
Araucanian Materials, Inc.

TEMUCO, CHILE

CASES A AND B

Focus of the Case

Araucanian Materials is a Chilean construction and electrical parts distributor that has long employed inventory practices designed to reduce the need to hold large amounts of inventory. The system, however, has created many stockout situations. Steve Wigler, a visiting American business adviser, studied their system and identified some alternative ideas for improving the operation. He believed the business was ripe for employing an Economic Order Quantity inventory model. But he was hard pressed to explain the concept and convince his kindly but skeptical managers that their old ways were not the best. The challenges he faces in the case are threefold: (a) how to get the computer programmers to develop new reports to highlight the stocking problems and suggest when to reorder, (b) how to get the salesmen to collect information about stockout situations to document the magnitude of lost sales, and (c) how to introduce the EOQ concept and gather supporting data to win management's support for a new approach to managing inventory.

Case A introduces the student to the company and identifies the challenges that Steve faces in advancing his ideas. At the end of that case, AMI management gives their full support to Steve's need for systems development. Steve now gropes for ways to enlist the salesmen. Case B presents the results of the survey of salesmen, documenting problems with stockouts. The

survey reveals that the company's traditional ways of handling inventory have had a substantial negative effect on sales.

Case A should be prepared by the student before class. Case B can be handed out in class midway through the class discussion. Assignment questions appearing at the end of Case A are as follows:

- 1. Assuming that the computer programmers began work implementing Steve's inventory tracking software idea, how could Steve get the salesmen to cooperate with his stockout survey, filling out the forms consistently and correctly?**
- 2. What difficulties might Steve encounter?**
- 3. How should Steve communicate his other ideas for improving operations?**
- 4. What impediments to his recommendations should he anticipate?**
- 5. What other areas of the firm can be improved?**

The discussion below examines these challenges along several dimensions: Cross-Cultural Communication, Information Management, Purchasing Methods, EOQ Inventory Model, and Inflation. It then summarizes other operational improvements suggested by the adviser, namely, changes to the ordering process, the warehouse, and deliveries.

Cross-Cultural Communication

Communication is the most important component in convincing management to change. The businessperson must appreciate the importance of understanding communication patterns found in another country and, consequently, must modify his or her approaches in order to be successful. Technical or professional expertise are important to solving problems, but without the ability to communicate, the businessperson's chances for success will not be promising. Often times, this means adapting to the host country's culture.

A definition of communication is the transmission of messages and ideas between two or more peoples. Not only does this include words but also emotions, situations, intonations, gestures, utterances, and so on. These variables are taken into account in the context of the exchange. Edward T. Hall, the researcher who first coined the term "contexting," defined it as "the way in which one communicates and especially the circumstances surrounding that communication" (Victor, 137).

Speaking another language in and of itself does not mean that one can successfully communicate with people who use that other language. One must learn the meaning of certain behaviors and the influence of situations on communication. Contexting is a learned behavior, and those people who have grown up in similar environments are able to interpret non-written and unspoken words because they transmit known signals to each other (Victor, 137). These exchanges often leave the foreigner confused and frustrated. For example, when an American makes a request of a Chilean and receives the response "yes," the word most likely was said out of courtesy, since saying "no" is considered offensive and impolite. While the American might be led to believe that these people do not keep their word, one familiar with the context would have understood the intended meaning. When Steve received a response of "yes" from the salesman, he had assumed that they would fill out the form without any supervision.

Countries vary in the degree of the importance of context. The U.S. is generally believed to be a lower context culture than Latin American society, while the Swiss-German culture has an even lower context index. There is a continuum of contexting characteristics

across several cultures (Figure 1). The uttered message states specifically what one wants to express in low context cultures. In high context cultures, this may not be so.

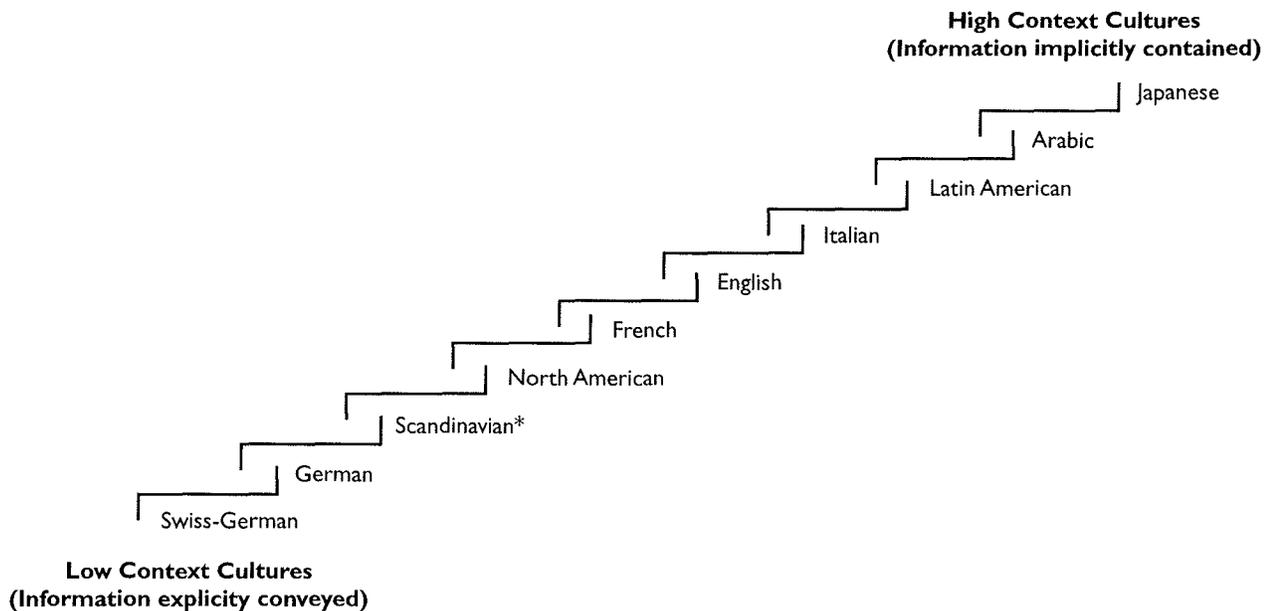
Low context cultures are often classified as being direct in their communication patterns while high context societies are considered indirect. Directness is regarded differently depending on the society in which it is heard. Low context cultures believe directness is good. High context cultures see it as being rude and offensive.

Along with the issue of indirectness comes the issue of face-saving. Face-saving is defined as the act of preserving one's prestige or outward dignity. The importance of face-saving varies from culture to culture. High context cultures tend to attach greater importance to face-saving than low context cultures. Indirectness avoids causing another person to lose face. Steve avoided this typically by utilizing the third person pronoun "we" whenever making suggestions. He wanted to convey a message of teamwork rather than give any indication of a "he-they" attitude. Politeness is very important. A common complaint of foreign nationals (such as Latin Americans) is that North Americans bring with them an attitude of superiority. While both North Americans and Latin Americans are concerned about stating thoughts that are on their minds, they differ in their means of expressing doubt, disagreements, opposing views, and so forth.

Steve needed to communicate in a manner that took issues of indirectness and face-saving into account. Communication was the means to overcome the following impediments. First, management felt there was no inventory management problem. Second, the computer programmers had tasks of higher priority and, therefore, could not devote much time to Steve's requests. Third, the salesman were not collaborating with the stockout survey. Without the salesman's cooperation he could not convince management that they could improve their inventory management. Without the help of the computer programmers, he could not create the programs required to give management a better handle on product information and some automated assistance in the ordering process.

In addition to the above impediments, others should be acknowledged. First, Steve was a lot younger than

Figure 1
HIGH CONTEXT AND LOW CONTEXT CULTURES



*Scandinavian category excludes Finland
 Source: *International Business Communication*

the managers. Age is more valued in Latin America than it is in the United States. Second, Steve's time was limited. He was only there for 10 months, and so fellow co-workers questioned whether or not the changes he proposed would really be made. Third, he was subsidized by another institution. The firm, therefore paid only a small fee for his services which may have lowered management's expectations. Fourth, he was allocated few resources.

In light of these constraints, Steve believed he needed to build relationships with other employees in order to be successful. He proceeded to do so by joining in all sorts of group activities. He set aside time for conversation and socialization with fellow employees. He invited some of them individually to lunch or dinner, and participated in activities with each of them. This allowed both Steve and the workers to familiarize themselves on a personal and professional basis. By building a relationship of trust, the salesmen became more cooperative in completing the stockout survey. Forming relationships with his coworkers and management was essential to obtaining their collaboration.

Steve also changed his way of approaching the salesmen to gain their cooperation. First, he called a meeting with the salesmen and store manager with the explicit backing of Don Jorge. Second, he himself stopped by daily to pick up the completed stockout surveys rather than asking the salesmen to submit them on their own when fully completed. He initially gave each salesmen one survey to fill out. Upon completion they were to give it to Steve, who in exchange would issue them another sheet. Each survey allowed for 15 entries. It took approximately a week for each salesmen to fill out one form completely. Knowing that they had approximately a week before it was due, the salesmen typically postponed writing up each stockout incident on the form. By picking up the forms daily, however, Steve motivated them to record each incident on the day it occurred. Third, he distributed a questionnaire to both the in-store salesmen and the out-house salesmen. Fourth, he delegated responsibility to an in-store salesman to collect the forms from this group. Fifth, the employees had to become more aware of the importance of the survey to the senior managers of the firm.

They needed to understand that the information they reported would be communicated to AMI management. The salesmen did cooperate. The closer supervision may have helped them regard the survey as a more important on-going task.

Information Management

Steve was hired expressly to analyze inventory rotation for a period of 10 months. The computer department was unable to provide the necessary data, which would have allowed him to provide such an analysis. Steve believed it would take too many hours to perform the analysis manually with little real payoff. Therefore, before he could embark on such analysis, he needed the assistance of the two computer programmers. His requests were constantly postponed to tackle more urgent tasks raised by the Cooperative and other business units.

Although the Cooperative had modern equipment, its computer capabilities were underutilized. AMI lacked a computer program that would give management easily accessible data. Their current database was deficient and needed improvement. Historical information regarding its product line was nearly non-existent. As a result, management relied on memory and intuition in making decisions. Their program did not have the ability to print reports such as family sales, items providing the highest returns, items not moving, and so on. Programs needed to be developed to print each of these types of reports.

The programmers knew of AMI's informational needs but were involved in more urgent tasks, or on tasks more constantly solicited. Don Jorge was discouraged with the computer programmers and preferred to base his decisions on his own intuition. He did not receive his requests within an acceptable period of time, and those he did receive were filled with inaccuracies. In addition, DJ had little experience with computers and was not too comfortable with them. This complicated matters for Steve, who wanted more computer involvement in the ordering process.

Steve suggested an increased use of computers in the decision-making process and an end to reliance on the Cooperative for information. Considering the time needed to write an adequate program, Steve suggested

it would be better to purchase a software program rather than to have the in-house programmers create it. DJ considered the proposal and encouraged Steve to search the local market to locate a suitable program. Steve found nothing acceptable on the local market. Thus a new program had to be developed by the programmers. Steve designed a user friendly program that would facilitate access of data with a report generator capability that would permit the user to print his/her own reports based on various criteria and specified fields. The program could print batch reports during the evening for pick-up the next morning. The program, for example, could print sales summary reports and list those items whose inventory levels had reached the critical stock level.

At the meeting with the managers described at the end of the case, Don Nelson ordered the accounting department to obtain outside help if the programmers were unable to do it. A student was hired to work with Steve and write the computer program. Most university programs in Chile require that their students participate in non-paid internship program, providing an inexpensive resource to companies, before they graduate.

Purchasing Methods

AMI had been purchasing their goods in the same manner since its inception. It had become successful using this method and had grown accustomed to it. Their resistance towards Steve's suggestions was thus understandable. Their methodology prevented them from being left with unsold merchandise. So why change it?

When the firm started, it had limited cash flow and could not purchase all goods for stock. It focused on those goods that provided high turnover and high returns. The goods that did have stock were purchased in quantities suggested by the salesmen. These suggestions did not consider ordering and holding costs. Steve felt that the process was too intuitive and the number of stockouts too high. The firm had grown enough to justify a more efficient purchasing method. He met with resistance and had no empirical data to convince management. An important assumption that Steve had to disprove was that 90% of the time clients were willing to backorder merchandise. If most of the customers purchased their goods as they needed them, Steve

reasoned, then backordering was not likely. Steve's intuitive feeling was that backordering must be much lower than 90% and he conducted a survey to prove his case.

The survey provided a better indication of backordering patterns and associated figures for lost sales. The survey's results are reported in Case B, Exhibit 10, which summarizes events for a one-month period. As can be seen from the results, approximately 83% of the customers did not backlog. This was practically the opposite of what Don Jorge had expected.

There were 233 observations in this survey. Those who indicated they would not backlog represented \$36,722 in sales. A yearly estimate was calculated by multiplying this number by 12. Given this, the stockout rate was costly to AMI.

With this data, Steve was able to support his recommendation for modifying their purchasing habits. Group meetings were used in AMI's operations to resolve problems and implement new ideas and evident throughout the case: Don Jorge had daily meetings with the general manager and monthly meetings with the board of directors; Don Nelson called a meeting for Steve after going to lunch. Steve decided to take this approach and organized a meeting with all the managers. He relayed his findings from the stockout survey. Months prior to this meeting, Steve took the informal approach to win support for his idea and to slowly familiarize them with the Economic Order Quantity model. So when this meeting came around, they understood some of these concepts. His findings were convincing enough to support Steve's recommendation of adjusting their buying habits and decrease the amount of intuition involved in the buying process.

Steve suggested that the firm incorporate an Economic Order Quantity (EOQ) model into their purchasing practices. This would reduce the amount of stockouts and, consequently, improve customer service. If they did not have the product in stock, customers would purchase it from their competitors. The EOQ model would reduce the amount of intuition involved in the buying process and introduce other variables that were not being considered, such as holding cost, storage cost, and stockout rate.

Economic Order Quantity Model

The firm could improve its customer service by lowering its stockout rate. Two important questions needed to be answered in order to effectively manage inventory:

1. How much to order?
2. When should the order be placed?

The first question requires a balance between small orders (ordering frequently) and big orders (ordering infrequently). The first alternative can result in high ordering costs, and the second in high holding costs. There is an equation that attempts to minimize the total of the two.

Ordering cost, holding cost, and demand are three variables required in this model. Holding costs are those costs associated in maintaining a certain level of inventory. These include insurance, breakage, financing, pilferage, etc. If the firm's money is used, then there is the opportunity cost of not being able to make other investments. If they borrowed money to finance inventory, then there would be an interest cost. Currently, AMI has a \$187,796 loan with 8% interest. In some instances, it may be better to pay back this loan rather than maintain inventory.

Ordering costs are those values associated with making an order. These could be any cost incurred in placing an order, such as paperwork utilized, telephone and fax costs, shipping costs, personnel time spent in the ordering process that could be devoted to other tasks, etc. AMI's major ordering cost was the time spent by personnel in the ordering process. Although their salaries were not high, they did consume many hours in this process, which could have been used for other tasks.

Demand is the number of units expected to be sold in a given period.

These variables may be difficult to attain but should not deter one from attempting to do so. If we can obtain close estimates of these costs, then the model can improve results. For example, let us say that ordering costs total \$5; holding costs are 10% of the unit's cost; unit cost is \$25; and demand is 1,000 units. The EOQ formula is $Q^* = \text{square root of } (2 \cdot D \cdot O_c / H_c)$, where D , O_c , and H_c are demand, ordering costs, and

holding costs, respectively. By plugging in the values for these variables, our equation gives a value of:

$$\begin{aligned} & \text{Square root of } (2 \times 1,000 \times 5) / (25 \times 10) \\ & \text{Square root of } (10,000 / 2.5) \\ & \text{EOQ} = 63.25 \end{aligned}$$

Ordering in quantities of 63 units will provide for the least total of holding and ordering cost. Holding cost is calculated by multiplying the holding cost by the average inventory level. In this example, total holding cost for the year is $(.10 \times 25) \times (\text{average inventory level } 63/2) = 2.5 \times 31.5$ is \$78.75. Total ordering cost is equal to ordering costs multiplied by the number of orders placed. This is equal to $\$5 \times 1,000/63 = \79.36 . Total ordering and holding cost is \$158.11. Ordering in batches of other than 63 units will result in a higher holding and ordering costs, an amount greater than \$158.11. The point at which these costs are minimized is where holding and ordering costs are equal to each other. In the above example, 63.25 units is the quantity at which this goal is satisfied. Since most goods cannot be ordered in fractions, one rounds to the nearest integer.

The second question, "when should we order?" has to be answered. If demand were constant, we could order whenever the product reached its critical stock level. The critical stock level is derived from lead time demand. Let us assume that lead time from order to receipt of a product is 7 days and during this period demand is 19 units. The critical stock level would be 19 units. Whenever the product's inventory level reached 19 units, an order would be placed at this point. The shipment would arrive just as the inventory is fully depleted.

AMI's demand is not constant and therefore has to deal with probabilistic demand. In a probabilistic model, demand fluctuates from period to period. Demand in one week might be 19 units, and in the following week might be 40 units. We cannot take an average of yearly sales of $19(1,000/52)$ units as a critical stock level, because this is only an average and demands higher and lower than 19 would be experienced virtually every time. Roughly 50% of the time AMI would stockout. When demand was higher than 19 during the lead time, the firm's product inventory level would reach 0 before the shipment arrived the warehouse. Considering that AMI's customers will not backorder 83% of the time,

it is unacceptable to stockout, because they will go elsewhere to purchase the product.

One way to compensate for these fluctuations is to assess the demand rates during lead times for a period of time. We could achieve this by taking the firm's historical sales data. This data can also provide us with average lead time demand and standard deviation. Let us assume that demand per week for product A in the past six months was the following:

19	15	10	2	25	30	45	33	20	11	0	13	16
9	20	12	12	23	19	32	9	11	21	25	28	15

The above figures have a mean of 18.27 units and a standard deviation of 9.92. AMI can use a normal probability distribution for orders received during lead time because it provides a good enough approximation to reality and deals with two easily determined parameters: the mean, μ , and the standard deviation, σ . These parameters can be easily stored in the computer and the machine can make these calculations for AMI's entire product line.

There are also intangible costs associated with stock-outs, such as customers' frustrations when the product is not available, the number of lost clients due to stock-outs, etc. Calculating these costs is very difficult because a specific figure cannot be associated with these intangibles. An easier variable to deal with is the customer's service level, which might be measured as the percentage of times AMI fully services a customer's order. To provide a service level of 100%, one would need to maintain a high inventory level, which results in high holding costs. A service level of 50% would result in many lost sales and revenues. Management must decide the level with which it would feel comfortable. AMI calculated its lost sales for the month of June as at least \$36,722. This figure is conservative because the salesmen could have forgotten to record some stock-outs, customers might not really wait even though they said they would, etc.

We will be able to recover some of these lost sales by utilizing the above data and z table. We could see that 1.645 deviations from the mean will give a stockout rate of approximately 5% during lead time. The level of service is 95% in this case.

The reorder point is described as the following,

$$R = \text{Average sale} + (z \text{ value})(\text{standard deviation})$$

Therefore, by using the numbers calculated above, we can calculate the reorder point.

$$R = 18.27 + (1.645)(9.92)$$
$$R = 34.59$$

Whenever the inventory level for this particular number reaches 35 units, a new order of 63 units should be placed. Setting the period for which you want to calculate mean and standard deviation is arbitrary. But you must be careful not to select periods that are too long or too short. Periods too long may not represent current demand patterns. Periods too short may represent aberrations from typical demand behaviors. Steve feels that two years will provide a reasonable time period to measure the mean and standard deviation for each of the firm's products.

IMPEDIMENTS TO THE EOQ MODEL

A very important variable in calculating the critical stock level is the suppliers' lead time. If this number is not reliable then the implementation of this model may become difficult. Unreliable lead times will cause a higher stockout rate and require higher inventory levels to buffer the uncertainty. There are several considerations that need to be taken into account. First, AMI experiences shortages of trucks during the summer months. Although the farmers and other individuals pay more during the harvest seasons, AMI has been able to obtain the trucking services' cooperation by reminding them of AMI's use of their service year round. Second, goods are not always available from the supplier. Third, deficient infrastructure may disrupt distribution of products. This has created complications for AMI in timing their receipt of goods. This could hamper the ordering process or thwart an implementation of a Just-In-Time model because goods cannot always be shipped reliably.

Inflation

There are several things a firm can do to protect its profitability in the face of high inflation. It can adopt one or more strategies, including forecasting inflation rates and government actions and adjusting prices accordingly, using a "replacement" cost approach to pricing, maintaining real margins over actual costs, shortening credit and extending payables, and adjusting performance indicators to remove the effects of infla-

tion. First, accurate forecasting of inflation is essential. Second, in an inflationary environment the company should employ accounting principles that view an item sold in terms of its replacement cost, because the original cost is too misleading. Third, real margins must be protected by continuously moving prices, as in the replacement method. Credit actually becomes part of the pricing strategy.

AMI's store manager spent a great deal of his time keeping information on products current. He constantly adjusted prices based on replacement costs. Doing otherwise would diminish the firm's profit margin. Another strategy was to build in an inflation factor in the price of goods bought on credit.

One area the firm had to readjust was its goal setting. Analyzing Case A Exhibit 4, we see that from January 1991 to January 1992, the actual percentage increase set was 23.06%. The firm sets its goals by adding 5% to the previous year's monthly sales. AMI does incorporate an inflation factor, but, as the year progresses, it reduces the inflation component. We can see that inflation from January 1991 to January 1992 was 19.46%. Accounting for inflation, a 5% increase goal should therefore be 490.610. This was not the case. AMI set it at 485.09. Although Local Industrial sold \$63,000 more in January 1992 than it did in January 1991, in actuality, it sold less. Inflation outpaced the nominal gain. By December, the firm did not take inflation into consideration and set its goal by a nominal 5%. *Inflation alone therefore would increase revenues to surpass the goal even if Local Industrial sold the same amount as last year. It would even be possible to sell less and surpass these goals. Inflation needs to be accounted for to provide for real changes in sales. Therefore, nominal achievements mislead one in assessing actual achievements in an inflationary environment.*

One solution would be to convert its monthly sales into Unidad de Foment (U.F.), an accounting unit that takes into account the currency's devaluation and is reported daily in several newspapers. Monthly goals could be set by adding 5% in terms of U.F.s. In closing the month, the firm would convert the recent month's sales into this unit and compare it to the monthly goal and the previous year's sales. This would allow for a comparison in similar units.

Ordering Process

With respect to the ordering process, diminish the amount of people involved. Currently the salesmen have to count the stock level each week and give a suggested reorder amount. The suggested BT4.8 reorder amounts are left up to intuition and do not take into account holding and ordering costs. Steve suggested automating this process and cutting the number of people involved by at least 50%. Let the computer print out a report that contains all goods that have reached their critical stock level. The salesmen would no longer be required to count products and give suggestions weekly. Now that the salesmen are on-line, acquisitions should also go on-line. A program that can automatically trigger a purchase order can be created. Upon receipt of goods, the processed purchase order would then automatically update inventory levels and product costs. This would reduce the number of manhours needed in this process and reduce the paperwork involved. These people would be able to focus on more productive tasks.

Warehouse

The firm relieved some of the congestion problems by separating vehicles that pick up cargo from vehicles that do not pick up cargo. It moved its showroom location next door.

Removing Don Francisco from his position was never a consideration. He had been a loyal employee of Don Jorge for many years and was brought by Don Jorge to the firm. Trust is a more important variable than efficiency.

Steve recommended the use of a motorized conveyor belt and the rearrangement of products in the warehouse. The company purchased approximately 30,000 cement bags per month, which resulted in an unloading and loading time of approximately 150–200 hours/month in the yard (based on a 1520 seconds estimate per bag with two people). It is calculated that a conveyor belt would cut the unloading and loading time in half

to about 75 to 100 hours/month (at least). Steve noted the following benefits as well: reduced injuries, reduced workload, saved time, and freed-up time for some people to do other tasks. DJ liked the idea and made plans to purchase a conveyor belt.

In addition, the layout of the merchandise could be improved. Steve saw possible benefits to moving the location of cement, located in the corner of the warehouse, which prevented more than one large vehicle from unloading at the same time. If the layout were changed it would allow more vehicles to unload simultaneously.

The bins for the products have to be made larger to support the large stock quantities. At present the bins are too small and the unloaders must place an item in more than one place. The salesmen then have difficulty in locating the item and believe that the item is not in stock when, in fact, it is.

Deliveries

Roberto, the truck driver, needs someone to aid him. The firm has on various occasions hired someone to assist him. These workers soon left because of personality conflicts. Roberto has been working with AMI since its inception and was hired as a truck driver. Eliminating him is not a consideration because he is fulfilling the responsibilities he was hired to do. At the same time, however, there are large amounts of idle time, which does not maximize deliveries. The gravity roller suggested by Steve for unloading cement was not viable. The rollers would rip holes in the cement bags.

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