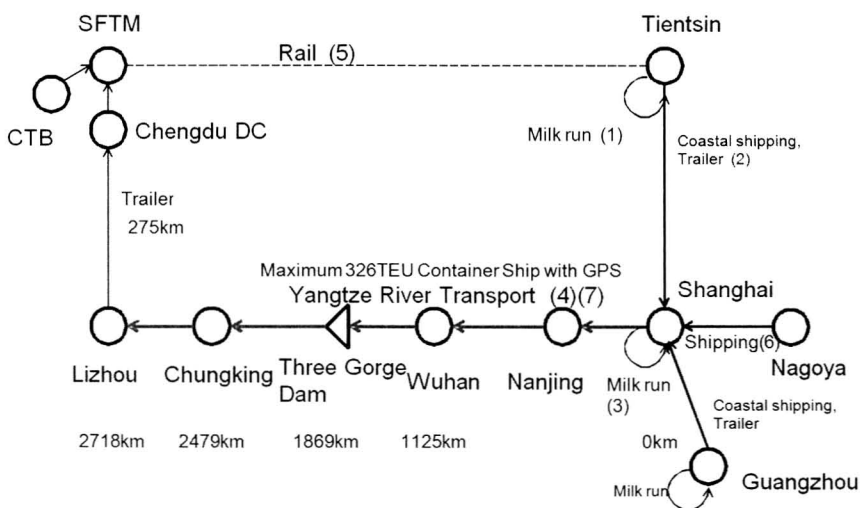
2,000 kilometers. However, transport by rail gradually decreased in 2005, and was discontinued after the Great Shenzhen Earthquake in 2008. The main reason cited is the unreliability of transport time.

3) Procurement from Japan

Parts from Japan, mainly knockdown (KD) parts, make up the bulk of imports. They are shipped twice a week on container loads of about 30 FEUs (40-Foot Equivalent Units) (6).

The containers are unloaded at Shanghai Port, and then loaded onto river container ships (7). According to the SFTM, transport using the Yangtze River is more reliable than rail transport. Distance from Shanghai to Luzhou using river transport is about 2,700 km, and an additional distance of 200 km is needed to transfer the containers from Luzhou to the Chengdu DC by trucks. In 2004, although the duration of transport using Yangtze River was about 2 weeks from Shanghai to Luzhou, this was still faster than rail transport. As will be described later, transport duration for this same route has been reduced to 9 days through the implementation of various logistics improvements.

<Figure 2> Procurement logistics using Yangtze River Transport



Source: SFTM

The location of the container ships, numbering about 15 ships, using the Yangtze River is determined by utilizing Global Positioning Systems (GPS). SFTM can monitor the movement of parts by linking ship information and cargo (automotive parts) information together. In cases of accidents, bad weather, or emergencies such as when specific parts are urgently needed in the factory, SFTM is able to ask the shipping company to unload containers at Chongqing instead of Luzhou, and transport them directly to the factory using truck trailers. The size of the container ships used in the past for river transport were small with loading capacities of only 96 TEU. However, with the increase in cargo volumes and the completion of the Three Gorges Dam, which enable the river to have higher water levels, the sizes of the container ships have increased up to 326 TEUs.

4. Improvement in procurement logistics

1) China's procurement logistics network

While SFTM has been trying to make its procurement logistics more efficient, TMC has similarly been undertaking concerted efforts to establish its procurement logistics network in China. Apart from Chengdu and Changchun, TMC has also established factories in Tientsin and Guangzhou. Automotive parts used in these four factories are procured from the surrounding suppliers and from the coastal areas where the automotive parts suppliers have gathered together. TMC has established cross-dock stations in Tientsin, Shanghai, and Guangzhou in order to make efficient the flow of procurement between these regions.⁵⁾ Automotive parts are collected mainly by milk-run from suppliers around the cross-dock stations. Between cross dock stations, parts are transported by truck trailer, although the use of shipping has been expanding. TMC is promoting the use of shipping from Shanghai to Chengdu using Yangtze River transport. From Tientsin to Chengdu, the mode of transport has changed from rail to Yangtze River transport owing to

5) Takamatsu (2009) discusses the details of logistics systems in China.

the establishment of the Shanghai cross-dock station.

2) Logistics management by a subsidiary logistics company

Logistics management has been traditionally done by each production factory. However, with the establishment of the logistics network by TMC, the need for an integrated logistics management in China has intensified. Thus, TMC, FAW and Guangzhou Automobile have jointly established in 2007 the Tong Fang Global Logistic Co., Ltd. (TFGL), a logistics subsidiary company. The total amount of capital is 5 million US dollars, with capital shares of 40 percent for TMC, 35 percent for FAW, and 25 percent for Guangzhou Automobile. The objectives of the TFGL are: 1) to establish lean production and logistics based on TPS (Toyota Production System), and 2) to improve competitive edge by increasing the level of quality, lead time, cost, safety, and environment.

TFGL is entrusted as a contractor for the logistics management of finished cars, replenishment parts, and automotive parts of joint enterprises in China. TFGL then entrust actual logistics operations to mainly Japanese logistics companies with higher levels of logistics services. However, the area where TFGL operates are limited to China's coastal areas at present, and therefore, SFTM itself manages inland logistics operations. If the management capability of TFGL increases, TFGL will manage the whole logistics network in China including the inland area.⁶⁾

3) Improvement of Yangtze River transport

In 2004, the total lead time from Shanghai to Chengdu was 16 days, composed of 1 day at Shanghai to get bonded transport permission, 14 days from Shanghai to Luzhou by Yangtze River transport, and 1 day at Luzhou to clear customs. SFTM then set the target of reducing lead time by half.

Results of the survey conducted at SFTM concerning Yangtze River transport clarified that ship operation were also stabilized due to the increase in water

6) Takamatsu (2009) and Ri (2009) discuss the details of TFGL.

levels brought about by the completion of the Three Gorges Dam. Furthermore, it became clear that ships are now able to navigate at night and can increase their operating speeds resulting in reduced transport time. The completion of ship locks at the Three Gorges Dam in 2006 has resulted in reductions in waiting time. The total transit time for the 5 locks is also reduced to about 4 hours.

In addition, SFTM intensified the use of faster and direct ships without calling to other ports to further reduce transport time. Shipping companies were willing to introduce direct ships due to the increased volumes of parts brought about by increased production. As a result, transport time from Shanghai to Luzhou was reduced from 14 days to a now standard 9 days plus or minus 1 day by 2007.

The cargo volume handled in 2007 at the Luzhou container terminal had increased to three times of the 2005 volume. Nevertheless, reductions in handling time and transport costs had become more possible through handling improvements from the terminal operator. The shortening of transport time has resulted in the reduction of parts inventories. The volume of inventories in 2007 is equivalent to the corresponding transport time required from Shanghai to Luzhou, which is 9 days.

IV. Procurement logistics of Chengdu Toyota Boshoku Automotive Parts

1. Overview of CTB

CTB is located adjacent to SFTM, and it supplies interior parts such as seats to SFTM. It was established in 1999 from investments of Toyota Boshoku Co., Ltd. (53%), China FAW Group Corporation (42%), and Toyota Tsusho Co., Ltd. (5%), and began operations in December 2000. The first factory has an area of 8,555 square meters while the second factory has an area of 2,170 square meters with

total employment of 339 people as of July 2009.

CTB, just like SFTM, plans to move to a new and bigger factory with an area of 20,000 square meters by October 2010. It plans to annually produce 5,000 parts for the Coaster and 19,200 parts for the Prado totaling 24,200 parts.

2. Background of the production process

The factory is composed of the parts and raw materials receiving area, the urethane forming area, the welding area, the texture cutting area, the needlework area, the assembling area, the inspection area, the shipping area, and the loading area.

CTB makes production plans based on the assembly plans of the SFTM factory. It delivers seats or other parts in accordance with the progress of SFTM's assembly line. The order lead time is about 60 minutes. CTB orders textiles twice a month, then stocks them in the warehouse of Toyota Tsusho, before bringing them to the processing and assembly line.

3. Procurement logistics

Toyota Boshoku Co., Ltd. has a total of 13 factories in China; i.e., 1 in Changchun, 4 in Tientsin, 4 in Shanghai (including Ningbo), 3 in Guangzhou, and 1 in Chengdu. Each factory procures parts and raw materials from suppliers in their respective regions. Parts coming from the Shanghai region account for about 75 percent of the total volume of parts. CTB also procures parts and materials from Guangzhou although most of the volumes come from Shanghai using trucks and Yangtze River ship transport. For parts and materials coming from Japan, CTB imports them via Shanghai, where containers are shipped to Luzhou using Yangtze River transport. Cargoes are then cleared at the customs of Luzhou Port or at an inland bonded warehouse near Chengdu. Property rights for the cargoes are transferred to CTB as soon as it is carried into the warehouse near the

Chengdu factory. The current local content ratio of automotive parts is about 80 percent for the Coaster and about 35-40 percent for the Prado. Local content ratio for the Prado is targeted to be increased to 50 percent. The synthetic leather used for the seats is procured from a Japanese manufacturer in China.

The amount, quality, and freight transport charges for the procurement of parts and raw materials determines whether they will be sourced from Japan or China. The procurement of parts from Shanghai to Luzhou using direct ships on the Yangtze River has shortened transport time from 12 days to 9-10 days after the completion of the Three Gorges Dam. On the other hand, the transport times of trucks operated by Toyota Tsusho are about 3.5 days from Shanghai, 6 days from Tientsin, and 4 days from Guangzhou. For emergency cases, air transport such as FedEx can also be utilized.

4. Improvement in procurement logistics

Among the many problems of procurement logistics in China, Toyota Boshoku recognizes the following: 1) presence of several distribution centers, 2) complex transport routes, 3) entrustment of various logistics operators, and 4) inconsistent logistics management. CTB has, at present, 13 logistics centers and as many as 94 transport routes which link these logistics centers together.

To eliminate the complex systems for logistics, there is a plan to consolidate the existing 13 logistics centers into 4 cross-dock centers located in Changchun, Tientsin, Shanghai, and Guangzhou. According to the plan, the existing 94 routes will be consolidated into 6 routes which will link the centers and promote transport by consolidation. Parts and materials collected by milk-run in Tientsin and Guangzhou will be transported to Chengdu by rail or truck transport. Those from Shanghai will be transported by ships using the Yangtze River. In order to make such logistics network become more efficient, the cooperation between CTB and SFTM will be indispensable.

V. Consideration

1. Procurement logistics network in China

Although Sichuan is expected to be a large car market in the near future, it is still confronted with problems on parts procurement due to the inadequacy of suppliers, and its dependency on suppliers from Japan and the coastal region of China. SFTM has attracted CTB to locate adjacent to its site in order to facilitate delivery of bulky cargoes like car seats in the most economical way possible.

Following the transfer of SFTM to a new factory site, CTB will also be moving to a new location adjacent to the SFTM factory.

However, for other automotive parts, SFTM has no alternative but to procure them from remote areas of the factory. This situation is somewhat common to the factories in Changchun, Tientsin, and Guangzhou. As horizontal division of labor prevails in a global scale in the automotive parts industry to attain economies of scale in production, procuring inexpensive parts from remote places often becomes advantageous. Making the most of these logistics conditions, TMC is trying to establish the procurement logistics network for the whole of China. This involves the establishment of cross-dock stations at Tientsin, Shanghai and Guangzhou to be able to pick-up parts from nearby suppliers using milk-run, and to transport them in bulk via trucks between stations.

Moreover, TMC has finally decided procurement in each factory in China to decrease procurement cost by bulk buying. Toyota Boshoku also promotes the establishment of a procurement logistics network based on the same concept. There is cooperation between Toyota Boshoku and TMC on the procurement of parts from same suppliers although this has not yet reached the stage of cooperative procurement.

2. Systematization of procurement logistics

TMC's direction towards the systematization of procurement logistics is characterized by the following: 1) procurement synchronized with production, 2) milk-run collection for short-distance transportation, and 3) use of efficient mode of transport such as shipping for long-distance transportation. These directions also apply to SFTM. By using the adjacent factory of CTB to perform just-in-time (JIT) deliveries using the kanban system, procurement of parts can be synchronized with production. For other suppliers, they are asked to deliver to a nearby DC, and parts are transported to the factory synchronized with production.

At present, separate DC is being used due to the small area of the current factory. However, the imminent transfer to a new factory site anticipates DC functions to be provided in the new factory, which will enable the exploration of introducing milk-run collection. For long distance transport, the use of efficient bulk transport mode such as Yangtze River transport is expected to be promoted after comparisons with rail and road transport.

3. Utilization of Yangtze River transport

The main characteristic of the procurement logistics being done by SFTM and CTB is the use of Yangtze River transport. This system of transport has attracted the attention of the logistics industry after the completion of the Three Gorges Dam. SFTM has introduced various improvements in this river transport and has used it regularly. The use of inland water transport is thought to be effective in coping with global warming issues such as reducing CO₂ exhausts from trucks. In terms of transport time and cost, the use of Yangtze River transport as a mode for long-distance transport of automotive parts has to be clarified.

Table 1 shows the transport time and cost of different modes to transport a 40-foot containerized cargo from Shanghai to Chengdu, as revealed from the

interview surveys administered on Japanese logistics companies and the Port of Luzhou.⁷⁾ According to the table, Yangtze River transport is slower but much cheaper than other modes. However, the assessment done by SFTM reveals that it does not use rail transport any longer because of the unreliability of trip schedules and there are cases when transit time for rail transport often takes longer than river shipping. Furthermore, although rail transport is relatively faster, apart from operational and management problems that make it unreliable, it is impossible to trace the rail containers. If the operational and management system for rail containers can be developed and rail capacity can be increased in the future, SFTM might reconsider the use of rail again. Compared with truck transport, Yangtze River transport is overwhelmingly cheaper but requires transport time which is three times more. The total costs of procuring the automotive parts can be evaluated by looking at the trade-off relationship of transport time and freight charges. If unit time evaluation cost is 2,400 yen per hour for a 40-foot container⁸⁾, total costs (freight charges + time evaluation cost A) for general shipper for the fastest case become 760,000 yen by Yangtze River transport, 750,000 yen by rail, and 790,000 yen by only truck. Three modes of total costs seem to be almost equal. On the contrary, by evaluating total costs from the components of transport time and freight charges, for the fastest case, the unit cost becomes 57,500 yen per day (i.e., (560,000 yen - 100,000 yen) ÷ (12 days - 4 days)) for a 40-foot container.⁹⁾

Time evaluation cost B could be calculated by obsolescence rate and auto parts value. The value of auto parts by marine container shipping bound for China is about 1.3 million yen per ton.¹⁰⁾ When the weight of auto parts loaded in a 40-foot container is 15 ton, the value of auto parts in the container is about 20 million

7) Table 1 is based on interview surveys of shippers, in general. SFTM has shortened transport time using Yangtze River to 9-10 days through various improvements.

8) MLIT(2004) p. III-1-22. Unit time evaluation cost for a 40-foot container cargo exported to Asia.

9) The calculated result of unit cost is 2,396 yen per hour. This is almost equal to the unit cost of 2,400 yen per hour from MLIT (2004).

10) FOB price in 2008 calendar year based on "Japan Customs Statistics" by Ministry of Finance.

yen. If the obsolescence rate is 1 % per week¹¹⁾, total costs (freight charges + time evaluation cost B) for the fastest case become 440,000 yen by Yangtze River transport, 520,000 yen by rail, and 670,000 yen by only truck. The result shows Yangtze River transport is advantageous.

SFTM has introduced many improvements for Yangtze River transport to reduce transport time to standard 9 days. Freight charges for SFTM might be more advantages than for general shippers because of volume discount for larger shipper. As a result, Yangtze River transport becomes more advantageous for SFTM. Another merit of Yangtze River transport is that the shipper can trace the location of parts by linking ship information with cargo information using GPS. Moreover, the ship is a more secured mode, and SFTM has further reduced risks such as theft and losses through the utilization of faster direct ships. It is thought that these elements other than freight charges also greatly influence modal selection.

However, as local procurement expands from the lower-priced parts, the price of parts procured from Japan is expected to get higher. It is predicted that the use of trucks might become more advantageous in the future based from trends on prices of parts and increased container loadings.

<Table 1> Transport time and costs by mode of transport for general shipper
(From Shanghai to Luzhou)

	Transport time	Freight charges * ¹	Freight charges +Time evaluation cost A* ²	Freight charges +Time evaluation cost B* ³
Yangtze River transport + Truck	12 - 15 days * ⁴	7,200 yuan (100,000 yen)	760,000 - 960,000 yen	440,000 - 530,000 yen
Rail + Truck	8 - 10 days	21,000 yuan (290,000 yen)	750,000 - 870,000 yen	520,000 - 570,000 yen
Truck only	4 days	40,000 yuan (560,000 yen)	790,000 yen	670,000 yen

*1: 1 yuan = 14 yen as of August 2009.

*2: Time evaluation cost A = (unit time evaluation cost (from MLIT (2004))) x(transport time).

*3: Time evaluation cost B = (obsolescence rate) x (parts value) x (transport time).

*4: For general shipper. Standard 9 days for SFTM.

Source: Interview of Japanese logistics companies and the Port of Luzhou

11) The obsolescence rate is based on Tsuboi et al. (2010).

VI. Concluding Remarks

This paper discusses efforts by SFTM and CTB to establish the procurement logistics network given the poor logistics infrastructure conditions in inland China. This network is part of the procurement system to synchronize with production based on the JIT concept, which is the basic philosophy of the Toyota group. Their efforts are gradually paying off as actual cases of improved procurement logistics systems have been implemented and have been successfully adapted to local conditions.

The special inland location of Chengdu had presented problems on how to efficiently procure automotive parts from suppliers to the production factory. However, the completion of the Three Gorges Dam had increased the potential of the Yangtze River to develop new logistics systems. The cases of SFTM and CTB showed that Yangtze River transport has become advantageous through the introduction of various logistics improvements. As more companies enter inland China, Yangtze River transport is expected to play an important role for logistics in the region.*

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