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Rethinking Distribution Logistics at VASA, Pilkington

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Leopoldo Garcés Castiella, the CEO of Vidriería Argentina S.A. (VASA), was preoccupied with the fast deterioration of the company's delivery service, the increasing number of customer service problems, and the ensuing complaints, an unheard-of situation until recently. It was mid-2008, and these complications were jeopardizing the solid reputation of VASA, a glass manufacturing company, as the favored supplier in the Argentinian market.

Garcés Castiella was an industrial engineer with over twenty years of experience in the glass industry and a successful management track record in the company. During the previous two years he had been based in Brazil as regional manager before his appointment as CEO in 2008. VASA's performance in customer service, considered crucial for success in the glass industry, was beginning to decline. In addition, VASA's market leadership was challenged by international competitors in the domestic market amidst a soaring demand for glass, which was propelled by the expanding local economy.

Garcés Castiella was considering a turnaround in the logistics strategy for the company's local customer network. He identified three basic alternatives: transforming the two transportation companies that had traditionally provided the distribution service, replacing them with more sophisticated logistics suppliers, or taking total control of distribution to customers by developing a VASA-owned delivery service.

Said Garcés Castiella:

> We are going through one of the best times in the industry with our distribution logistics in the hands of two transportation companies. Our responsiveness and fast delivery service are no longer the pride of our company; in fact, they have become a nightmare. It is time we took control and solved this transportation problem for our customers.

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The Global Glass Industry

Glass was an inorganic, hard, fragile, and transparent material with high hygiene and chemical compatibility characteristics that resulted from fusing natural materials such as silica sand, sodium carbonate, and limestone at high temperatures. It was manufactured in high temperature furnaces where mixtures were heated and melted into a viscose, clear, homogeneous liquid, and subsequently subjected to cooling and shaping techniques in the production of a wide range of products.[1]

In 2007, the supply of float[2] glass—obtained through leading high-demand glass technology—amounted to almost 50 million tons worldwide and was strongly concentrated in four international players that produced and marketed over 60 percent of world production. Three of the players supplied over 75 percent of the glass for the automobile industry. The four players were AGC—Asahi Glass Corp. (Japan), NSG Group (Japan), Guardian (USA), and Saint-Gobain (France) (see **Exhibit 1**).

Global demand was mainly made up of two industrial sectors: construction and automobiles. Of the 50 million tons total, over 30 million tons were high quality float glass, two to three million tons were sheet glass,[3] and two million tons were laminated glass.[4] The remaining 15 million tons were low quality float glass, mostly produced in China.

Although the global float glass market had been rising at a steady annual rate of 4 percent over the last several years, more recently between 2005 and 2008, growth had risen to 7 percent per year driven by the economic recovery and related construction boom in many countries. This demand expansion exposed a capacity problem in world supply with capacity utilization levels ranging between 90 percent and 95 percent.

In 2009, the Guardian group was expected to open a new float glass plant in Brazil. Guardian's glass production expansion would strengthen its competitiveness in the region and force NSG/Pilkington and Saint-Gobain, Guardian's major competitors in the region, to hone their operations in order to hold on to their regional market positions.

The NSG/Pilkington Group

Pilkington Group Limited was created as St. Helens Crown Glass Company in Saint Helens, England in 1826. Based on John William Bell's technical knowledge and expertise, it was funded by three influential families (the Bromilows, the Greenalls, and the Pilkingtons), who, by applying then revolutionary technology, played a major role in the development of the flat glass industry.

In 1952 the company transformed the industry with the development of glass manufacturing technology using float glass, replacing the traditional methodology of double processing based on precision glass rolling and polishing. In 2006, Pilkington stopped trading as an independent company when it was acquired by NSG (Nippon Sheet Glass Co.). This acquisition helped transform "NSG" into "NSG Group"—which maintained the Pilkington brand for all Group flat glass businesses.

The NSG/Pilkington Group promoted the development of new markets and business growth using two clearly defined strategies: a) it produced new proprietary manufacturing technologies, and b) it formed joint ventures with other companies in the industry. Its global operations included more than 45 countries, with a strong presence in Europe, Japan, North and South America, China, and Southeast Asia.

Historically, the Group had shown a preference for joint ventures with partners from emerging economies or with global players willing to operate in countries lacking adequate technical knowledge. Joint ventures with global competitors included agreements with Saint-Gobain in South America, and Shanghai Yaohua Pilkington and China Glass Holdings in China.

Vidriería Argentina S.A. (VASA)

Vidriería Argentina S.A. (VASA) was created in 1938 as a joint venture between NSG/Pilkington and Saint-Gobain, its French competitor. Since the 1980s, VASA had been the undisputed leader in the Argentine market, and by early 2000, it had become a leading glass manufacturer in South America through its operations across the continent. Estimated revenue for 2008 exceeded US $100 million[5] (**Exhibit 2**).

VASA's stated value proposition was to "offer a full range of products" and "deliver in due time and manner" (the following day from date of order placement). It offered a wide range of products made up of 600 SKU[6] varying in type, color, thickness, length, and width. With such a value proposition, VASA managed to protect itself against the threats posed by imports produced by regional competitors without production facilities in Argentina.

Fifty percent of VASA's production volume represented only 15 of its SKUs (2.5 percent of total SKUs) comprising its highest margin products. Another 40 percent of volume came from 140 SKUs (23 percent). The last 10 percent of volume came from the remaining 74.5 percent of the total product portfolio (450 SKUs), which included special and printed glass.

VASA's plant in Lavallol (Province of Buenos Aires, Argentina) supplied its four basic product lines. Float glass represented 80 percent of production while the other three basic lines, cathedral, mirror, and laminated glass, accounted for the remaining 20 percent (**Exhibit 3**). Most of the Lavallol plant's production (95 percent) was for the domestic market. The other 5 percent was exported to Latin American countries such as Brazil, Uruguay, and Paraguay.

VASA imported[7] only lines it did not produce locally, either because of shortages caused by sporadic excess demand or for products that required technology or installed capacity not available at its local plants. The most common external supply sources were other company divisions based in Brazil, Chile, USA, Mexico, and Europe.

Impact of Rising Market Demand

Between 2005 and 2008, the local glass market started to experience supply difficulties. After the economic and political crisis in late 2001, Argentina had experienced a period of steady growth leveraged by the government's plans to reactivate the economy. This had a positive impact on two very sensitive industries: automotive and construction. At the same time, this growth could have been the justification for a government increase in prices for services such as electricity and gas.

Limitations in installed capacity to supply a rising domestic market during 2008 forced VASA to seek supply alternatives overseas. Import operations became a central activity and raised costs. However, inefficient planning for import sourcing further increased costs due to importing incorrect product mix quantities and lack of space. VASA was forced to rent more space and duplicate stockroom operations.

The Group's plant in Brazil, its main external supply source, could not satisfy VASA's demand due to rising demand in the Brazilian market itself, which worsened the local supply situation. In addition, the overall international glass market was experiencing high demand. Consequently, VASA had to look for supply sources at greater distances, such as Europe or Asia. Around the same time, Guardian, VASA's main global and regional competitor, announced the imminent construction of a second float glass plant in Brazil that was expected to supply the unmet demand in Argentina.

Customers

For clear glass, which represented 80 percent of VASA's production, its customer portfolio was made up of 75 distributors, mostly local small- and medium-sized companies that met national demand (**Exhibit 4**). Approximately 60 percent of the distributors operated in the city of Buenos Aires (Capital Federal & GBA—greater Buenos Aires area), while 40 percent served the Argentine provinces (**Exhibit 5**). VASA did not provide finish processing for its float glass production because it was a wholesale seller; for the most part its distribution-processing customers offered cutting and delivery services to satisfy retail channel requirements. These distribution-processing customers worked with minor retailers or constructor clients to prepare either the orders or the stocks and plan the logistics lead times to receive the glass on time either in the warehouse of minor retailers or on the construction site.

The remaining 20 percent of VASA's production was distributed via one of the Group's locally-based subsidiaries, Pilkington Automotive, which served the automotive industry.

Distribution companies differed greatly in size and infrastructure capacity. These differences affected product delivery time. If a distribution company's unloading capacity was impaired by a lack of adequate infrastructure (e.g., forklifts or cranes), the resulting delivery delays strongly affected idle capacity of the transportation company's trucks. Also, most distributors unloaded packages one at a time.

Before 2003, VASA had not offered delivery service, letting distributors contract with transportation companies themselves. Because of recurrent problems in delivery service and an unsatisfactory attempt in 2003 to hire a leading international logistics service provider at the Cordoba distribution center, the company decided to take control and manage logistics by directly hiring and coordinating two transportation companies.

Encouraged by VASA's promise of fast delivery, distributors usually worked with low inventory levels; therefore, developing and sustaining an agile and efficient delivery service was critical to VASA customer satisfaction.

Although VASA maintained good relationships with and was highly committed to its distributor customers, the rapid deterioration of the delivery service over the last few years jeopardized this long-term association.

Another concern was the increasing fragmentation of VASA's customer base because of retail customers trying to lower costs by coming to VASA directly rather than through the larger distributors. As the geographic distribution of the customers became more scattered, delivery service logistics grew more demanding and complex.

Order Processing

VASA's Marketing Department was responsible for processing orders every day. Orders were placed directly by customers on an e-commerce platform until 1:00 p.m. the day before delivery was required. Upon placing an order, customers selected product specifications such as type, color, size, and the number of items needed. This platform also allowed customers to find out if these items were in stock and to schedule a window of time for delivery (although often customers did not specify delivery time).

The Logistics Department classified customer orders according to such characteristics as size and distance, and established the number and types of trucks required to meet customer needs. By 3:00 p.m., transportation companies would submit truck fleet availability for the next day. VASA then matched deliveries with available trucks, creating a "Trip Schedule Table" (**Exhibit 6**) that was sent to each transportation company for confirmation. This "Trip Schedule Table" presented the number and the type of trucks each customer needed to receive the order. It was an administrative document used jointly by VASA and the transportation companies.

In turn, the Logistics Department developed an operation schedule for the next day's delivery with the "Orders and Dispatch Schedule Table" (**Exhibit 7**), which was used internally as the stockroom dispatch program and customer delivery schedules for the next day.

The "Trip Schedule Table" set a timetable for loading each order from the stockroom; however, some trucks were late (**Exhibit 8**). Although the "Trip Schedule Table" did not specify time of delivery to customers, truck drivers often coordinated delivery directly with the distributors' crew. One transportation company manager commented, "Being able to coordinate a last minute schedule with truck drivers provides greater service flexibility as it allows us to avoid unnecessary delays in queue time and enables customers to adjust their reception operations."

VASA established priority criteria for daily dispatch in the stockroom. For customers located in Buenos Aires and its suburbs, an attempt was made to schedule unloads in early morning hours or before midday, so assigned load hours at the plant were concentrated between 4:00 a.m. and 6:00 a.m. (**Exhibit 9**). Trucks scheduled for customers located in the inner provinces were assigned loading times between 2:00 p.m. and 8:00 p.m. The Logistics Department determined that for these longer trips it made little sense to load during the morning, since many times it was impossible to deliver on the same day before the distributor's closing hours; also, truck drivers usually preferred to travel until late night, rest, and deliver early in the morning the following day.

The documentation or information process (**Exhibit 10**) ended when each transportation company submitted the "Delivery Report" (**Exhibit 11**) to VASA. This form registered the arrival and departure times for each order from VASA's stockroom. The truck driver later filled out the form with arrival and departure dates and times in the customer's warehouse. Customers signed the form and noted any additional pertinent information, such as the goods had been delivered damaged. There was one Delivery Report per customer. VASA next transferred all this data to an Excel® spreadsheet and monitored drivers' punctuality upon arrival at VASA's stockroom.

Delivery Management

VASA owned two distribution centers (DC): a stockroom in Buenos Aires at the Lavallol plant that centralized reception and delivery of goods throughout the country, and a DC in Córdoba, which supplied the local province and the Northern region of Argentina.

The Buenos Aires stockroom had a covered surface capacity of 270,000 square feet with a dispatch capacity of 185,000 tons per year (or up to 360 packages per day) for a range of almost 600 SKUs.

The stockroom was a warehouse composed of six adjacent aisles separated by columns. Two overhead cranes (one for 6 tons and the other for 20 tons) that ran along each of the six aisles were used to move merchandise within each aisle. Forklifts were used to shift goods from one aisle to another aisle, but these forklifts were limited by the layout of the stockroom and the way packages were stored.

Glass sheets were stored in groups according to type and measurements in preestablished stockroom areas. The loading crew assigned storage areas based on space availability and team loading-unloading skills. The Head of Logistics explained: "Sometimes, the crane operator has to go get a package that is 260 feet away and when he gets to the stowage spot, he may find that eighty sheets have to be removed to get to what he needs. This increases overall order preparation time."

Stockroom operations were carried out in three shifts (from 10:00 p.m. to 6:00 a.m., from 6:00 a.m. to 2:00 p.m., and from 2:00 p.m. to 10:00 p.m.) by dispatch teams, each consisting of a crane operator and an assistant, overseen by the shift supervisor. Although teams were stable, they rotated their assigned shifts on a weekly basis. The supervisors usually rotated with the teams they supervised. Productivity and work pace among teams and shifts differed noticeably, which was generally attributed to supervisors' different managerial styles.

The Logistics Department was in charge of organizing activities in the stockroom. The head of Logistics always checked the following day's "Orders and Dispatch Schedule Table" (Exhibit 7) and assigned tasks to each shift according to internal operational guidelines. Shift crews included three dispatch teams (with a fourth team on the busier morning shift) and one supervisor. At the beginning of the shift, the supervisor assigned tasks to each team according to the activities required: unloading from furnace shipments; picking up or stowing packages or sheets; consolidating or deconsolidating glass packages; and truck loading. At the end of the shift, the incoming and outgoing supervisors met to discuss the status of activities already completed and those in progress. This information helped in planning for the following shift.

The dispatch team's most delicate task was moving glass sheets or packages in the stockroom for picking and/or storage. This was carried out by crane operators, who also drove forklifts. According to the Logistics Manager: "One of the biggest bottle necks in our management is in the training and development of a stable and competent team of crane operators, as this specific and delicate activity (glass manipulation) requires skills that are difficult to find in the conventional labor market."

There were two types of loading methods: trestle and modular technologies (**Exhibit 12**). Trestle loading included a fixed "A" shape framework on the truck loading platform for stowing packages one by one. The modular method used standalone portable loading modules that could be hoisted fully loaded onto a truck by an overhead crane

in one maneuver. These modules were standalone metallic structures with "A" shape trestles used to support glass packages, which were designed to be loaded on a truck in one crane operation. Modules offered the advantage of allowing order preparation independent of the truck that would then ship the order. Module preparation was made mostly during the night shift (from 10:00 p.m. to 4:00 a.m.). As trucks did not come in at that time, teams left modules ready to be loaded on trucks at a later time.

Loading times depended on the type of truck and loading method used (Exhibit 12). For a trestle truck, loading time for a medium standard truck (six packages) was around 1.5 hours, while a semi-trailer truck took 2.5 hours (twelve packages). Trucks with modular technology reduced loading time to an hour. As for Jumbo tow trucks, used to transport glass sheets larger than the conventional 3,600 x 5,500 mm, loading time could take up to two hours.

Although trestle technology caused loading and unloading delays, the modular method necessitated significant investment in modules and took up more surface space in the stockroom. Moreover, unlike the trestle method, modular technology required distributors to stow the modules[8] which involved larger space requirements to unload a module in one crane operation.[9]

Transportation Companies

VASA outsourced transportation and delivery services to CristaLog Hnos. and Transfer S.A., two local small- to medium-sized transportation companies with which it had maintained good business relationships for more than twenty-five years. Although both companies worked almost exclusively for VASA, they also provided services to other companies in other businesses, thus increasing their own capacity utilization.

VASA paid for the logistical costs of delivery. The delivery service rate depended on destination, type of truck, and if the return trip was full or empty (**Exhibit 13**). Customarily, VASA did not apply a reward or penalty system for its transportation drivers based on the service quality achieved.

Although the company possessed monitoring resources, including delivery reports and customer feedback, it did not use this information systematically to control transportation company performance. For example, a satellite routing system (Sitrack)[10] that tracked truck fleets was used only to increase safety in cases of truck theft or breakdown.

Although not explicitly committed to doing so, VASA assigned customer orders to transportation companies according to geographical areas. (CristaLog Hnos. was assigned Buenos Aires City and suburbs while Transfer S.A. was scheduled to deliver to the inner provinces (**Exhibit 14**). The Head of Logistics put it this way: "This assignment by region gives us several advantages. It causes a higher specialization of transport; it develops a closer bond between transportation companies and customers; and, above all, it avoids competition among transportation companies."

Likewise, transportation companies promoted closer bonds between drivers and customers (**Exhibit 15**). The director of Transfer S.A. said, ". . . We try to make sure that the same driver always serves the same customer. It might not always be logistically convenient, but it promotes a better knowledge and understanding of customers."

CristaLog Hnos.

With annual sales of $2.5 million and an average annual growth of 10 percent in the last few years, CristaLog had fourteen permanent drivers and ten paid employees on the administrative and general staffs. Although there were no penalties for non-compliance or delays, the transportation company rewarded best performing drivers with additional delivery trips. The CristaLog Hnos. director noted, ". . . This is a very difficult business. Delays during the trips cause later return hours to our warehouses so we are forced to pay overtime. We are very strict when it comes to meeting agreed-upon loading and unloading times."

To supply its market of over thirty distributors mostly based in Capital Federal & GBA—greater Buenos Aires, CristaLog Hnos. owned a fleet of fifteen trucks (thirteen semi-trailer trucks and two medium standard trucks). Eight of the fifteen had modular technology. It also hired five trucks from independent transportation companies to provide operational flexibility and reduce problems created by a larger payroll.

Transfer S.A.

Transfer S.A. was a family-owned company established in 1962 under the name Vidrio Transportes. Its operating capacity enabled it to make fifteen daily trips to cover more than fifty customers throughout the country as well as subsidiary companies in neighboring countries such as Uruguay, Chile, and Brazil.

The company's strategy was to develop a flexible organizational structure by investing in its own modern fleet while also using trucks owned by independent truck drivers. With a fleet of eleven owned trucks (ten semi-trailer trucks with trestle and one medium standard truck) and twelve outsourced trucks, Transfer S.A. was able to adjust capacity according to demand. Twelve of the available trucks had modular technologies and eleven had trestle technology.

Although there was no explicit incentive system in place, top management rewarded punctuality and truck maintenance with more attractive trips. One company director explained, "Success in this business is about good management and good relationships with truck drivers. It has always been our distinctive feature since we founded the company . . . and I think it is our main strength."

The Dilemma

Meeting high service standards with deliveries was becoming increasingly difficult to achieve. Customers complained of late truck arrivals and failure to fulfill orders. Many longtime customers grumbled that VASA's service was not as good as it used to be. They demanded that VASA maintain tighter control over order dispatch and compliance with agreed-upon delivery timetables.

The VASA logistics manager told CEO Garcés Castiella that improving service posed a challenge. He explained that the company depended on transportation companies that did not deliver adequately, "Transportation companies do not comply with the truck loading schedules. In addition, drivers blame VASA for the delay, jeopardizing VASA's reputation with its customers. This is a big blow for us, since there is a long-lasting relationship between transportation companies and distributors."

A transportation company director argued otherwise, "If VASA guaranteed loading service punctuality, things would be different. I cannot ask a truck driver to be at the plant at 2:00 a.m. only to wait at the parking lot for hours. . . . The ideal thing would be to load all trucks at VASA at 6:00 a.m. and to be at the distributor ready to unload, at 8:00 a.m. . . . Besides, average delay in the loading process stands at no less than three hours. The problem is that the dispatch team prepares the order after we arrive. Usually, staff is insufficient or orders are incomplete . . . I think the delivery process lacks pace and regularity."

Another transportation company director added, "On many occasions, we don't have enough trucks available because there are delays at distributors' warehouses, either because there is no staff available when trucks arrive or no suitable equipment. In any case, this implies three- to four-hour delays."

"There are several problems," explained VASA's commercial manager, "There is a logistics engineering routing issue to get to sixty destination delivery points which calls for more careful planning. In addition, due to planning problems, on many occasions merchandise that is recorded as available in the stockroom has not yet been released . . . On the other hand, it is true that we have displayed a paternalistic attitude towards transportation companies. That worked well while we were able to adequately respond to our customers. But now, with a rising market, the level of informality we tolerated has led to levels of non-compliance in delivery of over 20 percent."

Garcés Castiella was unsure which logistical approach to pursue to recover quality delivery service. Considering the impact on customer contact, he wondered whether VASA should increase control over its operations and manage transportation using its own fleet. Another possibility was to take direct action with the transportation companies that had traditionally provided them with distribution services and require them to transform their management systems to meet stricter service conditions. What he knew is that to ensure success, his decision would need to gain the commitment and involvement of major supply chain players, such as marketing, programming, logistics and supply, transportation companies, and customers. Because of the scope of this decision and actions required, his leadership and involvement were essential.

Some VASA managers believed that instead of assuming the cost and risk of transforming these transportation companies, VASA should replace them with larger and more sophisticated logistics service providers. Although it could prove hard to find adequate alternative companies with skills in manipulating glass, they could follow the successful experience of Pilkington Brazil, which had hired a leading international logistics operator for transportation services.

It was clear that time was not on VASA's side. The unsatisfied market demand was expected to grow and VASA might have to consider increasing imports from subsidiaries further away. This would make delivery service problems even more apparent. In addition, an increasing number of customers were placing more rush orders for smaller amounts.

To make matters worse, pressure from regional competition was growing. Guardian was planning to install a new furnace in Brazil to supply the region via a distribution center near Buenos Aires. This posed a real threat for VASA, since many distributors had already begun to do business with Guardian in order to be able to meet customer orders.

Garcés Castiella: "I have to decide which logistical approach to pursue. One way or the other the commitment of the major supply chain players will be essential to maintain VASA's leadership."

Exhibit 1: World Class Suppliers in 2009

Companies	Annual Production (MM ton)	World Market share(%)	Target market (regions)
AGC-Asahi Glass Corp. (Japan)	**9**	**17**	Europe, Japan, South East Asia, North America, China, Russia
NSG Group (NSG/Pilkington Group) (Japón)	**9**	**17**	Europe, Japan, South East Asia, North America, South America, Russia
Guardian (USA)	**6.4**	**12**	Europe, South East Asia, North America, South America, Russia
Saint-Gobain (France)	**7.4**	**14**	Europe, South East Asia, North America, South America, China

Source: Pilkington. Annual Report (2009). Pilkington and the flat glass industry.

Exhibit 2: VASA Income Statements 2006 to 2008 (forecast)

	2006	2007	2008 (forecast)
Income	**81,217**	**91,452**	**102,784**
Sales Costs	**(39,791)**	**(47,312)**	**(60,841)**
Power	**(5,499)**	**(7,830)**	**(11,287)**
Transport	**(2,131)**	**(2,806)**	**(2,183)**
Income before tax	**33,396**	**31,877**	**31,306**

Note: In thousands of US dollars.

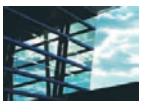
Source: Company documents.

Exhibit 3: Glass Types: Description

Float Glass

Traditionally called flat glass, Float glass is irreplaceable when a clear vision without optical distortion is necessary and it is the raw material to be transformed into tempered glass, laminated glass, to make mirrors and manufacture sealed double pane units.

When fed, the glass mass is confined to an environment whose atmosphere is chemically controlled at a sufficiently high temperature for a while, long enough to eliminate irregularities and level off surfaces until they turn flat, parallel and bright, molten. As the surface of tin is flat, the surface of the glass will be flat as well.



Cathedral Glass

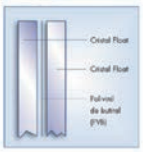
Printed Cathedral glass has in one or two faces a decorative texture that reflects the light in a diffuse manner, and reduces clear visibility. The pattern creates different degrees of translucence and intimacy.

In architecture and decoration, this glass offers a wide range of uses that only the user's imagination can limit. Its main applications are: doors and windows, room dividers, table tops and shelves, ceilings, vitraux, blinds and any application that may require more visual intimacy or transmission of light.

Laminated Glass

It is traditionally considered the glass for security and protection. It provides security for people and property in case of burglary, vandalism, preventing easy access to a property by the shattering of doors and windows.

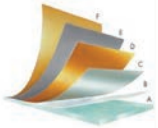
It is made up of two sheets of floating glass intimately joined by means of 2 laminated sheets of PVB, applied with heat and pressure in a steam pressure sterilizer. To satisfy requirements of solar control, it can have any type of float_ . . . colorless, color or reflective, although both glasses do not need to be of a similar width.



Mirror Glass

This is traditionally considered as the most decorative glass. It can magnify and multiply images creating an illusion of bigger and more luminous rooms. It gives surprisingly spatial sensations. It . . . irreplaceable in interior decoration, the furniture industry and may combine styles, top quality and distinction.

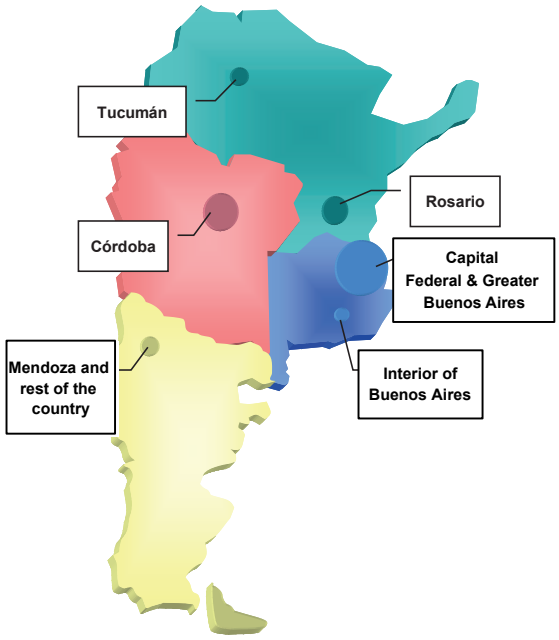
It is made with colorless or color crystal glass. It has a double coat of protection paint that ensures long life without modifying its aspects.
Composition:



A-Flat float glass, free of distortion. They are manufactured by applying a hot water wash free of minerals.
B-Application of a solution that makes the surface more sensitive and provides adherence for a coat of silver to the mirror.
C-Coat of metallic coat that forms the reflective surface of the mirror.
D-Application of copper solution to act as a protective coat and sacrifice of silver film..
E-First layer of anticorrosive layer whose function is to protect copper and silver films.
F-Second layer of anticorrosive paint with higher mechanical resistance to injuries and prevents moisture over the mirror.

Source: URL www.vasa.com.ar accessed on March 15, 2010.

Exhibit 4: Customer Distribution Map



Source: Company documents.

Exhibit 5: Geographic Distribution of Customer Sales Volume

Customer	Relative Importance (% of sales volume)
Capital Federal & Greater Buenos Aires	57%
Interior of Buenos Aires	8%
Córdoba	15%
Rosario	8%
Tucumán	3%
Mendoza	2%
Rest of the country	7%
General Total	**100%**

Source: Company documents.

Exhibit 6: Trip Schedule Table

VASA - Trips Schedule

DATE: Daily Sample

TO BE FILLED BY TRANSPORTATION COMPANY

PLEASE, CONFIRM RECEPTION AND CONFORMITY WITH REQUESTED SCHEDULES AND DESTINATIONS

TRANSPORTATION COMPANY	CUSTOMER	Load Schedule	MDD Float	CAB Float	MDD Cal	CAB Cat	PQ Float	PQ Cat	TR Float	TRCat	Sales Observations
TRANSFER S.A.	IVANOVICH S.A.	00:00:00	2		-	-	12	-	-	-	8011022/23/24
TRANSFER S.A.	SUPERGUS y Hnos	03:00:00	2		-	-	11	-	-	-	8010957 y 8010974/75
TRANSFER S.A.	KALZAN TECNOLOGÍA DEL VIDRIO S.A.	04:00:00	2		-	-	12	-	-	-	8,011,027
TRANSFER S.A.	VIDRIERÍA SANTA MARÍA S.A.	04:00:00	2		-	-	8	-	-	-	8011019/20/21
TRANSFER S.A.	BAM DOBLE S.R.L.	04:00:00	1		-	-	6	-	-	-	8,010,887
TRANSFER S.A.	TESTER PROD S.A.	08:00:00		1	-	-	12	-	-	-	8010796/97
TRANSFER S.A.	VID de PIAS S.A.C.I.F	10:00:00	-	1	-	-	12	-	-	-	8,010,819
TRANSFER S.A.	Planta Industrial de VID de PIAS	10:00:00	2		-	-	11	-	-	-	8,010,965
TRANSFER S.A.	MARCELO TARANTINI S.R.L Rosario	14:00:00	2		-	-	12	-	-	-	8011029/30/31
TRANSFER S.A.	VID de PIAS S.A.C.I.F	15:00:00	2		-	-	11	-	-	-	801 0963 y 64
TRANSFER S.A.	COPPARITTI HNOS.	16:00:00		1	-	-	10	-	-	-	8010958/59
TRANSFER S.A.	A. PUGLIESEY S.R.L.	16:00:00	2		-	-	11	-	-	-	8010993/94/95
TRANSFER S.A.	VIDRIO MERCOSUR S.R.L.	18:00:00	2		-	-	12	-	-	-	8011003/04
			19	3	-	-	140	-	-	-	

Source: Company documents.

Exhibit 7: Orders and Dispatch Schedule Table

VASA - ORDERS AND DISPATCH SCHEDULE TABLE

DATE: Daily Sample

Transp.	Transportation Company	Truck Driver	Tractor Patent N	Semi Patent	Load Time	Customer	Dest	Arrival Time	MDD Float	CAB Float	MDD Cat	CAB Cat	PQ Float	Sales Observations
3	TRANSFER S.A.	Garcia O.	EOI 059	TEI 592	0:00	IVANOVICH S.A.	MDQ		2				12	8011022/23/24
2	INTERNO				2:00	PLANTA LAMINADO			1				6	
2	PROPIO	Quitante E.	WGS50C	-	2:00	CRISTEMAS S.A.	GBA		1				4	PROPIO 8010986 y 8011009
2	CRISTALOG HNOS	Fernandez W.	GZQ4S3	GET497	3:00	JOSE TRENTUNO VIDRIOS S.R.L. Loma Hermosa	GBA	6:00	1				8	INLOADER 8010978
2	TRANSFER S.A.	Olivieri	R2E557	HFS835	3:00	SUPERGUS y Hnos	GBA	6:00	2				11	8010967 y 8010974/75
2	TRANSFER S.A.	Orilla	RUI294	ART157	3:00	MARCELO TARANTINI S.R.L Rosario	ROS		2				12	8011029/30/31
3	TRANSFER S.A.				4:00	KALZAN TECNOLOGÍA DEL VIDRIO S.A.	PIL	7:00	2				12	8011027
2	TRANSFER S.A.	Gregorio	CAT384	HBW56C	4:00	VIDRIERÍA SANTA MARÍA S.A.		7:00	2				8	8011019/20/21
3	TRANSFER S.A.				4:00	BAM DOBLE S.R.L.	GBA	5:00	1				6	8010887
4	BARAH LOG S.A.	Pontequio	GCB583	CHU711	5:00	KALZAN TECNOLOGÍA DEL VIDRIO S.A.	PIL	8:00	2				12	8011026
2	CRISTALOG HNOS	Petroni E.	VJV842	-	5:00	JOSE TRENTUNO VIDRIOS S.R.L. Loma Hermosa	GBA	8:00	1				6	8010960
3	CRISTALOG HNOS	Sureda	SEY200	SEY206	5:00	VIDRIOS LUJAN y CASTELAR S.A.	GBA	7:00	2				12	8010979180/81
2	CRISTALOG HNOS	Ruggieri	SLI322	SFWS38	6:00	GRUPO GLASS LATAM	GBA			1			12	8010876 y 77
2	PROPIO				6:00	CRISTEMAS S.A.	GBA		1				4	PROPIO 8010897 y 8011010
2	INTERNO				7:00	PLANTA LAMINADO			1				6	
2	TRANSFER S.A.				8:00	TESTER PROD S.A.	GBA			1			12	8010796/97
2	PROPIO				9:00	COVINOR COMP. DEL VIDRIO	GBA		1				6	8010922
2	PROPIO				10:00	CASA GATSE SAIC	CAP			1			4	8010937
2	TRANSFER S.A.				10:00	VID de PIAS S.A.C.I.F	CBA			1			12	8010819
2	TRANSFER S.A.				10:00	Planta Industrial de VID de PIAS	CBA		2				11	8010965
2	CRISTALOG HNOS				11:00	BALENOVICH S.R.L.	GBA	8:00	1				6	8010954/55
2	CRISTALOG HNOS				11:00	KALZAN TECNOLOGÍA DEL VIDRIO S.A.	PIL	17:00	1				8	INLOADER 8011028
2	CRISTALOG HNOS				11:00	JOSE TRENTUNO VIDRIOS S.R.L. Loma Hermosa	GBA			1				DELIVERY IN SHEETS 8010961
3	CRISTALOG HNOS				11:00	CASA GATSE SAIC	CAP			1				DELIVERY IN SHEETS 8010890
3	CRISTALOG HNOS				11:00	MASTORETTI S.A.	GBA			1				DELIVERY IN SHEETS 8010898
3	CRISTALOG HNOS				11:00	TESTER PROD S.A.	GBA			1				DELIVERY IN SHEETS 8010903
3	CRISTALOG HNOS				11:00	CASA GATSE SAIC	CAP			1				DELIVERY IN SHEETS 8010904
2	INTERNO				13:00	PLANTA LAMINADO			1				6	
2	CRISTALOG HNOS				14:00	IVANOVICH S.A.	MDQ			1			12	8010905 "RANGE"
2	BARAH LOG S.A.				15:00	CD CÓRDOBA	CBA			1			12	
2	TRANSFER S.A.				15:00	VID de PIAS S.A.C.I.F	CBA			1			11	8010982/3
2	TRANSFER S.A.				16:00	A. PUGLIESEY S.R.L.	MDQ		2				11	8010993/94/95
4	BARAH LOG S.A.				17:00	KALZAN TECNOLOGÍA DEL VIDRIO S.A.	PIL	22:00	2				12	8010990
3	TRANSFER S.A.				17:00	COPPARITTI HNOS.	RAF			1			10	8010958/59
2	CRISTALOG HNOS				18:00	KALZAN TECNOLOGÍA DEL VIDRIO S.A.	PIL	21:00	2				12	8010991/92
2	INTERNO				18:00	PLANTA LAMINADO			1				6	
2	TRANSFER S.A.				18:00	VIDRIO MERCOSUR S.R.L.	OLA		2				12	8011003/04

Source: Company documents.

Exhibit 8: Delayed Truck Arrivals–Monthly Average in terms of Severity

Scheduled Arrival Time	Number of Delayed Trucks according to Severity (*)						Total number of trucks scheduled to arrive
	0	1	2	3	4	5	
12:00 AM	20	2		2	2		26
1:00 AM	8						8
2:00 AM	12		8	20	10	2	52
3:00 AM	14	2	18	24	4		62
4:00 AM	50	26	28	50	2		156
5:00 AM	60	26	50	22	6	2	166
6:00 AM	64	64	38	54	20	2	242
7:00 AM	34	22	16	22	8	2	104
8:00 AM	26	4	16	16	6		68
9:00 AM	36	10	20	10	12		88
10:00 AM	42	8	8	10	10		78
11:00 AM	30	8	26	22	4		90
12:00 PM	20	10	28	20	4		82
1:00 PM	30			2			32
2:00 PM	24	4	2	6	4		40
3:00 PM	38		6	8			52
4:00 PM	28	6	16	22	2		74
5:00 PM	20	12	28	24			84
6:00 PM	16	12	14	12	4		58
7:00 PM	6	4	4	2			16
8:00 PM	2						2
9:00 PM	8						8
10:00 PM	10						10
11:00 PM	16						16
Total number of trucks scheduled to arrive	**614**	**220**	**326**	**348**	**98**	**8**	**1614**

(*) Severity of Delay					
0	From	00:00	a	00:19	minutes
1	From	00:20	a	00:59	minutes
2	From	01:00	a	02:20	hours
3	From	02:20	a	04:59	hours
4	From	05:00	a	10:19	hours
5	From	10:20	a	20:59	hours

Note: Severity measures level of delay (1, low level of delay–5, high level of delay).

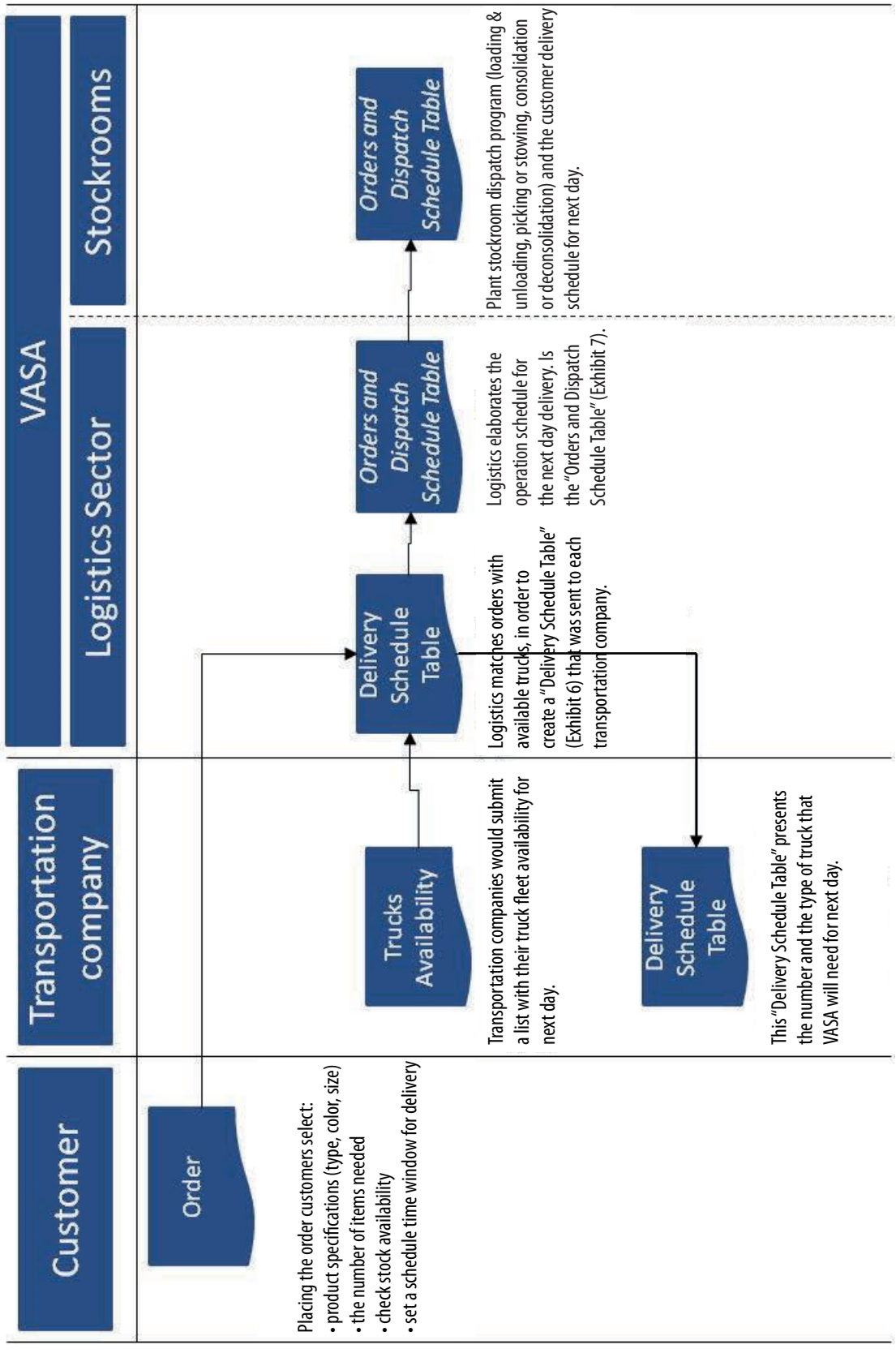
Source: Prepared by the authors based on company archival data.

Exhibit 9: Truck Movement Table–Monthly Average in Stockroom

Scheduled Arrival Time	Trucks		
	Scheduled	Arrivals	Departures
12:00 AM	26	22	38
1:00 AM	8	8	30
2:00 AM	52	12	16
3:00 AM	62	16	22
4:00 AM	156	116	32
5:00 AM	166	110	84
6:00 AM	242	246	46
7:00 AM	104	112	112
8:00 AM	68	64	142
9:00 AM	88	116	104
10:00 AM	78	116	90
11:00 AM	90	78	66
12:00 PM	82	66	120
1:00 PM	32	64	112
2:00 PM	40	80	72
3:00 PM	52	62	82
4:00 PM	74	50	60
5:00 PM	84	62	80
6:00 PM	58	74	64
7:00 PM	16	54	32
8:00 PM	2	26	66
9:00 PM	8	26	94
10:00 PM	10	12	32
11:00 PM	16	22	18
Total	**1614**	**1614**	**1614**

Source: Company documents.

Exhibit 10: Order Processing Flowchart



Source: Prepared by the authors using information provided by the company.

Exhibit 11: Sample Delivery Report

VASA®
VIDRIERIA ARGENTINA S.A.

INFORME DE ENTREGA Nº 008014

Para ser completado por Portería y por el Stockroom

CARGA 04 DIC. 1340 04 DIC. 1540

Fecha y hora Arribo a planta: 1246 04 DIC.

Fecha y hora Ingreso a planta:

Fecha y hora Remito: 169812

Fecha y hora Salida de planta: 04 DIC. 2047

Para ser completado por el guinchero y el chofer en el SRF

Transporte: Monte

Cliente: Vidrio Cordoba

Chofer: Candetti

Remito: 169812

Estado de la mercadería al momento de carga

Mercadería OK ☐ **Roturas** ☐

04 DIC.

En caso de roturas o vidrio mojado, por favor detallar

Espesor	Color	Hojas	Observaciones

Firma y Aclaración Chofer

Firma y Aclaración Supervisor

Para ser completado por el chofer en el Cliente

DESCARGA

Fecha y hora Arribo a cliente: 7/12 1032

Fecha y hora Salida de cliente: 7/12 1112

VIDRIERIA ARGENTINA S.A. SERVICIO DE VIGILANCIA PORTERIA CHARLONE

Estado de la mercadería al momento de carga

Mercadería OK ☑ **Roturas** ☐

En caso de roturas o vidrio mojado, por favor detallar

Espesor	Color	Hojas	Observaciones

Firma y Aclaración Chofer

Firma y Aclaración Supervisor

Av. Antártida Argentina y vías FFCC Roca - (B1836AON) Llavallol
Pcia. de Buenos Aires - República Argentina
www.vasa.com.ar

Source: Company documents.

Exhibit 12a: Glass Loading Technologies

Trestle Technology

Modular Technology

Source: Company documents.

Exhibit 12b: Trucks for Transporting Glass

Medium Standard Truck

Semi Trailer

Trestle Jumbo

Source: Company documents.

Exhibit 13: Freight Fees

			Price for each type of Freight (in Argentine pesos) (*)					
Destination Area	**Km.**	**Code**	**Semi (full return)**	**Semi (empty return)**	**Medium Standard**	**Trailer / Jumbo**	**Inloader**	**Combined 6 PQ**
Capital y GBA	80	**CAP / GBA**	-	$ 899	$ 534	$ 1,168	$ 899	
Cipolletti	1178	**CIP**	$ 4,581	$ 7,200	-	-	-	
Córdoba	720	**CBA**	$ 2,800	$ 4,401	-	$ 5,723	-	
Corrientes	1040	**COR**	$ 4,044	$ 6,356	-	-	-	
Depósito Córdoba	720	**DPC**	$ 2,759	$ 4,401	-	-	-	
Luján	90	**LUJ**	-	$ 1,016	$ 604	-	-	
Mar del Plata	400	**MDQ**	-	$ 2,445	$ 1,926	-	-	
Marcos Juárez	450	**MJU**	$ 2,079	$ 2,751	$ 2,167	-	-	
Mendoza	1040	**MZA**	$ 4,044	$ 6,356	-	-	-	
Neuquén	1180	**NEU**	$ 4,590	$ 7,211	-	-	-	
Olavarría	352	**OLA**	-	$ 2,152	$ 1,696	$ 2,797	-	
Paraná	510	**PAR**	$ 2,120	$ 3,118	$ 2,455	$ 4,053	-	
Pilar	90	**PIL**	-	$ 1,202	$ 605	-	$ 1,202	
Rosario	305	**ROS**	-	$ 1,866	$ 1,468	$ 2,425	$ 1,866	$ 1,110
Rafaela	540	**RAF**	-	$ 3,300	$ 2,600	-	-	
Río Cuarto	610	**RCU**	$ 2,372	$ 3,728	-	-	-	
Salta	1600	**SAL**	$ 6,223	$ 9,779	-	-	-	
San Francisco	570	**SFR**	$ 2,217	$ 3,484	-	-	-	
San Jorge	500	**SJO**	$ 2,059	$ 3,056	$ 2,408	-	-	
San Juan	1126	**SJU**	$ 4,381	$ 6,883	-	-	-	
San Luis	800	**0**	$ 3,187	$ 4,891	-	-	-	
Santa Fe	490	**SAN**	$ 2,037	$ 2,995	$ 2,359	$ 3,894	-	$ 1,732
Tucumán	1230	**TUC**	$ 4,783	$ 7,518	-	-	-	
Villa Mercedes (S.Luis)	705	**VME**	$ 2,743	$ 4,310	-	-	-	
Villa María	560	**VMA**	$ 2,335	$ 3,423	-	-	-	
Catedral reparto 1		**RE1**	-	$ 5,016	-	-	-	
Catedral reparto 2		**RE2**	-	$ 3,061	-	-	-	
Two customers (Sta. Fe-Rosario)			Additional $185					

(*) Exchange rate 12-22-2008: 1 US dollar=3.43 Argentine pesos.

Source: Company documents.

Exhibit 14: Truck Driver Trip Assignments by Geographic Area for an Average Fortnight

Transportation Company: CRISTALOG Hnos

	Destination Area																								
Truck driver	**CAP**	**CBA**	**COR**	**GBA**	**LUJ**	**MDQ**	**MJU**	**MZA**	**NEU**	**OLA**	**PAR**	**PIL**	**RAF**	**RCU**	**ROS**	**SAL**	**SFA**	**SFE**	**SFR**	**SJO**	**SJU**	**SLU**	**TUC**	**VMA**	**VME**	**Total N of Trips**
Sanmartino	3			11	2																					**16**
Acosta C.				2		3						3	1										1			**10**
Acuña	10			27																						**37**
Fernandez W.				19								16			3											**38**
De Pinto												1														**1**
Delgado												1														**1**
Oro				5																						**5**
Laprida	2			9		6						2														**19**
Ruggieri	1			19								1														**21**
Sureda				7		1						12						1								**21**
Pitaluga				3																						**3**
Cascante	4			9	1							1														**15**
Calcagno				3		3										1		2					1			**10**
Vignoli	2			32								4														**38**
Zunino				3		2						4			1											**10**
Madera	1			3																						**4**
Madera D.				9	1							1														**11**
Cabrera	6			8		2						9														**22**
Petroni				5	1																					**6**
Petroni E.	9			32																						**41**
Vargas A.				1		6						3											1			**11**
Vargas C.				7		2						8						1					1			**19**
Total N of Trips	**38**			**214**	**5**	**25**						**66**	**1**		**4**	**1**		**4**					**4**			**359**

Transportation Company: TRANSFER S.A.

	Destination Area																									
Truck Driver	**CAP**	**CBA**	**COR**	**GBA**	**LUJ**	**MDQ**	**MJU**	**MZA**	**NEU**	**OLA**	**PAR**	**PIL**	**RAF**	**RCU**	**ROS**	**SAL**	**SFA**	**SFE**	**SFR**	**SJO**	**SJU**	**SLU**	**TUC**	**VMA**	**VME**	**Total N of Trips**
Pimentel	1			2								4			3											**10**
Castro		3						2				1									1	1		1		**9**
Bassovich		1				1		2							2		1						1		1	**9**
Llerena										3		1			4										1	**9**
Orilla		1		1			1			1	1	3			4				1							**13**
Pietroboni		6		2						1		1														**10**
Luna E.	5			35											1			2								**43**
Garcia O.		2		1		1				1		1			3										1	**10**
Rodriguez E.		4		1			1		1									1		1						**9**
Rodriguez J.		2		1				2	1			2			2		1									**11**
Valdomar D.		5		3						1																**9**
La Torre C.	4	3		3								12			4											**26**
Chiapperi	1			12		2						6			3										1	**25**
Gregorio	2	1		5		1				1		5														**15**
Motta		1	1				1	2				2		1												**8**
Cuyot												1														**1**
Vivot		3	1					1				2			2											**9**
Vernet		2		9					1	2		6			1											**21**
Villanueva		4					1					1			2			1					1			**10**
Rivarola				2						1		2			1			1								**7**
Ivarzabal	1	3		2			1					2	1		4			1		1					1	**17**
Laguna Ma		3						1	1																	**5**
Laguna Mi		5		3		1		1	2									1							1	**14**
Olivieri				5			1	1		1		1			2			1								**12**
Bendersky		3		1					1	2		3			2											**12**
Total N of Trips	**14**	**52**	**2**	**88**		**6**	**6**	**12**	**7**	**14**	**1**	**56**	**1**	**1**	**40**		**2**	**8**	**1**	**2**	**1**	**1**	**2**	**1**	**6**	**324**

Source: Company documents.

Exhibit 15a: Truck Driver Trip Assignments by Geographic Area for an Average Fortnight

Area / Customer N°

		CAP								GBA																												COR	LUJ
	Truck Driver	100	101	102	103	104	105	106	107	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	160	161
Cristalog Hnos	Sanmartino				2	1				2							1			1	1			1							3			1	1				2
	Acosta C.																														1				1				
	Acuña	3		2	3	1	1			1							1				1			1	1		4	1			3				5	2	7		
	Fernandez W.										13						1														5								
	De Pinto																																						
	Delgado																																						
	Oro															2	1																2						
	Laprida				2					1	1					1	1		1	1													3						
	Ruggieri				1					2				1		1							14														1		
	Sureda										1	2				1				1			1		1														
	Pitaluga												1																		2								
	Cascante	1	1		2												3					1	2									1	1		1				1
	Calcagno																1																2						
	Vignoli	1			1					3		1	1	3		2	2	1		3			1								7	5	2				1		
	Zunino																			1			1									1							
	Madera				1								2																		1								
	Madera D.									1			1	1				1		1			1				1				1				1				1
	Cabrera				5				1			4				1					2										1								
	Petroni																			1														3					1
	Petroni E.	2		1	4	2				1	1	1						1			2	2		3	1	1			2		5			4	6	2	1		
	Vargas A.													1																									
	Vargas C.										1	1					2				1										2								
	(blank)				2					1														1							1					1			
Transfer SA	Pimentel							1			1								1																				
	Castro																																						
	Bassovich																																						
	Llerena																																						
	Orilla															1																							
	Pietroboni												1							1																			
	Luna E.	4			1					8	6		2								2					1			3			2	1	7	3				
	Garcia O.												1																										
	Rodriguez E.															1																							
	Rodriguez J.										1																												
	Valdomar D.																			3																			
	La Torre C.				3			1		1						1																	1						
	Chiapperi							1			3		2			1			1													1	4						
	Gregorio							2			1		1			1			2																				
	Motta																																					1	
	Cuyot																																						
	Vivot																																					1	
	Vernet										3					1			1		2												2						
	Villanueva																																						
	Rivarola																																2						
	Ivarzabal				1														1		1																		
	Laguna Ma																																						
	Laguna Mi										1					1																	1						
	Olivieri															2					1												2						
	Bendersky																															1							
	(blank)				1			1								1																							

Source: Company documents.

Exhibit 15b: Truck Driver Trip Assignments by Customer for an Average Fortnight

		Area / Customer N°																																		
		CBA					MDQ		MJU	MZA		NEU		OLA	PAR	PIL	RAF	RCU	ROS						SAL	SFA	SFE		SFR	SJO	SJU	SLU	TUC			VMA	VME
	Truck Driver	110	111	112	113	114	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
Cristalog Hnos	Sanmartino																																				
	Acosta C.							3								3	1																	1			
	Acuña																																				
	Fernandez W.															16			3																		
	De Pinto															1																					
	Delgado															1																					
	Oro																																				
	Laprida							6								2																					
	Ruggieri															1																					
	Sureda							1								12												1									
	Pitaluga																																				
	Cascante															1																					
	Calcagno							3																	1		1	1						1			
	Vignoli															4																					
	Zunino							2								4						1															
	Madera																																				
	Madera D.															1																					
	Cabrera							2								9																					
	Petroni																																				
	Petroni E.																																				
	Vargas A.							6								3																		1			
	Vargas C.							2								8												1						1			
	(blank)															1																					
Transfer SA	Pimentel															4				2				1													
	Castro		2	1						1	1					1															1	1				1	
	Bassovich		1				1			1	1													2		1							1				1
	Llerena													3		1			1	1				2													1
	Orilla		1						1					1	1	3			2	1				1					1								
	Pietroboni		5		1									1		1																					
	Luna E.																							1			1	1									
	Garcia O.		1	1			1							1		1			1		2																1
	Rodriguez E.		4						1			1															1			1							
	Rodriguez J.		2							1	1		1			2				1		1				1											
	Valdomar D.		5											1																							
	La Torre C.		2		1											12					1	1	1	1													
	Chiapperi						2									6			3																		1
	Gregorio					1	1							1		5																					
	Motta		1						1	1	1					2		1																			
	Cuyot															1																					
	Vivot		3								1					2								2													
	Vernet		1			1						1		2		6								1													
	Villanueva		3	1					1							1								2				1							1		
	Rivarola													1		2								1			1										
	Ivarzabal		3						1							2	1				1	2		1				1		1							1
	Laguna Ma		2		1						1	1																									
	Laguna Mi		3			2	1				1	2															1										1
	Olivieri								1		1			1		1			1					1			1										
	Bendersky		1	2								1		2		3								2													
	(blank)		2								2	3												1													

Source: Company documents.

Notes

1. One of the oldest shaping techniques was glass blowing, a glass-forming technique that involved blowing air into a molten portion of glass through a large metallic tube.
2. This process made a sheet of glass by floating raw materials melted at high temperature on a bed of molten tin.
3. Process by which molten glass was withdrawn from the furnace in a vertical manner and then melted again.
4. Process by which molten glass was squeezed between two rollers to make the sheets, generally with a pattern on the surface.
5. Exchange rate 12-22-2008: 1 US dollar = 3.43 Argentine pesos.
6. SKU (Stock Keeping Unit) was an identification number referring to an invoiceable item that enabled effective follow-up management of goods.
7. During 2008, VASA's imports represented 30 percent of total supply and involved grey and bronze colored glasses.
8. Logistics estimated that if 100 percent of trucks were modular (at the time, they accounted for 50 percent of the truck fleet), 15 percent more stockroom space would be required.
9. Many VASA customers unloaded glass packages from modules one by one, because they did not have strong enough cranes to hoist the loaded module from the truck, thus lengthening delivery time.
10. Sitrack was an integrated control, optimization, and tracking system with GPS (Global Positioning System) technology used to identify the exact position of any transportation vehicle.