GAC Case study

"What manufacturing strategy makes the most sense for company?" mused Jerry Peshel, vice president of operations for General Appliance Company (GAC). GAC is a leading producer of major appliances with a moderately wide line of high-quality products. The major appliance industry, marked by several large competitors and relatively slim margins, was expecting strong unit shipments in the coming year. Rising consumer confidence and falling interest rates had stimulated demand for durable goods and new tomes, promising increased sales in both the replacement and first purchase markets.

GAC was currently enjoying strong profitability, but there were clouds on the horizon. Process and product innovations by aggressive domestic competitors threatened to leave GAC with obsolete products and cost disadvantages. One rival had recently signaled a push into GAC's high-quality, high-price market segment by sharp increases in advertising and promotions that emphasized quality and reliability. The same company had recently purchased the industry's leading producer of top-quality dishwashers. Foreign concerns were currently small players in the U.S. major appliance market, but many industry observers expected Japanese and European companies to make bids for increased market share within the next five years.

Manufacturing performance plays an important role in maintaining viability in the major appliance business, due to the competitive requirement for responding to consumer demands for higher quality while addressing competitive cost pressures. Although GAC had continuously invested in maintaining and modernizing its manufacturing and distribution facilities over the last few years, many competitors had done likewise.

Peshel felt that there was a need to coordinate the company's piecemeal approach to reducing costs and planning production in the context of an overall manufacturing and distribution strategy. An integrated approach would help him resolve the myriad of trade-offs that confronted him on a daily basis.

Recent discussions with the company's sales and manufacturing managers had forcefully reminded him of many of these issues. Managers at some plants were urgently requesting funds for expansion, while others were plagued with overcapacity. Some of the newer and more efficient plants and distribution centers were underutilized, while older facilities were approaching capacity limits.

Several specific questions formed in Peshel's mind:

- Was the current configuration of manufacturing and distribution facilities desirable? Should new facilities be purchased or built, should capacity be expanded or reduced at existing facilities, or should some facilities be shut down?
- Should each plant produce a wide range of finished products or should they specialize in just a few product lines? Should some plants specialize in the fabrication of components and subassemblies while others are devoted to assembly?
- Is the existing network of distribution centers and warehouses appropriate? How should it respond to changes in the manufacturing system?
- How should distribution centers be sourced by manufacturing plants, and which customer market zones should be assigned to each of the distribution centers?
- How should overall market production requirements for each product, component, and subassembly be assigned to various plants? How should these production outputs be distributed to other plants, distribution centers, and warehouses? How should these quantities be determined on a regular basis?
- Which production processes are appropriate for the various components and assemblies used in the appliance industry? How should process choices be made, given estimated volumes, product mixes, and costs for each of GAC's plants?
- How will changes in demand patterns, competitor actions, and external costs affect the answers to these questions?

Jerry Peshel grew increasingly uncertain as he contemplated the possible options and their ramifications. He knew that the answer to any one question impacted the answers to the others, and that choices of a manufacturing/distribution policy would have significant impact on GAC's future competitive position. He also knew, though, that his boss, GAC President Bill Clark, was counting on him to come up with a review of the operating function for the next board meeting, which was scheduled in four weeks.

The firm had recently hired a management consulting firm to evaluate GAC's competitive potential. In their report the consultants concluded that there was poor integration between corporate objectives and the manufacturing side of the business. One of their recommendations was to consolidate manufacturing into few plants. They also documented several instances where delivery problems had led to lost sales in key markets. These service problems were traced to excessive production lead times which were brought about by component shortages. Their key finding, however, was that GAC must move to introduce new product designs and expand its market penetration if it hopes to grow in the future.

Company History

General Appliance Company was founded as the Cleveland Washing Machine Company in 1939 by two brothers in Cleveland, Ohio. Fred and William Sherman built their first automatic clothes washer in an abandoned warehouse on Cleveland's south side. The Shermans made improvements on newly introduced automatic washer technology, and demand outstripped their ability to produce the machines almost immediately.

By 1950, unit sales had reached 70,000 and ground was broken for the construction of an additional plant to handle skyrocketing postwar demand. Production of clothes dryers was added in 1953 with the completion of the new manufacturing facility. In 1958, the product line was broadened to include electric and gas ranges and ovens with the acquisition of the Newton Range Company of St. Joseph, Michigan. Two years later, the company officially changed its name to the General Appliance Company and went public, with a listing on the New York Stock Exchange.

A small manufacturer of clothes washers and dryers. located in Fort Smith, Arkansas, was acquired in 1961. When a full line of portable and built-in dishwashers was introduced in 1969, GAC manufactured them in Fort Smith as well as in Cleveland.

In 1975 GAC built a production facility in Dalton, Georgia, to provide southern manufacturing capacity for ranges and a newly introduced food waste disposer line. By 1983 the plant had been expanded twice, and production lines for washers, dryers, and dishwashers had been installed.

A manufacturing facility located near Los Angeles was purchased from another appliance producer in late 1978 and converted to the manufacture of GAC washers, dryers, and dishwashers.

General Appliance consistently enjoyed the largest margins in the major appliance industry, mainly due to its emphasis on quality, product reliability and excellent after-market service. The company had never experienced an unprofitable year and, by 1985, had achieved earnings of $74 million on sales of $685 million.

Product Line

GAC's product line consisted primarily of electric and gas ranges and ovens, clothes washers and dryers, and dishwashers. GAC also produced food waste disposers, but these supplied a relatively insignificant portion of revenue. GAC products enjoyed a high-quality image that was maintained by outstanding product and process engineering, thorough testing, a motivated production work force, and by advertising that stressed reliability. The high prices that GAC products commanded allowed GAC to maintain a high level of R & D and capital spending.

GAC's products required components and assembly procedures that were basically similar. Each had a cabinet composed of a sheet metal exterior and several plastic or metal interior parts, an electrical or electronic control unit and a motor and drive mechanism (or in the case of the ranges and ovens, heating elements).[1]

1-Smaller hearing elements of various kinds were also required for dishwashers and dryers.

There were also various handles, knobs and trim pieces made of glass, metal, and plastic. The major steps in manufacturing the products were:

1. Raw material and component purchasing
2. Cabinet manufacturing
3. Component manufacturing
4. Final assembly

GAC had developed methods and systems that, in management's view, accomplished these tasks efficiently and effectively. Each step is described below.

Purchasing

GAC purchased relatively few components, preferring instead to manufacture many of the parts that other appliance producers bought. For instance, GAC produced its own pumps, heating elements, transmissions (drive mechanisms), hoses, wire harnesses, and many molded plastic parts. This was done to maintain high quality levels, lower production costs and lower transportation costs (several GAC plants were not close to qualified parts suppliers). Continuous review of make-versus-buy decisions determined if components currently manufactured in-house should be purchased. For many parts the answer in terms of both cost and quality continued to be to produce them in GAC plants.

Raw materials such as steel, plastic, porcelain ingredients, and cement[2] were purchased by the plants on an individual basis, although there were corporate guidelines for material and supplier selection. Critical purchased components like motors, timers, and assembled circuit boards were obtained only from a limited number of corporate-specified, qualified vendors.

The manufacturing plants currently purchased relatively few parts from each other, although such internal intermediate product sourcing was not prohibited by the corporate office. The Fort Smith and St. Joseph plants were required o buy the major components that they did not manufacture, including pumps, transmissions and heating elements, from one of the other plants.

The volume of plant-to-plant transfers was increasing, aid disputes between the plants, mainly over transfer prices, were becoming more frequent. GAC used a "cost-plus" method to set transfer prices because they did not sell their intermediate products externally and no objective market price could be set. Although the "cost-plus" method itemed straightforward, it resulted in disagreements about low costs were calculated and about what the mark-up should be. In particular, Fort Smith plant manager Mike Soane felt that the prices he paid the Cleveland plant for

2- cement was used to balance and add weight to washer tubs.

components were too high. An analysis performed by his Industrial Engineering department showed that, with the proper capital investment, the parts could be manufactured for a lower cost in Fort Smith. Jerry Peshel was well aware of the problems with the transfer pricing scheme, and was weighing the advantages and disadvantages of alternatives that would promote equity among the plants.

Cabinet Manufacturing

The creation of cabinets from rolls of sheet metal required the following steps:

1. Slitting, sheeting, and stretching of the steel to form blanks
2. Drawing and pressing to form tubs, top panels, and side panels
3. Welding of subassemblies
4. "Pickling" of subassemblies
5. Application of paint or porcelain
6. Assembly

Large presses, from 30 to 1250 tons of capacity, were used for the first two operations. Many of them were loaded and unloaded automatically, allowing one operator to run several machines. All of the welding was done automatically, by robots or automatic welders.

"Pickling" is a process that prepares metal parts for the application of porcelain enamel. It involves removing foreign materials and oil, etching the metal surface with an acid solution, and depositing a nickel film on the surface of the part to promote adherence of the enamel during the firing process.

Cabinet manufacturing consumed a large part of GAC's resources, in terms of people, equipment, and floor space, and accounted for a large part of the appliance manufacturing cost. It also represented a significant portion of GAC's in-process inventory investment. Enough cabinet parts for four hours of production were maintained in front of the paint and porcelain operation, while eight hours' worth were held in front of the assembly department.

For these reasons, GAC paid close attention to innovations in materials and processes that were used to produce appliance cabinets. For instance, Jerry Peshel knew that at least one of GAC's competitors molded clothes washer and dishwasher tubs out of plastic. GAC used porcelain-coated steel for both parts. (Stainless steel was also an alternative for these parts. Although it did not rust and did not require expensive coating processes, it was expensive and difficult to form.) Over the last few years developments in materials and molding technology had increased the viability of using plastic for these parts.

From a production standpoint, the replacement of steel-and-porcelain with plastic was attractive for several reasons. Although plastic cost more than steel on a per unit basis, additional material cost was more than offset by labor and quality advantages. Also, molding processes generate very little scrap. An injection molding and milling process reduces labor costs by eliminating numerous stamping and assembly operations. Elimination of stamping dies and presses and abbreviation of the assembly line significantly reduce the cost of design, engineering, and tooling for new models.

Models may be redesigned almost every year since the costs of retooling decline. Also, the time and direct labor required to setup production lines for each model run are reduced.

Tubs can be designed that reduce the number of parts needed in assembly. The elimination of parts means that raw and in-process inventories are reduced and that manufacturing cycle times are speeded up as assembly is simplified.

Problems encountered by consumers, including cracked and chipped porcelain and the resulting rust, are eliminated. Plastic also makes quieter parts, a characteristic demanded by consumers, especially in dishwashers.

For General Appliance, plastic had its drawbacks, too. For one thing, GAC production personnel had no experience in the molding of such large parts. The major disadvantage, though, was that plastic components required a cure time after molding. While steel parts could be produced in one or two seconds, plastic parts needed to cool for one or two minutes. Thus, if throughput was to be maintained, many expensive injection molders had to be purchased. Consequently, adoption of this innovation would require substantial capital investment and floor space, and could only be justified by a relatively high volume of production.

The industry's largest company, General Electric, had taken advantage of plastic's favorable characteristics by spending four years and $38 million to redesign both its dishwasher product line and manufacturing facilities. Most of the product's steel parts were replaced with a one-piece plastic tub. The well-publicized results included higher product quality, inventory turns, and market share, along with lower production costs, transportation costs and number of parts and assemblies (reduced from 5600 to 850) *(Purchasing,* March 29, 1984, p. 113). An analysis of potential advantages for GAC in carrying out a similar dishwasher product and manufacturing system redesign for the Cleveland plant had been prepared for Jerry Peshel and is shown in Exhibit 1. Exhibit 2 shows the cost/volume trade-offs of dishwasher process and product alternatives, each of which is indicated by the material to be used for the dishwasher tub.

In addition to product and material changes, investment in various production processes also offers reduced cabinet manufacturing costs. For example, some companies have installed steel slitting systems that are used to reduce …

Exhibit 1

Cost/Benefit Analysis of Redesigning Dishwasher Products and Manufacturing Systems for Plastic (Millions of Dollars)

Required Investment	
Capital investment (4 molding machines)	$17.60
Capital investment (other manufacturing equipment)	6.30
Manufacturing system redesign	1.50
Product redesign	1.10
Consolidation costs (Note 6)	0.90
	$27,40

Annual Cost Savings	
Reduced direct labor in assembly	$ 6.50
Reduced indirect labor	0.39

Savings from inventory reduction	0.05
Scrap reduction	0.16
Reduced shipping costs (Note 7)	0.01
Increased material cost	(1,75)
Increased maintenance costs	(0.40)
	$4.96

Notes

1. GAC's cost of capital was estimated to be 11%.
2. Annual cost savings were based on an estimated volume of 250,000 units/year.
3. The two-shift capacity of the injection molding machine being considered was 65,000 parts/year.
4. The molding machines and other manufacturing equipment proposed for the project had estimated lives of seven years, but were classified in the five-year recovery class under the ACRS. It was expected that the molding machines would have a salvage value of approximately 10% of the original cost after seven years. Other equipment had no expected salvage value.
5. All of the proposed equipment was eligible for a 10% ITC (although legislation that would eliminate this credit has been proposed).
6. To obtain all of the cost savings indicated, dishwasher manufacturing operations would have to be consolidated into one facility. This was the estimated cost to physically relocate the affected equipment. The effects on other factors, like inbound and outbound transportation costs, administrative costs, customer service, and quality levels had not yet been quantified. Plastic parts reduced the dishwasher weight by 15 to 22 pounds, reducing some shipping costs.

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standard-width steel coils to the proper widths for cabinet parts. The alternative to performing this step in-house is to contract with a third party for the service or to pay extra for custom-width steel. Slitting systems require substantial floor space and installation costs (including the digging of a 25-foot deep "looping pit" to maintain proper tension), but allow the appliance manufacturer to reduce steel costs and inventory through the purchase of standard-width coils. Most of these systems require a capital investment of between $0.4 and *$2* million.

Some of GAC's competitors had invested heavily in factory automation and flexible manufacturing systems (FMS) to produce sheet metal parts for appliance cabinets. The FMS approach promised reduced direct labor, floor space, and inventory requirements, along with improved quality. The promised advantage of an FMS is its flexibility in producing a large number of part types, over a wide range of production volumes, at a competitive manufacturing cost. However, the fixed and investment costs of such systems were extremely high.

Magic Chef had recently spent *$2.7* million for an FMS to produce sheet metal parts and realized a 50% increase in direct labor productivity. Panels for several different appliances »ere manufactured on the same line. The system required a coil of steel at the beginning of the line and only two operators—one to enter part numbers in the system computer and another to remove finished panels. The FMS had been installed in conjunction with consolidations of their facilities and product lines so that high system utilization was assured. li was anticipated that panels produced at the FMS plant would be shipped to other Magic Chef facilities for assembly *(Appliance Manufacturer,* October 1985, p. 31).

Peshel felt that GAC's product line was not varied enough, and its production runs were too long, to justify a large investment in FMS. There were those in the Manufacturing Engineering department who strongly disagreed with Peshel on this point.

Component Manufacturing

Pumps, heating elements, and transmissions were produced in only three of GAC's five plants (Cleveland, Dalton, and Los Angeles). Substantial investments had been made in machinery and automation to ensure low costs and consistently good parts. GAC used robots and employed dedicated automation in the fabrication of many parts and subassemblies. For example, the die casting operation used to make parts for washer transmissions had been automated (at an expense of $1.5 million) so that virtually no direct labor was required. An automatic ladle poured molten metal into the form, a computer controlled the pressure, and a robot removed the finished part.

Powdered (sintered) metal technology is an alternative process that can be employed for the production of some transmission and pump parts. Sintered metal parts are formed by introducing blended, powdered metals into a die under tremendous pressure and then heating to bond the particles. First used commercially ten years ago, the sintered metal process has several advantages. Resulting parts are stronger, more uniform and require little added trimming or machining. Sintered metal forging is said to produce products of higher quality at lower manufacturing costs than other methods. Although an investment of $2.5 to $4 million per plant is required, the potential payoffs are large. Exhibits 3 and 4 show the cost/volume relationship among the possible forging processes for both pump parts and drive unit parts.

Components were assembled in a variety of ways. Control panels for all of GAC's appliances were assembled at individual work stations. Direct labor costs were higher for this method than for an assembly line or automated assembly, but quality was high and it contributed to "job enrichment."

Currently, top-of-the-line dishwashers were the only GAC products that contained electronic control panels (all others used electromechanical timers and conventional switches). GAC purchased fully assembled circuit boards, along with membrane switches and other components, for these control panels. Assembly time was reduced because wiring and component mounting was greatly simplified, but the parts purchased for an electronic panel cost almost $50 more than those for a standard panel. Also, 100% testing of the incoming circuit boards offset assembly labor savings. GAC Marketing and Engineering personnel

were watching competitive products closely and contemplating the introduction of electronic controls on other products. So far, though, consumer resistance to electronics on major appliances and engineering hurdles (including temperature problems during "self-cleaning" oven cycles and washer vibration difficulties) had to be overcome.

Other major components, including pumps and transmissions, were built on machine-paced assembly lines in Cleveland and Los Angeles and on worker-paced (non synchronous) lines in Dalton. The Dalton assembly lines produced parts at a slower rate, but component quality was higher. Lower rework costs more than covered the higher direct labor assembly costs.

Final Assembly

Most of GAC's plants used machine-paced final assembly lines, although many subassembly operations were performed individually or on worker-paced lines.

In the Cleveland plant, the Industrial Engineering department had designed a high-speed machine-paced assembly line. The decomposition of final assembly operations in multiple individual jobs, coupled with careful line balancing and the judicious use of automation, allowed for a line cycle time that was several seconds faster than those in other plants. In contrast, the St. Joseph plant used worker-paced final assembly lines to produce ranges and ovens. Each worker completed a number of assembly operations before passing the unit to the next worker.

Machine-paced lines produced at a faster and more steady rate than the worker-paced lines but quality some-limes suffered. Higher capital and maintenance requirements for the machine-paced lines made them cost-effective only if they could be fully utilized for high volume production (generally considered to be at least two full shifts).

The investment required for a typical machine-paced line was $200,000 to $800,000, while the high-speed lines cost $650,000 to $1,200,000. Maintenance costs for the machine-paced lines often ran 20% to 50% higher than for worker-paced lines, due mainly to the complexity of the equipment and the need for skilled technicians to maintain them. The delays and costs associated with retooling such lines for model changes were also considerable.

Automated assembly, in the form of dedicated "pick-and-place" units or robots, could be utilized on the assembly lines to reduce errors and maintain a constant pace. If a suitable application was found, these units (costing between $40.000 and $200,000) could be placed on a machine-paced line to eliminate workers or improve quality.

Manufacturing Facilities

Exhibit 5 is an organizational chart of GAC's manufacturing and distribution operations and Exhibit 6 is a map showing the location of each facility. A description of each manufacturing plant follows.

Cleveland, Ohio

GAC's Cleveland manufacturing plant was the largest and oldest of its facilities. It consisted of the original GAC manufacturing plant and a large addition, which was built in the early 1950s. Several smaller expansions had been made during the past three decades and the entire facility now had floor space of almost 3 million square feet. General Appliance headquarters was located adjacent to the plant, with the Research and Development building directly across the street.

The smaller, original GAC plant produced pumps, transmissions, heating elements, hoses, wire harnesses, small plastic parts and other components. The main plant fabricated sheet metal cabinets and housed assembly lines for all of GAC products.

Building maintenance costs were extremely high. Inefficient material handing, due to the outdated factory design and lack of a modern conveyor system, pushed up unit costs. Labor costs were also higher in this region. Despite recent concessions, the union maintained many work rules that management considered to be inefficient. There was no more room to expand on the current Cleveland site, and facilities were currently utilized at more than 90% of capacity.

Fort Smith, Arkansas

The Fort Smith plant was the sole manufacturing facility of a troubled laundry products manufacturer that GAC acquired in 1961. The plant was quickly converted to the production of General Appliance products and, mainly through the efforts of a GAC manufacturing team (of which Jerry Peshel had been the junior member), operating losses were stemmed within six months. In addition to washers and dryers, GAC manufactured portable and built-in dishwashers in Fort Smith. Fort Smith purchased several major components from Cleveland, including pumps and transmissions.

Although labor costs were low and the union was relatively cooperative, unit costs suffered because of outdated equipment that required much maintenance and that resulted in frequent downtime. Fort Smith was a prime candidate for a large capital outlay to update its manufacturing facilities. The plant manager, Mike Sloane, had submitted project requests in each of the last two years and had been turned down both times. He was becoming increasingly vocal about the potential his plant had for low-cost production if corporate would approve his capital requests. Fort Smith was currently producing at less than full capacity.

St. Joseph, Michigan

The St. Joseph plant, formerly the Newton Range Company, manufactured only gas and electric ranges and ovens. GAC had not invested heavily in the St. Joseph plant over the last few years because of the plant's limited size and product line.

Although St. Joseph was currently producing at capacity, it was questionable whether the fixed cost of the small plant was worth the incremental capacity for ranges and ovens. Little automation had been installed in either the fabrication or assembly areas, but the plant was surprisingly efficient in terms of labor hours per unit produced. This was attributed mostly to an older, experienced work force that generated little scrap and worked well together. Assembly was performed on an operator-paced assembly line. Each worker performed several operations on the product before rolling it along the line to the next operator. St. Joseph employed only about 200 people. Heating elements were purchased from the Cleveland plant, but all other parts were either manufactured in-house or purchased from approved vendors.

Dalton, Georgia

The Dalton plant was the newest and most efficient of GAC's manufacturing facilities. Although it was almost ten years old, GAC had invested heavily over the last decade to expand and update the plant and its equipment. Several miles of overhead conveyors provided efficient transport of material from sheet metal, paint, and porcelain departments to the assembly lines. Robots had been installed in several locations, mainly to perform tedious or difficult punch press and painting operations.

Machine-paced final assembly lines were used to obtain high-volume production of all of GAC's products, including food waste disposers. Dalton had the same capacity as the Cleveland plant with twenty percent less floor space. Facilities to manufacture all components including pumps, heating elements and transmissions, had been installed.

Union relations were very good and employees were generally more hard-working and cooperative than in the other GAC plants. Wage rates were lower than at any other GAC location.

One disturbing change Jerry Peshel had recently spotted, though, was a significant increase in the unit cost of several products. The change had appeared fifteen months ago, shortly after production of dishwashers was initiated in Dalton (making Dalton the only production facility that manufactured all of GAC's products). These cost increases seemed to be exacerbated by changes in product mix and volume requirements. Dalton plant manager Brad McCallura had assured Peshel that Dalton would remain GAC's most efficient facility.

Los Angeles, California

The Los Angeles plant was a large facility that GAC had purchased in 1978 from another appliance manufacturer to provide West Coast capacity. The transportation of bulky and heavy appliances to the West Coast was expensive and lime-consuming. Before the Los Angeles plant purchase, at an\ given time large amounts of inventory were on trains and trucks between GAC plants and the West Coast. The Los Angeles plant had been converted to the manufacture of GAC washers, dryers and dishwashers.

Since 1979, however, results had been disappointing. Labor costs were high and quality was the lowest of any GAC plant. Rapid employee turnover was attributed to both problems. Pumps and transmissions were currently produced in the Los Angeles plant, but the rework and scrap rates were high. Attempts by GAC engineering and production people to improve component quality had resulted **in** little improvement after two years of effort. Jerry Peshel knew that the Dalton and Cleveland plants had sufficient capacity to ship pumps and transmissions to the West Coast if the Los Angeles plant did not get its act together soon.

Many large and expensive presses, automatic cabinet lines and automatic coating lines had been installed to provide high volume capability, but the capacity was underutilized. Likewise, machine-paced assembly lines were used at less than their two-shift capacity because of slack demand.

Although it had been unthinkable just two years before, one option being considered was the closing of the Los Angeles plant. The fixed cost savings and lower unit costs at Fort Smith, St. Joseph and Dalton would possibly outweigh the higher transportation and inventory costs. It was anticipated that higher utilization of these other plants would generate cost savings due to scale economies, but this was uncertain.

Exhibit 7 summarizes refixed and variable cost for the different manufacturing plants.

Distribution

General Appliance maintained four distribution centers (DCs) to serve twelve customer market zones. East, Central and West DC's supplied ten domestic customer zones. The East DC served the foreign (mainly European) markets and Canada was served by a DC located in Downsview, which is a suburb of Toronto. Exhibit 8 presents the cost and capacities for the different distribution centers.

The Eastern DC, located outside of Philadelphia in Mechanicsburg, was the newest and most efficient distribution facility; it was also the smallest. It was currently operating at capacity and Manager Ann Marie Martin was already requesting funds for expansion. The Central DC, located in St. Louis, was the largest distribution facility.

The Western DC, in Los Angeles, had the highest handling and fixed costs due to high labor rates and building maintenance expenses. All goods shipped to Europe went through the Mechanicsburg DC, while Canadian shipments went through the Downsview facility.

All products were shipped from the manufacturing plants to the distribution centers where they were inventoried with varying degrees of automation and efficiency. Customer zone orders were generally filled by the nearest DC, but sometimes it was necessary to ship products from other DCs. All DCs maintained a 90% fill rate service target.

The customer zones comprised many wholesale appliance distributors who in turn sold to a total of approximately 10,000 retail outlets. Distribution exclusively through retail stores had allowed GAC to avoid the sales declines associated with housing industry downturns and the price-cutting of mass merchandisers. Most of GAC's appliances went to the relatively stable replacement market.

Peshel was contemplating opening a Southern DC. Fixed and operating costs for a proposed Atlanta facility had been estimated by a team that Peshel had appointed (see Exhibit 8), but the impact of such a facility on overall costs was not yet clear. Transportation costs from existing DCs to many rapidly growing Southern markets were high, but it was difficult to determine if reduced shipping charges would offset the costs associated with operating another DC.

The manager of the St. Louis DC, Brian Foulke, was against such an addition, arguing that his facility could cost-effectively serve the South if GAC would invest in the improved inventory control systems and the state-of-the-art storage and retrieval system that he proposed. The St. Louis facility was not currently operating at maximum capacity.

Manufacturing Strategy Options

Although GAC had its share of manufacturing problems, Peshel knew that his costs were currently competitive, given GAC's quality and service performance. Even though GAC's products commanded high prices, the company could not have enjoyed margins almost double the industry average without a competitive cost structure. He was concerned, though, that changing market demands, foreign and domestic competitors and new product and process technologies could erode those margins quickly. To maintain a competitive cost position, he wanted to ensure that the configuration of GAC processes, plants and distribution centers was rational and consistent with the company's overall corporate strategy of market segmentation and differentiation. However, the trade-offs to be evaluated were complex. If GAC continued manufacturing the same products at several different locations, scale economies that could be realized by centralizing production would be sacrificed. Also, consistency and quality are enhanced by manufacturing each product at only one location. Recent experience with the Dalton plant suggested that there may be costs associated with overloading a plant with a production mission that is too complex. On the other hand, transportation charges for major appliances were significant and some economies of scope were obtained by manufacturing several similar products at the same location.

QUESTION

Peshel had instructed his new assistant, recent MBA graduate Skip Clark, to pull together relevant distribution and manufacturing cost information as the first step in a comprehensive analysis (see exhibits 9 to 15). With this information and Mr. Clark's assistance, Jerry Peshel hoped to draw some conclusions about the most effective manufacturing strategy for GAC.